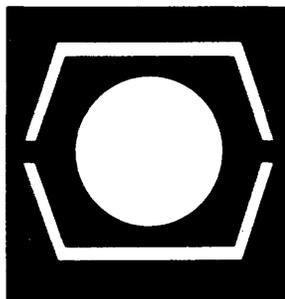


DECUS

**PROGRAM
LIBRARY
CATALOG**



DECUS

**DECUS PROGRAM
LIBRARY CATALOG**

NOVEMBER 1969

DIGITAL EQUIPMENT COMPUTER USERS SOCIETY
MAYNARD, MASSACHUSETTS 01754 TEL. 897-5111 TWX 710 347-0212

DECUS PROGRAM LIBRARY

The DECUS Program Library contains programs for the PDP-5, PDP-6, PDP-7, PDP-8 family, PDP-9, PDP-10, LINC and LINC-8, and also a section containing programs that require FOCAL. Users interested in programs for the PDP-1 should contact the DECUS Program Librarian.

This catalog is divided into four major sections: Category Index, Programs Available from Authors, Programs for Sale or Lease, and Numerical Index with Abstracts.

The Numerical Index indicates what is available on the program and should be referenced when requesting programs. A sample request form follows. The programs in the Category Index are listed according to the following categories:

- I. Programming Language, Monitor, Programming System
- II. Text Editing, Text Manipulation
- III. Debugging, Disassembly, Simulation, Trace, Dump
- IV. Binary Loading, Binary Punching
- V. Duplication, Verification
- VI. Numerical Function, Numerical Input/Output
- VII. Utility
- VIII. Display
- IX. Data Management, Symbol Manipulation, Sorting
- X. Probability, Statistics, Curve Fitting
- XI. Scientific Application, Engineering Application
- XII. Hardware Control
- XIII. Game, Demonstration
- XIV. Plotting
- XV. Desk Calculator, Business Application
- XVI. Maintenance
- XVII. Miscellaneous

In the Category Index, programs are listed in each category grouped by computer line with FOCAL programs inserted at the end. The Numerical Index and Abstracts are divided into machine lines. New programs added to the Library will be published in a Monthly Newsletter which will also contain information on programs that are submitted for approval. Catalog addenda will be issued quarterly.

A DECUS Program Submittal Form and instructions are included in this catalog. All programs should be submitted with the necessary software for program operation to: DECUS Program Librarian, Digital Equipment Computer Users Society, 146 Main Street, Maynard, Massachusetts 01754. Additional forms may be obtained from the DECUS Office.

DECUS LIBRARY PROGRAM SUBMITTAL INFORMATION

Programs may be contributed to or requested by any DECUS member from the

DECUS Program Librarian
Digital Equipment Computer Users Society
146 Main Street
Maynard, Massachusetts 01754

PROGRAM SUBMISSION

Each Program should include the following:

- 1) Program Submittal Form (complete as possible)
- 2) Write-up - (existing documentation permissible):
 - Contents: Full operating instructions; Program Description; References for mathematical techniques employed; Additional information pertinent to users.
 - Format: Preferably typewritten or printed (black and white), for reproduction purposes. In general, write-ups will be reproduced without alteration.
- 3) Paper Tapes or DECTape*: Object (Binary) and Source (Symbolic).
Cards (Source Deck)
 - Label paper tapes with the following information:
 - a) Program Title
 - b) Subtitles (indicate various program subroutines)
 - c) Tape Format, i.e., Binary or ASCII
 - d) Starting Address
 - e) Version Date
 - *User-supplied DECTapes will be replaced by DECUS when required.
- 4) Listings and Flowcharts, whenever possible.

PROGRAM REVISIONS AND CORRECTIONS

Please include: New tapes; Write-up addendum indicating change; New Listings reflecting changes.

PROGRAM CATEGORIES (reference Submittal Form)

- | | |
|--|---|
| I. Programming Language, Monitor, Programming System | IX. Data Management, Symbol Manipulation, Sorting |
| II. Text Editing, Text Manipulation | X. Probability, Statistics, Curve Fitting |
| III. Debugging, Disassembly, Simulation, Trace, Dump | XI. Scientific Application, Engineering Application |
| IV. Binary Loading, Binary Punching | XII. Hardware Control |
| V. Duplication, Verification | XIII. Game, Demonstration |
| VI. Numerical Function, Numerical Input/Output | XIV. Plotting |
| VII. Utility | XV. Desk Calculator, Business Application |
| VIII. Display | XVI. Maintenance |
| | XVII. Miscellaneous |

The program will be announced in the Monthly Newsletter and Catalog Addendum. Information for the announcement will be extracted from this form.

DECUS welcomes your comments, criticisms and suggestions.

DECUS LIBRARY PROGRAM SUBMITTAL FORM

Submitted to the PDP-_____ LINC-~~8~~_____ Library
 (Indicate computer(s) on which program may be run)

Title: _____

Author: _____ Date: _____

Submitted by: _____
 (other than author)

Company: _____

Address: _____

Categories: _____
 (reference "Program Categories")

Minimum Hardware Required: _____

Other Programs or Subroutines Needed: _____

Programming Language: _____

Storage Requirement: _____

Restrictions: _____

Execution Time: _____

Miscellaneous: _____

Abstract (purpose of program and short description): _____

Material (indicate number of copies of each item submitted):

<u>Paper Tape</u>	Object: Binary	<input type="checkbox"/>	RIM	<input type="checkbox"/>	Source: ASCII	<input type="checkbox"/>
		<input type="checkbox"/>		<input type="checkbox"/>		<input type="checkbox"/>
<u>DECtape</u>	Object: Binary	<input type="checkbox"/>	Source: ASCII	<input type="checkbox"/>		
		<input type="checkbox"/>		<input type="checkbox"/>		
<u>LINCtape</u>	Object: Binary	<input type="checkbox"/>	Manuscript: LAP-4	<input type="checkbox"/>		
		<input type="checkbox"/>		LAP-6	<input type="checkbox"/>	
Cards (Source Deck)	<input type="checkbox"/>		Listing	<input type="checkbox"/>	Writeup	<input type="checkbox"/>
Flowcharts	<input type="checkbox"/>		Other Documentation	<input type="checkbox"/>		

I, the undersigned, give full permission to DECUS to publish information regarding this program in DECUSCOPE and to reproduce and distribute this program in full or part, to all interested parties.

Signed: _____

DECUS LIBRARY - PROGRAM ORDER FORM

DECUS NUMBER	1 PAPER TAPES		2 DECTAPES		WRITE-UP NO CHARGE (✓)	3 LISTINGS (\$)	4 CARD DECK (\$)	TOTAL PRICE	TO BE COMPLETED BY DECUS OFFICE	
	BIN	SYM	USER	DECUS					SENT	5 COMMENTS
								\$		
								\$		
								\$		
								\$		
								\$		

GRAND TOTAL \$ _____

1. Paper Tapes - Reproduction and Handling Charge - Binary or Object Program \$1.00 per program. Symbolic or Source tapes \$5.00 per program.

No charge for Delegates, (Please (✓) check appropriate column) all others* please indicate unit price.

*For Individual members only. If form is signed by a Delegate from your installation there will be no charge for paper tapes and user-supplied DECTapes.

2. DECTapes or LINCtapes - \$20.00 program and tape (tape supplied by DECUS). \$5.00 program and tape (tape supplied by user). For Delegates only, \$15.00 for program and tape - (tape supplied by DECUS).

3. Listings - \$5.00 if Listing is not included as part of the write-up.

4. Card Decks - \$7.00 per program.

5. Comments - BTOA - Binary Tape Only Available, STOA - Symbolic Tape Only Available, LU - Listing Unavailable, NT - No Tapes available for this program.

NAME _____ DELEGATE'S
SIGNATURE _____

INSTALLATION _____

ADDRESS _____

CITY _____ STATE _____ ZIP CODE _____

Please indicate on which computer these programs will be used _____

TO BE COMPLETED BY DECUS OFFICE:	
Date received _____	Amount received _____
Cash _____	Check _____
Approved _____	Completed by _____
Date Sent _____	Refund Amount _____
	Reason _____

REQUESTER: PLEASE RETAIN PINK COPY FOR YOUR RECORDS. PLEASE SEND BALANCE TO DECUS. GREEN COPY WILL BE RETURNED TO YOU WITH YOUR ORDER AS A RECEIPT.

Charges for programs indicated on this form are being made to help defray the cost of handling and postage.

NOTE:

The information below should be noted when ordering programs that are available on LINCtape or DECTape. In the past problems have arisen due to the confusion in the interpretation of our policy.

EXPLANATION OF CHARGES FOR PROGRAMS AVAILABLE ON
DECTAPE OR LINCTAPE

I. Delegates

A. Request Forms Signed by Delegate

1. Form accompanied by DECTape or LINCtape - No Charge.
2. Form not accompanied by DECTape or LINCtape - \$15.00 for the tape.

II. Individual Members

A. Request Forms Signed by Delegate

1. Form accompanied by DECTape or LINCtape - No Charge.
2. Form not accompanied by DECTape or LINCtape - \$15.00 for the tape.

B. Request Forms Not Signed by Delegate

1. Form accompanied by DECTape or LINCtape - \$5.00 Reproduction Charge.
2. Form not accompanied by DECTape or LINCtape - \$20.00 (\$5.00 for reproduction, \$15.00 for tape.)

III. Non-Members

A. Form accompanied by DECTape or LINCtape - \$5.00 Reproduction Charge.

B. Form not accompanied by DECTape or LINCtape - \$20.00 (\$5.00 for reproduction, \$15.00 for the tape.)

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PART I
CATEGORY INDEX

CATEGORY INDEX

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DECUS-5/8-28a	PAL III Modifications - Phoenix Assembler
DECUS-5/8-45	PDP-5/8 Remote and Time-Shared System
DECUS-5/8-46a	PDP-5/8 Utility Programs
DECUS-8-59	PALDT - PAL Modifications for DECTape (552 Control)
DECUS-5/8-64	DECTape Programming System (552 & TCØ1 Controls)
DECUS-8-67	PAL Modified for DECTape Input (552)
DECUS-8-77	PDP-8 Dual Process System
DECUS-8-82	Library System for 580 Magnetic Tape (Preliminary Version)
DECUS-8-84	One-Pass PAL III
DECUS-8-91	MICRO-8: An On-Line Assembler
DECUS-8-102a	A LISP Interpreter for the PDP-8
DECUS-8-116	PDP-8 Automatic Magnetic Tape Control (Type 57A) Library System
DECUS-8-122A	SNAP: Simplified Numerical Analysis Program (without EAE)
DECUS-8-122B	SNAP: Simplified Numerical Analysis Program (with EAE)
DECUS-8-123	UNIDEC Assembler
DECUS-8-124	PDP-8 Assembler for IBM 360/50 and above
DECUS-8-125	PDP-8 Relocatable Assembler for IBM 360/50 and above
DECUS-8-129	PDP-8/57A Magnetic Tape Program Library System
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DECUS-8-146	High Speed Interrupt Executive
DECUS-8-159	CINET-BASIC
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DECUS-8-166	The PDPMAP Assembly System
DECUS-8-195	POLY BASIC
DECUS-8-197	Overlay for Standard Editor and PAL III Assembler
DECUS-8-200	BOSS
DECUS-6/8-12	PDP-8 Assembler for PDP-6
DECUS-6/10-29	LISP 1.5 for PDP-6/10
DECUS-6/10-30	COBOL
DECUS-6/10-38	LISP 1.6 for PDP-6/10
DECUS-6/10-39	GIST
DECUS-6/10-41	Rapid Program Generation System
DECUS-7-2a	FAST 7 START
DECUS-7-29	Non-FORTRAN DECTape System
DECUS-7-41	FLAP: A Two-pass Assembly Program for the PDP-7
DECUS-7-42	The ML/1 Macro Processor
DECUS-7-47	Macro Definitions for the ML/1 Macro Processor
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DECUS-9-5	DECTape File-Reading Basic Assembler
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DECUS-L-7	Modifications to PROGOFOP, Version 2
DECUS-L-15.1	LEAP-1
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DECUS-L-21	LINC-TRAN: FORTRAN Macros for the LINC-8
DECUS-L-30	LAP6-1C (Modification to LAP6)
DECUS-L-31	SNAP: Simplified Numerical Analysis Program for the LINC-8 (with and without EAE)
DECUS-L-43	LAP6-1H Using High-Speed Punch for LINC-8

I.	<u>Programming Language, Monitor, Programming System (Continued)</u>
DECUS-L-52	LINC-TAPE FORTRAN
DECUS-L-54	LES
DECUS-L-60	FORTRAN with LINCtape
FOCAL-3	DISK FOCAL
FOCAL-6	FOCAL-8 Patch for LINC-8 Display
FOCAL-8	Magtape FOCAL
FOCAL-11	EAE Routines for FOCAL
FOCAL-17	FOCAL: How to Write New Subroutines and Use Internal Routines
FOCAL-32	Translation Table
FOCAL-43	A Collection of FOCAL Patches

II.	<u>Text Editing, Text Manipulation</u>
DECUS-5/8-50	Additions to Symbolic Tape Format Generator (DEC-8-21-4)
DECUS-8-52	Tiny Tape Editor
DECUS-8-66	Editor Modified for DEctape (552)
DECUS-8-88	DEctape Symbolic Format Generator
DECUS-8-101	Symbolic Editor with View (338)
DECUS-8-139	Editor
DECUS-8-170	FORTRAN Source Conversion Program
DECUS-8-176	PAL CHOP
DECUS-8-184	Page Routine
DECUS-8-185	Modifications to Symbolic Editor and Symbolic Tape Format Generator
DECUS-8-197	Overlay for Standard Editor and PAL III Assembler
DECUS-8-209	Editor-With-View (VD 8/1 or 34D Scope)
DECUS-6-15	DREDIT
DECUS-6/10-38.1	ALVINE
DECUS-6/10-40	SCOPE TECO
DECUS-6/10-42	LST9: A Program to List PDP-9 DEctapes on a PDP-10 Line Printer
DECUS-7-9a	Scope Text Editor with Text Display MK III for the PDP-7/340
DECUS-7-46	Symbolic Tape Editor with Text Display
DECUS-7/9-53	Programs for Masking and Processing Nonstandard Paper Tape Input to PDP-7/9 FORTRAN
DECUS-9-28	PACKER: A Text Handling Subroutine for PDP-9 ADVANCED Software System
DECUS-L-1.1	MSCPNT: Manuscript Compressed Print
DECUS-L-51	TAGSWAP: Change Manuscript Tags

III.	<u>Debugging, Disassembly, Simulation, Trace, Dump</u>
DECUS-5-2.1	OPAK - An On-Line Debugging Program
DECUS-5-4	Octal Timeout of Memory Area with Format Option
DECUS-5-11	PDP-5 Debug System
DECUS-5/8-18A	Binary Tape Disassembly Program
DECUS-5/8-18C	Disassembler with Symbols
DECUS-8-19a	DDT-UP: Octal Symbolic Debugging Program
DECUS-5/8-33	Tape to Memory Comparator
DECUS-5-36	Octal Memory Dump Revised
DECUS-5-41	Breakpoint
DECUS-5/8-55	PALEX - An On-Line Debugging Program for the PDP-5/8
DECUS-8-56	Fixed Point Trace No. 1
DECUS-8-57	Fixed Point Trace No. 2
DECUS-5-63	SBUG-4
DECUS-8-78	Diagnose: A Versatile Trace Routine for the PDP-8 with EAE
DECUS-8-83A&B	Octal Debugging Package (with and without Floating Point)
DECUS-8-89	XOD: Extended Octal Debugging Program
DECUS-8-91	MICRO-8: An On-Line Assembler
DECUS-8-95	TRACE for EAE
DECUS-8-97	GOOF
DECUS-8-105	D-BUG
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DECUS-8-127	XDDT: Extended Octal-Symbolic Debugging Program

III. Debugging, Disassembly, Simulation, Trace, Dump (Continued)

DECUS-8-149	Core Window
DECUS-8-150	PTOD8 High and PTOD8 Low
DECUS-8-156	HEPTRACE
DECUS-8-165	The PDP-8 Simulator System for Philco 212
DECUS-8-172	Octal Systems Edit
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DECUS-8-179	EAE Modifications for Binary Disassembler with Symbols
DECUS-8-182	Memory Compare
DECUS-6-20	DTADDT
DECUS-6/10-43	PDP-8 Simulator on the PDP-10
DECUS-7-3	CUS: Console Utility System
DECUS-7-39	Store Display Program
DECUS-7-44	An Interrupt Compatible DDT
DECUS-9-14	PROCON-9
DECUS-9-18	A PDP-8 Simulator for the PDP-9
DECUS-L-34	LINC-DDT
DECUS-L-37	BINLAP6 (LAP6)
DECUS-L-38	TAPEDUMP
DECUS-L-44	LINC DUMP
DECUS-L-63	L6DISASS
FOCAL-2	XOD Modification for use with FOCAL

IV. Binary Loading, Binary Punching

DECUS-5/8-1.1	BPAK - A Binary Input/Output Package
DECUS-5-3	BRL - A Binary Relocatable Loader with Transfer Vector Options for the PDP-5
DECUS-5-12	Pack-Punch Processor and Reader for the PDP-5
DECUS-8-26A	Compressed Binary Loader (CBL)
DECUS-8-26B.1	CBL2BN and BN2CBL
DECUS-8-26C	XCBL: Extended Memory CBL Loader
DECUS-8-26D	XCBL Punch Program
DECUS-5/8-27 & 27a	Bootstrap Loader and Absolute Memory Clear
DECUS-5-34	Memory Halt - A PDP-5 Program to Store HALT in Most of Memory
DECUS-8-47	ALBIN - A PDP-8 Loader for Relocatable Binary Programs
DECUS-8-48	Modified Binary Loader MK IV
DECUS-8-81	A BIN or RIM Format Data or Program Tape Generator
DECUS-5/8-85	Set Memory Equal to Anything
DECUS-8-120	Disk/DECtape FAILSAFE
DECUS-8-130A	REBIL8: Relocating Binary Tape Loader for the PDP-8/5
DECUS-8-130B	RELCON: Binary to Relocatable Binary Tape Converter
DECUS-8-140	Binary Tape Consolidator
DECUS-8-142	Binary Punch - Extended Memory
DECUS-8-160	FASTLOAD
DECUS-8-180	Editor and Assembler for 57A Magnetic Tape System
DECUS-8-181	Automatic Binary Loader and Duplicator-Coder for Auto Bin
DECUS-8-183	The WANG Loader
DECUS-8-187	Keyboard Controlled Binary Punch
DECUS-8-204	PATCH: A PDP-8 Binary Paper Tape Patch Program
DECUS-8-205	MTSAFE
DECUS-7-12	Punch Output Package
DECUS-9-12	READ-IN Mode Puncher
DECUS-L-61	Alternative Binary Loader for LINC-8 Library

V. Duplication, Verification

DECUS-5-16	Tape Duplicator for the PDP-5
DECUS-5-22	DECtape Duplicate (552)
DECUS-5/8-33	Tape to Memory Comparator
DECUS-5/8-53	COPCAT (DECtape Copy 552)

V. Duplication, Verification (Continued)

DECUS-8-113	Conversion of Friden (EIA) to ASCII
DECUS-8-170	FORTRAN Source Conversion Program
DECUS-6/10-28	CMPSRC
DECUS-7-3	CUS: Console Utility System
DECUS-7-17	CREASE
DECUS-7-18	Paper Tape Verifier (with EAE)
DECUS-7-20	DECTape Copy Routine
DECUS-7-27	Paper Tape Verifier (without EAE)
DECUS-9-1	DECTape Copy Routine
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DECUS-9-22	DTCOPY
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DECUS-10-5	CONVRT
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DECUS-L-55	COMPAREM

VI. Numerical Function, Numerical Input/Output

DECUS-5-6	BCD to Binary Conversion of 3-Digit Numbers
DECUS-5/8-7	Decimal to Binary Conversion by Radix Deflation on PDP-8
DECUS-5/8-21	Triple Precision Arithmetic Package for the PDP-5/8
DECUS-5/8-29	BCD to Binary Conversion Subroutines
DECUS-5/8-35	BCD to Binary Conversion Subroutine and Binary to BCD Subroutine (Double Precision)
DECUS-5/8-38	FTYPE: Fractional Signed Decimal Type-In
DECUS-5/8-39	DSDPRINT, DDTYPE: Double Precision Signed Decimal Input-Output Package
DECUS-5/8-43	Unsigned Octal- Decimal Fraction Conversion
DECUS-8-44	Modifications to the Fixed Point Output in the PDP-8 Floating Point Package (Digital-8-5-S)
DECUS-8-60	Square Root Function by Subtraction Reduction
DECUS-8-61	Improvement to Digital 8-9-F Square Root
DECUS-5/8-69	LESQ29 and LESQ11
DECUS-8-70	EAE Routines for FORTRAN Operating System (DEC-08-CFA3)
DECUS-8-72	Matrix Inversion, Real Numbers
DECUS-8-73	Matrix Inversion, Complex Numbers
DECUS-8-74	Solution of System of Linear Equations: $AX = B$, by Matrix Inversion and Vector Multiplication
DECUS-8-75	Matrix Multiplication - Including Conforming Rectangular Matrices
DECUS-8-80	Determination of Real Eigenvalues of a Real Matrix
DECUS-8-93	CHEW - Convert Any BCD to Binary Double Precision
DECUS-8-96	J Bessel Function (FORTRAN)
DECUS-8-100	Double Precision Binary Coded Decimal Arithmetic Package
DECUS-8-103A	Four Word Floating Point Function Package
DECUS-8-103B	Four Word Floating Point Rudimentary Calculator
DECUS-8-103C	Four Word Floating Point Output Controller with Rounding
DECUS-8-103D	Additional Instructions for use with Four Word Floating Point Package
DECUS-8-114	Rounded Decimal Output Modifications for PDP-8 FORTRAN
DECUS-8-115a	Double Precision Integer Interpretive Package
DECUS-8-136	Fourier Transform Program in FORTRAN II
DECUS-8-143	FFTS-R: Fast Fourier Transform Subroutine for Real Valued Functions
DECUS-8-144	FFTS-C: Fast Fourier Transform Subroutine for Complex Data
DECUS-8-157	Square Root Patch for DEC-8-5-S
DECUS-8-186	EAE FORTRAN Patch for the PDP-8
DECUS-8-188	Extended Memory Patch for Four Word Floating Point Package (DEC-08-FMHA-8B)
DECUS-8-199	Accessing Data Arrays and Teletype Text Input/Output
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VI.

Numerical Function, Numerical Input/Output (Continued)

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DECUS-6/10-44	LaPlace Transform Computer Program
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DECUS-7-11	POSPNT: Positive Decimal Integer Print Routine
DECUS-7-15	FORTTRAN Patch for EAE Arithmetic
DECUS-7-23	OUTFLT
DECUS-9-3	Double Precision Integer Package (PDP-9 ADVANCED Software System)
DECUS-9-4	INTEGE: Integer Arithmetic with EAE
DECUS-9-24	Matrix Package
DECUS-9-30	OCTIP: Octal Integer Print Subroutine (Basic Software System)
DECUS-L-29	DEC-BI
DECUS-L-35A	DF.INOUT
DECUS-L-35B	I-O TAGS
DECUS-L-47	OCTBIN: Octal-to-Binary Conversion
DECUS-L-48	DECBIN: Decimal-to-Binary Conversion
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DECUS-L-50	BINDEC: Binary-to-Decimal Conversion
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DECUS-L-68	DBLFLT 2: A Multibank Configuration of DBLFLT
FOCAL-1	A Pseudo Random Number Generator for the PDP-8, for use with FOCAL
FOCAL-11	EAE Routines for FOCAL
FOCAL-18	T-ASK
FOCAL-33	Square Matrix Multiply, Least Common Multiple, Base to Base Integer Conversion, Prime Number Generator, Repeating Decimal
FOCAL-39	Rectangular-to-Polar Conversion, Polar-to-Rectangular Conversion

VII.

Utility

DECUS-5/8-32a	Program to Relocate and Pack Programs in Binary Format
DECUS-5-37	Transfer II
DECUS-8-68a	LABEL for PDP-8
DECUS-5/8-85	Set Memory Equal to Anything
DECUS-8-87	XMAP
DECUS-8-106	Readable Punch
DECUS-8-110	DIREC: Directory Print
DECUS-8-120	Disk/DECtape FAILSAFE
DECUS-8-135	DNHELP: Directory Assistor Program
DECUS-8-140	Binary Tape Consolidator
DECUS-8-141	SYSLUK
DECUS-8-153	Tape/Disk Transfer Programs
DECUS-8-154	SWAP
DECUS-8-172	Octal Systems Edit
DECUS-8-177	COPY
DECUS-8-189	LKDN: Look into the Directory Name Block
DECUS-8-190	PATCH Utility Program
DECUS-8-198	SYSHLP: Monitor System Utility Program
DECUS-8-204	PATCH: A PDP-8 Binary Paper Tape Patch Program
DECUS-8-205	MTSAFE
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DECUS-6-6	DTADIR
DECUS-6-7	DTALST ALIAS PIP-3
DECUS-6/10-16	FILER
DECUS-10-1	UT6RD
DECUS-L-19	LABELS for LINC-8
DECUS-L-36	PRINTMSS
DECUS-L-56	FIDDLX
DECUS-L-59	INDEXL4
DECUS-L-67	TAPEIN

VIII.

Display

DECUS-5/8-23A	PDP-5/8 Oscilloscope Symbol Generator (4x6 Matrix)
DECUS-5/8-23B	PDP-5/8 Oscilloscope Symbol Generator (5x7 Matrix)
DECUS-8-98	3D DRAW for 338
DECUS-8-99A	Kaleidoscope
DECUS-8-99B	Kaleidoscope (338)
DECUS-8-101	Symbolic Editor with View (338)
DECUS-8-107	CHESSBOARD Display on the 338
DECUS-8-108	INCMOD: Increment Mode Compiler (338)
DECUS-8-109	SEETXT Subroutine (338)
DECUS-8-128	PDP-8 Oscilloscope Display of Mathematical Functions
DECUS-8-131	SRCD: Software Rapid Character Display
DECUS-8-132	STRIP: A Data Display and Analysis Program for the PDP-8, 8/1
DECUS-8-149	Core Window
DECUS-8-158	AX-Ø8 Symbol Generator
DECUS-8-162	Demonstration Programs for the PDP-8
DECUS-8-167	CIRCUITS
DECUS-8-173	TIC-5/8 (Scope Version)
DECUS-8-174	Medium
DECUS-8-175	Post Stimulus Interval Histogram for AX-Ø8
DECUS-8-191	Fields
DECUS-8-193	DISP
DECUS-8-209	Editor-With-View (VD 8/1 or 34D Scope)
DECUS-6-1	ALPHAS
DECUS-6-2	LPFOL
DECUS-6-18	DISUBS
DECUS-6-25	1KCLOK
DECUS-6-32	DISDAT
DECUS-7/9-4c	PTSCOPE, PTPEN, PTPLOT, CALIBRATE, and LISTEN
DECUS-7/9-8a	FPTSCOPE, FPTPEN and FPTPLOT
DECUS-7-9a	Scope Text Editor MK III for the PDP-7/340
DECUS-7-13	340 Display Programming Manual
DECUS-7/9-30	GRASP: Gaussian Reduction and Analysis of Spectrum Peaks
DECUS-7-31	Display N Letter Word
DECUS-7-39	Store Display Program
DECUS-7-50	Plotter and Display Output Routines for the PDP-7 ADVANCED Software System
DECUS-7/9-54	Character Generator Display File Routines
DECUS-9-2	3D DRAW for 339 Display
DECUS-9-13	Plotter and Display Output Routines for the PDP-9 ADVANCED Software System
DECUS-9-23	KALSD9
DECUS-9-29	LPB.
DECUS-L-4.1	IN HISTO
DECUS-L-11	DATUM 8
DECUS-L-12	READIT
DECUS-L-22	A New PDP-8 Display Instruction for LINC-8
DECUS-L-27	Q & A Subroutine (Modification for LAP6 Characters)
DECUS-L-66	LAP6DISP
DECUS-L-69	GRAPHAS
FOCAL-6	FOCAL-8 Patch for LINC-8 Display
FOCAL-7	STRIP FOCAL - Storage of Data Arrays
FOCAL-13	3-D PLOTTER
FOCAL-24	GRADE: A Grade Averaging and Display Program

IX.

Data Management, Symbol Manipulation, Sorting

DECUS-5/8-51	Character Packing and Unpacking Routines
DECUS-8-137	Programs for Storage, Manipulation and Calculation of Data Using DECtape
DECUS-6-33	PLIST
DECUS-6-34	IBYTE
DECUS-6-37	PACK, UNPACK, REPACK
DECUS-7-33	SLP1: Simple List Processing Package
DECUS-10-4	ROCK: A Sort/Merge Program for the PDP-10
DECUS-L-53	FIND 1

X.	<u>Probability, Statistics, Curve Fitting</u>
DECUS-5/8-9	Analysis of Variance PDP-5/8
DECUS-5-25	A Pseudo Random Number Generator
DECUS-5/8-69	LESQ29 and LESQ11
DECUS-8-118	General Linear Regression
DECUS-5/8-126	Cumulative Gaussian Distribution Curve Fitting
DECUS-8-134	LSQ: Least Squares Subroutine
DECUS-8-137	Programs for Storage, Manipulation and Calculation of Data Using DECTape
DECUS-6-24	CHISQ
DECUS-6-36	RANDOM
DECUS-7-22	LEGFIT
DECUS-10-2	SERG: An Interactive Program to Perform Simple Regression Analysis
DECUS-L-13	AVPROG
DECUS-L-14	MEAN
DECUS-L-64	A Pseudo Random Number Generator for the LINC-8
FOCAL-7	STRIP FOCAL - Storage of Data Arrays
FOCAL-14	Least Squares Fit to a Straight Line
FOCAL-15	Least Squares Fit to a Cubic Polynomial
FOCAL-16	One-Sample Statistics, Two-Sample Statistics, Welch Procedure; One-Way Analysis of Variance; Sheffe's Contrast Between Means
FOCAL-19	Least Squares Fit to an Exponential
FOCAL-20	MULTIPULSE
FOCAL-21	MULTIPULSE-2
FOCAL-26	CURVE FITTING
FOCAL-28	Column Width, TRAVERSE, Least Squares "Linear" Fit, Nozzle Weight Flow, Filter Design, Ohm's Law
FOCAL-34	Simultaneous Equations, Abbreviated Simultaneous Equations, Curve Fittings
FOCAL-37	Nth Degree Polynomial Data Point Fitting Routine, Nth Degree Polynomial Data Point Fitting Routine with RMS Error
FOCAL-40	Simple Chi-Square Test
XI.	<u>Scientific Application, Engineering Application</u>
DECUS-8-49	Relativistic Dynamics
DECUS-8-65	A Programmed Associative Multichannel Analyzer
DECUS-8-76	PDP NAVIG 2/2
DECUS-5/8-90	Histogram on Teletype
DECUS-8-92	Analysis of Pulse-Height Analyzer Test Data with a Small Computer
DECUS-8-117	A PDP-8 Interface for a Charged-Particle Nuclear Physics Experiment
DECUS-8-118	General Linear Regression
DECUS-8-133	First Order Kinetics
DECUS-8-145	A Time-of-Flight Analyzer Based on a Small On-Line Computer
DECUS-8-161	EXPO: A Flexible PDP-8 Data-Acquisition Program
DECUS-8-164	Prime Number Determination
DECUS-8-167	CIRCUITS
DECUS-8-169	Physical Oceanography Data Reduction Programs for the PDP-8 (II)
DECUS-8-171	Real-Time System for Behavioral Science Experiments
DECUS-8-175	Post Stimulus Interval Histogram for AX-Ø8
DECUS-8-194	NMR Simulator
DECUS-8-208	Evaluating Determinants
DECUS-6-21	Critical Path Scheduling
DECUS-6-26	WIRE
DECUS-7-5	KINEMATICS
DECUS-7-6	CGC Function
DECUS-7-7	INPUT ND 180, INFLT ND 180, INPUT VICTOREEN, and INFLT VICTOREEN
DECUS-7-16	Single-Level Breit Wigner Fit
DECUS-7-19	DUMP ND 180 and FDUMP ND 180
DECUS-7-21	Reaction Kinematics
DECUS-7-24	ENLOSS
DECUS-7/9-30	GRASP: Gaussian Reduction and Analysis of Spectrum Peaks
DECUS-7/9-34	BESSEL
DECUS-7/9-35	Coulomb Excitation
DECUS-7/9-36	Finite Geometry Attenuation Coefficients

XI.

Scientific Application, Engineering Application (Continued)

DECUS-7/9-37	DIRECS and LUBITZ
DECUS-7/9-38	Gamma Ray Peeling Program
DECUS-7-49	ONER Mark III - Single Parameter Pulse Height Analysis Program
DECUS-9-19	PIPHA, CALPIT - Particle Identification System
DECUS-9-20	Conversational Mode Software for Control System Analysis
DECUS-9-21	CLOSS
DECUS-L-3	Off-Line LABCOM System
DECUS-L-4.1	IN HISTO
DECUS-L-10	LINC-8 Multi-analyzer
DECUS-L-11	DATUM8
DECUS-L-25	LINC Spectrum Program
DECUS-L-33	On-Line LABCOM System (Version IV)
DECUS-L-40	AVERAGER
FOCAL-4	PRIME NUMBER PLOTS
FOCAL-20	MULTIPULSE
FOCAL-21	MULTIPULSE-2
FOCAL-22	Monte-Carlo Solution to Neutron Penetration Problem
FOCAL-23	Seismic Refraction Sloping Layer Program
FOCAL-24	GRADE: A Grade Averaging and Display Program
FOCAL-27	Δ -Y Complex, Y- Δ Complex, Series Resonant Circuit Analysis
FOCAL-28	Column Width, TRAVERSE, Least Square "Linear" Fit, Nozzle Weight Flow, Filter Design, Ohm's Law
FOCAL-29	Second Order Differential Equation
FOCAL-30	One Line Routines, X^3 and Circle, Superposition, Circle
FOCAL-31	Sines, Factors, Figure Eight, Right Triangle Solutions
FOCAL-35	ROOTFINDER Program
FOCAL-36	DETERMINOT Program
FOCAL-38	Magic Square Generator

XII.

Hardware Control

DECUS-5/8-17	Type 250 Drum Transfer Routine for use on the PDP-5/8
DECUS-5-40	ICS DECTape Routines (One-Page 552 Control)
DECUS-8-58	One-Page DECTape Routines (552 Control)
DECUS-8-77	PDP-8 Dual Process System
DECUS-8-82	Library System for 580 Magnetic Tape (Preliminary Version)
DECUS-8-104	Card Reader Subroutine for the PDP-8 FORTRAN Compiler
DECUS-8-121	DECTape Handler (552 Control)
DECUS-8-201	DECSW: Decimal Switch
DECUS-6/10-16	FILER
DECUS-6-22	MEM2 and MEM4
DECUS-6/10-42	LST9: A Program to List PDP-9 DECTapes on a PDP-10 Line Printer
DECUS-7-14	ISENSE
DECUS-7-19	DUMP ND 180 and FDUMP ND 180
DECUS-7-28	.IODEC Revision
DECUS-7-48	Magnetic Tape Device Handlers for the PDP-7 ADVANCED Software System
DECUS-7/9-52	Analog-to-Digital Conversion Subroutine Package
DECUS-9-6	Scatter-Gather Magnetic Tape Routines
DECUS-9-8	TT-6 Bit Teletype I/O Handler
DECUS-9-16	Real-Time Clock Handler - 4 Level Queue
DECUS-9-25	RCA Bootstrap
DECUS-9-26	DTF. (DTG.): DECTape Handlers for FORTRAN Compiling
DECUS-9-27	PRGLDR: Program Loader for RCA Bootstrap
DECUS-10-1	UT6RD
DECUS-L-5	Tape Subroutine
DECUS-L-6	TRIGGR
DECUS-L-8	DECTape Interface for LINC-8
DECUS-L-16	RWTAPE
DECUS-L-18	BUFFER - Fully Buffered Teletype I/O
DECUS-L-22	A New PDP-8 Display Instruction for LINC-8
DECUS-L-23	Control to Designate Left or Right LINC-8 Tape Transport as Unit Zero
DECUS-L-32	XMARK
DECUS-L-42	Using the Teletype with the LINC-8

XIII.

Game, Demonstration

DECUS-5/8-14	Dice Game for the PDP-5/8
DECUS-5/8-15	ATEPO: Auto Test in Elementary Programming and Operation of a PDP-5/8 Computer
DECUS-5/8-54	TIC-TAC-TOE Learning Program
DECUS-8-71	Perpetual Calendar
DECUS-8-79	TIC-TAC-TOE (Trinity College Version)
DECUS-8-94A	BLACKJACK
DECUS-8-94B	Patch for BLACKJACK
DECUS-8-98	3D DRAW for the 338
DECUS-8-99A	Kaleidoscope
DECUS-8-99B	Kaleidoscope - 338
DECUS-8-107	CHESSBOARD Display on the 338
DECUS-8-108	INCMOD: Increment Mode Compiler (338)
DECUS-8-112	Sentence Generator
DECUS-8-119	Off-Line TIC-TAC-TOE (PAL)
DECUS-8-151	On-Line TIC-TAC-TOE
DECUS-8-152	PDP-8 Music Program
DECUS-8-162	Demonstration Programs for the PDP-8
DECUS-8-173	TIC-5/8 (Scope Version)
DECUS-8-174	Medium
DECUS-8-191	Fields
DECUS-8-196	DET: Detect Key Words
DECUS-6-4	NUMBER
DECUS-6-14	The Dots Playing Program
DECUS-6-25	1KCLOK
DECUS-7/9-25	PDP-7/9 DICE Playing Game
DECUS-7-40	DUEL
DECUS-7-43	A PDP-7 Music System
DECUS-9-2	3D DRAW for 339 Display
DECUS-9-23	KALSD9
DECUS-L-2.1	"Clock 1" for LINC and "Clock 8" for LINC-8
DECUS-L-39	SPCWAR
FOCAL-4	PRIME NUMBER PLOTS
FOCAL-5	The Sumer Game
FOCAL-9	Hexapawn
FOCAL-38	Magic Square Generator
FOCAL-41	Fran the Barmaid
FOCAL-42	The Hangman Game

XIV.

Plotting

DECUS-5-30	GENPLOT: General Plotting Subroutines for the PDP-5
DECUS-5-31	FORPLOT: FORTRAN Plotting Program for PDP-5
DECUS-8-147	Incremental Plotter Printout Subroutines
DECUS-8-148	Plotter System
DECUS-8-168	CalComp Plotting Package
DECUS-8-202	PLOT
DECUS-8-203	ALPHA
DECUS-7-45	FORTAN Plotter Library
DECUS-7-50	Plotter and Display Output Routines for the PDP-7 ADVANCED Software System
DECUS-9-13	Plotter and Display Output Routines for the PDP-9 ADVANCED Software System
DECUS-L-9a	LINC-CalComp Plot Subroutine Package (LAP5)
DECUS-L-24	PLTKBD: Plot Keyboard
DECUS-L-45	PLOT and PLOTTEST
FOCAL-7	STRIP FOCAL - Storage of Data Arrays
FOCAL-12	QUIP1: QUIck Plot in Quadrant 1
FOCAL-13	3-D PLOTTER

XV.	<u>Desk Calculator, Business Application</u>
DECUS-5-5	Expanded Adding Machine
DECUS-8-122A	SNAP: Simplified Numerical Analysis Program (without EAE)
DECUS-8-122B	SNAP: Simplified Numerical Analysis Program (with EAE)
DECUS-8-155	HEP
DECUS-8-192	T.A.L.C. (Taylor's Algebraic Linear Calculator)
FOCAL-25	Payroll Calculations (California, 1968)
XVI.	<u>Maintenance</u>
DECUS-5-10	Paper Tape Reader Test
DECUS-L-26	RELTS8-1C (LINC-8 Only)
XVII.	<u>Miscellaneous</u>
DECUS-6-5	TIMEF4
DECUS-6-8	BELL STAR
DECUS-6-10	DATE
DECUS-6-31	CARD
DECUS-7-28	.IODEC Revision
DECUS-9-10	TIME
DECUS-L-27	Q & A Subroutine (Modification for LAP6 Characters)
DECUS-L-28	Text TTY Subroutines
DECUS-L-46	SERINDEX: Search LAP6 Index

PART II
PROGRAMS AVAILABLE FROM AUTHOR

PROGRAMS AVAILABLE FROM AUTHOR

Many users have programs which for various reasons are not fully debugged or documented for submission into the DECUS Library but are working to a certain extent. Authors who would like to make these programs available to other users have submitted them to DECUS as "Programs Available from Authors." New additions are announced in DECUSCOPE and programs presently available are listed below. Persons interested in using these programs should request them directly from authors. Authors interested in submitting programs under this category should send a short summary of the program length, I/O equipment needed, etc. and information regarding material available for tapes and documentation to the DECUS Program Librarian, Digital Equipment Computer Users Society, 146 Main Street, Maynard, Massachusetts 01754.

COMPUTER - PDP-5 or PDP-8

Title: Morse Code Sender for PDP-5/8

Author: Jack Harvey, Communication System, Inc.,
Paramus, New Jersey

This subroutine is entered with an ASCII character (trimmed or untrimmed) in the AC.

A square wave tone of the international Morse Code for the character is sent to any appropriate output device such as digital to analog converter, binary channel, or scope display. The program is easily altered to suit the particular output channel available. An ordinary audio amplifier and speaker on the channel make the tone audible. Three registers on page zero control tone pitch, code speed, and character spacing.

Documentation available from author:

1. Binary tape (routine uses 400-577)
2. Symbolic tape with relative addresses (no comments)
3. Photocopies of the author's notes on the listing of (2).

COMPUTER - PDP-5, PDP-8, or PDP-8/S

Title: Wire List Package

Author: C. W. Peck, Synchrotron Laboratory, California
Institute of Technology, Pasadena, California

This is a group of four routines used to prepare wire lists for Flip Chip modules to be installed in, at most, two DEC Type 1943 Mounting Panels (128 modules). With the wire lists and associated redundancy checks provided by the program, the author has had mounting panels hand wired with no errors.

The four programs are:

1. WIRE LIST ORGANIZE (50-1777, 6400-6777, Connection List 2000-6377)

This program accepts paper tape input of a wire list taken from the engineering drawings and generates a connection list in core. It outputs an ordered wire list in which each connection terminal used is referred to only once. The connection sequence generated does not necessarily result in minimum wire length, but usually does. The three subsequent programs assume that a connection list such as generated by this program is in core.

2. TERMINAL USE PRINT (50-1777, Connection List 2000-6377)

This program generates a table indicating which cards are used and the number of connections on each terminal (0, 1, or 2).

3. EDITOR (50-1777, Connection List 2000-6377)

This program allows the user to edit a connection list. It checks for elementary wiring errors in the editing.

4. BUS INCLUDE (50-1777, 6400-6777, Connection List 2000-6377)

This program includes all bussing into the connection list. It allows the designer to make a complete check of signal loading.

Material available from author:

1. IBM compatible magnetic tape (200) density. Upon request, binary paper tapes could be created.
2. Operating instructions.

COMPUTER - PDP-8 with 338 DISPLAY

Title: Core Display Program

Author: A. M. Romaya, Design Automation Department,
International Computers Ltd. Kidsgrove,
Stoke-on-Trent, Staffs., England

This program allows the user to display, change, dump and punch the contents of any core location by commands initiated from the 338 Display light pen and push buttons. The program occupies locations 5000-7340 of memory field 1. It does not set the push-down pointer or the interrupt system, therefore, field 0 is absolutely free for use by other programs. It is possible to run this program concurrently with another which uses the interrupt system.

COMPUTER - PDP-8 with 338 DISPLAY

Title: Drawing Applications Program
Author: A. M. Romaya, Design Automation Department,
International Computers Ltd., Kidsgrove,
Stoke-on-Trent, Staffs., England.

The program is intended to show the facilities the 338 Display offers when considered as a drawing board.

The program allows the user to:

1. Draw straight lines or "free hand" over a total area of 75x75 inches.
2. Include symbols which may be formed by means of the program.
3. Label the drawing in alphanumeric and other characters.
4. Delete items drawn.
5. Output the display and symbol files created.
6. Input a display file and its symbols for updating.

The program incorporates a tracking cross and raster, and the coordinates of the tracking are shown when required. Control is obtained by a set of light buttons, push buttons and the switch register.

Possible core location changes for adapting the dimensions drawn to special cases if required are given.

COMPUTER - PDP-8 with 338 Display

Title: Scan and Analysis Program
Author: A. M. Romaya, Design Automation Department,
International Computers Ltd., Kidsgrove,
Stoke-on-Trent, Staffs., England

The program is an investigation of the possibility of using a graphic display for a highly efficient method of inputting graphic data.

The program is divided into two parts. The first part scans the graphic data set as rectangular shaped elements or routings on a transparency. A digitized image of the transparency is obtained and displayed.

This image is then analyzed by the second part to obtain the desired symbols or routings.

COMPUTER - LINC

Title: Datamec Diagnostic
Author: D. W. Hazelton, Biomedical Computing Center,
University of Wisconsin, Madison, Wisconsin

This program checks Datamec tapes for accuracy and also contains several "hardware" service routines.

The general user will find this program useful for checking CDC compatible tapes. Specifically, the check section tests in even or odd parity for the following:

1. Lateral Parity Errors
2. Missing Record Characters
3. Missing Longitudinal Redundancy Check Character (LRCC's)
4. Longitudinal Parity Errors

Also, if desired, one can count the total number (octal) of Datamec words in each record. The results of these tests are displayed on the scope.

To assist the user in tape manipulation, a backspace routine capable of backing over any number of records less than 7777g is included:

Four routines are included to check various aspects of Datamec operation.

1. Parity Test
2. Test-Record Generation
3. General Purpose Tape Checking
4. Test Record Verification

COMPUTER - LINC

Title: General Sampling Program (GENSAM)
Author: D. W. Hazelton, Biomedical Computing Center,
University of Wisconsin, Madison, Wisconsin

This general-purpose program takes digitized samples from the LINC analog-to-digital converter and writes them on Datamec tape in a CDC compatible format. From one to four channels can be sampled with the time interval between sample variables at any multiple of one millisecond from 1 to 409510. The individual channels are sampled almost simultaneously; with reference to the preceding channel, each succeeding channel is sampled 112 μ sec later. Any of the LINC lines or potentiometers can be sampled. Starting and stopping can be effected by either a sense switch or a pulse on an external line. To assist the user in succeeding data manipulations, a sample counter is included which displays the total number of samples collected per channel.

COMPUTER - LINC

Title: LINC Computer User-Interactive Programs and MACRO Instructions
Authors: Walter E. Reynolds, Robert B. Tucker, Timothy B. Coburn, James C. Bridges, Stanford University School of Medicine, Stanford Medical Center, Palo Alto, California

This report describes four program packages for use on the LINC computer.

1. A program package which enables the LINC and a Teletype to be used as a very sophisticated desk calculator including graphical output with a CalComp Plotter.
2. A general-purpose double precision floating point subroutine package for the LINC.
3. A set of input-output routines providing for the communication of octal, decimal and alphanumeric information via a Teletype.
4. Also included is additional information on the LOSS system (see "An Operating System for the LINC Computer," R. K. Moore, NASA Technical Report No. IRL-1038) under which the above packages may be used.

The first program described, CALCULATOR III, is a complete program that enables the LINC and a Teletype to perform in a manner quite comparable to the most sophisticated electronic calculators on the market today. In addition, vector or single dimension array operations are included, direct communication with data blocks on LINCtape is permitted, and if a CalComp Plotter is available, output may be graphically displayed.

The second package is a set of floating-point routines. They also exist in CALCULATOR III, but here in a form more suitable for inclusion in any LINC program where double-precision floating point arithmetic is desired. They occupy two quarters of LINC memory and when so included, become a comprehensive set of floating point macro instructions.

The third package contains numerous general-purpose routines in source code form invaluable to any LINC program where conversational input-output is desired. These may be inserted into LINC programs as desired to allow octal, decimal or alphanumeric communication with the LINC using a Model 33 Teletype in half-duplex mode.

These packages are presently utilized under the LOSS system, a general description of which is contained in this report.

Documentation for the above is available from:

Mr. Timothy Coburn
Stanford University School of Medicine
Stanford Medical Center
Palo Alto, California 94304

COMPUTER - LINC

Title: DECUS No. L-9A
LINC CalComp Plot Subroutine Package

Revisions to L-9A were made by A. Maynard Engelbretson and Don J. Manson.

The tapes and write-up for the revision are available from:

The Biomedical Computer Laboratory
Washington University
St. Louis, Missouri

COMPUTER - LINC-8

Title: Wisconsin Programmed Medicine Interviewer (WPMI)

Author: Dr. W. V. Slack and Lawrence J. Van Cura,
University of Wisconsin Medical Center, 1300
University Avenue, Madison, Wisconsin

This is a conversational program written for use with the Laboratory Instrument Computer (LINC). It is designed for verbal interaction between computer and people involved in the practice of medicine--patients and medical personnel. Patient interviewing and patient instruction (operations traditionally performed by physicians and nurses) have been conducted on the LINC with WPMI. The program can also be used for interviewing and instruction in non-medical situations.

Generally, the program operates as follows: questions and statements are displayed on the cathode-ray screen and responses are made on the computer keyboard. Printed summaries of patients' histories and physicians' physical examination findings are generated by Teletype upon completion of each interview. All responses are saved on magnetic tape for future computer processing both for patient care and clinical research.

There are 3 frame formats used in WPMI. These are designated mode 1, mode 2 and mode 3 and differ on the basis of the responses available to the respondent. Mode 1 frames have 4, fixed, mutually exclusive responses. Otherwise, mode 3 and mode 1 frames are identical.

The computer, with its capability of rapid branching, can present questions and statements as a function of the responses made. Thus, the following are possible--questions presented multiple times with varied wording before an affirmative or negative response is accepted; "YES" answers followed by complex groups of questions in turn involving and branching and designed to cover the item in-depth; and "NO" answers resulting in the instantaneous skipping of irrelevant questions. All of these enable information to be elicited from respondents in great detail.

Further, the computer can exert a useful control over the interviewing process. Programmed to proceed only after an appropriate response; to reinforce the respondent's progress through the interview with meaningful words of encouragement; to explain and teach the meaning of concepts not understood and to delve further into the subject of a question whose answer is initially unknown; the computer can increase the likelihood of successful completion of the interview with valid data having been obtained.

For more detailed information contact either Dr. Slack or Mr. Van Cura at the address given above.

PART III
PROGRAMS FOR SALE OR LEASE

PROGRAMS FOR SALE OR LEASE

The programs listed below may be purchased or leased. Pricing information should be obtained directly from the supplier. DECUS makes no charge for announcing these programs and reserves the right to discontinue this service at any time. DECUS cannot guarantee the accuracy of these announcements. A complaint file will be maintained at the DECUS office for each offering and this file may be inspected by any DECUS member.

Programs will be announced for sale or lease only if they are submitted on behalf of corporations; no individual person may offer a program for sale or lease through DECUS.

SUBMITTED BY INFORMATION CONTROL SYSTEMS, INC.

Information Control Systems is leasing its 4K version of extended FORTRAN II and ALICS II programming systems. These systems bring to the 4K PDP-8 family a capability that is not available with existing software.

USA FORTRAN II programs compile into ALICS II assembly code in a single pass. ALICS II assembles this FORTRAN output or directly coded ALICS in a single pass. It produces relocatable binary object programs.

A linking loader automatically loads and links the main program and all subroutines. These programs and subroutines may be coded in ALICS or FORTRAN. Standard subroutines may be added from the user or ICS Library.

The system has been especially useful for real-time applications due to the building block structure and the compatibility between the machine level ALICS language and the high level FORTRAN language. The system is equally effective for scientific programming and small scale data processing. Important system features include:

Extended FORTRAN II

1. Large Capacity - A true compiler concept eliminates interpretive execution time systems. Programs of up to 200 FORTRAN statements may be fitted into a 4K memory.
2. Subroutines - Full provisions are made for either FORTRAN or ALICS II assembly language subroutines and external functions.
3. Precision - Floating point numbers are accurate to 8 significant digits, making the system suitable for accounting applications.
4. Speed - Object programs execute up to 4 times as fast as those processed with other compilers available for the PDP-8 family.
5. Relocation - Object programs are relocatable. They are automatically linked by the loader.

ALICS II Assembler

1. Relocatable - Binary object programs are produced which can be relocated without reassembling. A linking loader automatically establishes linkages between your program and subroutines and fits them into the available core.
2. Automatic Paging - Allows the programmer to directly reference all of core without considering page boundaries.
3. Single Pass Assembly
4. Powerful Diagnostics - To help you find errors quickly.
5. Easily Learned - People with no previous language experience will find ALICS easy to master.

ICS Library

1. Floating Point - Features 27 bit mantissa, 8 bit exponent, and sign. All operations fit on 3 pages.
2. Format Interpreter - Features full A, E, F, H, I, and X format term specifications for formatted I/O with conversion. I/O is device independent.
3. Integer MUL/DIV two's complement single precision.
4. Subscripts - One and two dimensional for FORTRAN arrays.
5. Mathematical functions - Includes ABS, IABS, SQRT, SIN, COS, TAN, EXP, ELOG, ATAN, and IRDSW for reading the console switches.

For more information contact:

Mr. John Wyman, Sales Manager
Information Control Systems, Inc.
327 South Fourth Avenue
Ann Arbor, Michigan 48104

SUBMITTED BY AGRIPPA-ORD CORPORATION

AGRIPPA-ORD Corporation is offering for sale the following LINC-8 programs.

PLAP Assembler

1. Completely compatible with the LAP6 utility system.
2. Assembles LINC code or PDP-8 code or both.
3. Six letter tags - 2047 user defined symbols.
4. Error diagnostics with listing.

5. Produces up to 16 blocks of binary.
6. Will load PDP-8 code into Bank 0 (new LO command).

CALCOMP Plotter Routines

1. Three subroutines: Plot alphanumeric, Plot graph, Plot line drawings.
2. Size - two quarters each subroutine (easily overlaid).
3. Self-relocating into any two consecutive quarters of Field 0 (lower 4K of PDP-8 memory).
4. 100% PDP-8 code - runs with the interrupt enabled - the LINC program can assign a task and go about its business.
5. Array driven, will plot text buffers, graph buffers, histogram buffers, or line drawings.
6. Data may be half or full-word packed, interleaved or sequential, and reside in any size machine.
7. Conversational subroutine driver supplied free of charge with purchase of three subroutines.

Isometric Scope Display

1. Displays isometric surface, 3D histogram or slices along X or Z axis.
2. Size - three quarters (1, 2, 3).
3. Data may be half or full-word packed, interleaved or sequential, up to 30K.
4. Display may be scaled, complemented and inverted.
5. Subroutine is called with four operands.

Graph and Text Display

1. Displays half-word packed LINC text strings and/or graph data.
2. Size - two quarters (binary for any two consecutive quarters).
3. Performs an operation (nop, add, subtract, multiply, divide) between two half or full-word packed data sets and displays result on the scope. If the operation is "nop", data set 1 is displayed.
4. Cursor, histogram, and scaling options.
5. Subroutine is called with nine operands.

† Test Subroutine

1. Computes and stores † Test values for related points of two data sets.

2. Size - three quarters (1, 2, 3).
3. Data sets may be half or full-word packed, sequential or interleaved, up to 2047 points each. An entry in a data set consists of a 12 bit mean value (6 bit optional) and a 12 bit standard deviation (6 bit optional).
4. Biased or unbiased option.
5. Subroutine called with 11 operands.

Correlation Subroutine

1. Generates the correlation function and correlation coefficient between two data sets at a specified lag value.
2. Size - three quarters (1, 2, 3).
3. Data sets may be half or full-word packed, sequential or interleaved, up to 1023 points each.
4. "Tail wrapping" option.
5. Subroutine called with nine operands.

Curve Fitting System

1. Keyboard or tape entry of 128 7-digit number.
2. Conversational operation.
3. Data and "best fit curve" can be displayed.
4. Analysis routines are completely modular - new versions may be added easily.
5. Present version includes: polynomial least-square approximations, simple linear regression, log-log and semi-log displays and multiple partition approximations, error analysis, and correlation coefficient.

For further information on these and other, more specialized, programs contact:

N. David Culver, President
 AGRIPPA-ORD Corporation
 Monument Square
 Carlisle, Massachusetts 01741
 Phone: (617) 369-2912

SUBMITTED BY

APPLIED DATA RESEARCH, INC.

MACRO ASSEMBLER

MACRO8X is an improved and expanded version of the MACRO-8 Assembler (DEC-08-CMA1). It is now a two-pass assembler which operates on PDP-5, 8, 8/S, 8/L, or LINC-8 with 8192 words of memory and a high-speed paper tape reader and punch. MACRO8X is fully compatible with both PAL III and MACRO-8.

General Enhancements

Larger Symbol Table - There is now room for over 750 user-defined symbols, minus that part of the user symbol area that is used to store macro definitions-- more than five times the capacity provided by MACRO-8.

Improved Literal and Link Processing - The processing of literals and the generation of links have been improved in two significant ways. Literals will not be dumped in the middle of a page and there is no duplication of literals. Second, MACRO8X will, when assigning any literal defined by parentheses or link, determine whether that literal has earlier in the source program been assigned to page 0. If the value has already been assigned a location on page 0, the page 0 literal will be used and no literal will be assigned on the current page.

Paginated and Formatted Output - Output listings produced during pass 2 of the assembler are divided into 8-1/2 X 11 inch pages. The MACRO8X listing routines also perform tabulation, converting tab characters into that number of spaces needed to produce a neat tabular listing.

Memory Allocation Table - At the end of each assembly, a table is printed showing what parts of memory were not used by the program. This table is intended for use as a guide in making patches and corrections to an assembled program.

Improved functioning of FIELD Pseudo-op - When a FIELD command is encountered in the course of a MACRO8X assembly, all page zero literals are dumped and assignment of page zero literals begins for the new field.

Added Pseudo-Ops

UNLIST, LIST - The UNLIST pseudo-op suspends listing of the source and object programs on the teleprinter during pass 2. The printing of error messages, allocation, or the symbol table is not suppressed, however. The LIST pseudo-op resumes listing subsequent to the use of UNLIST.

LGM, NOLGM - The NOLGM pseudo-op suspends printing of the diagnostic message "LG" during pass 2. The LGM pseudo-op resumes printing of the diagnostic message "LG" subsequent to the use of NOLGM.

LIT - The LIT pseudo-op causes the current-page-literal-buffer to be printed and punched on paper tape during pass 2. This command is intended for use at the end of a page to

improve readability of listings.

LITBAS - The LITBAS pseudo-op permits the user to specify an origin for the generation of literals which is other than location 177 of the page for which they are generated. The format of the LITBAS command is LITBAS n, where n is any number or symbolic expression.

VFD - The VFD pseudo-op permits the assembly of a word consisting of the concatenation of bit patterns representing several numbers of symbolic expressions. Its format is:

VFD A:B,C:D,E:F...

It is terminated by the occurrence of any punctuation or expression which does not fit the VFD syntax. The meaning of the expression above is "Assemble a word consisting of A bits of B followed by C bits of D followed by E bits of F, etc." A,B,C,D, etc. may be numbers or symbolic expressions. VFD may also be used in any context in which a symbolic expression is legal.

Availability

MACRO8X is available on a lease basis at nominal cost from:

The Research Computation Center
APPLIED DATA RESEARCH, INC.
Route 206
Princeton, New Jersey 08540
(609) 921-8550

A MACRO8X assembly service is also available from the center--card or paper tape input, line printer output.

SUBMITTED BY

DECISION SCIENCE, INC.

Decision Science, Inc. is offering for sale its SIMUL8S programming system consisting of an assembler for and a simulator of the PDP-8/S, PDP-8, PDP-8/L, and PDP-8/L, this is available for the IBM 360/40 or larger, 7090, 7094; CDC 3600, 6400, 6600; Univac 1108 or GE 635.

Specifically, SIMUL8S permits programming utilizing cards rather than paper tape, thus simplifying development and programming changes. It provides additional debugging aids to the programmer in that program tracing under on/off timing control, time dumps, and core dumps are available during execution. This time analysis feature can be used to determine the execution time between two points in the program, this being useful to determine compatibility with real time problems.

Complete program development can be achieved by using SIMUL8S for diagnostics, assembling, debugging, executing the program, and/or providing a binary paper tape for direct read in by the PDP-8 series computer, thus eliminating source paper tape punching, assembly and debugging on the smaller computer. SIMUL8S permits software development prior to the installation of the PDP-8 series computer or while it is in use performing its dedicated function.

It can be used to simulate proposed systems for evaluation, thorough checkout of programs by simulating "worst case" conditions since it allows simulation of interface equipment and signals difficult to generate with hardware.

The input language to cards and the printed output includes the basic format and features of the PAL III assembler as well as the page linkage feature of MACRO-8.

For more information contact:

Dr. A. J. Owens, Vice President
Decision Science, Inc.
4508 Mission Bay Drive
San Diego, California 92109

SUBMITTED BY
GRASON-STADLER COMPANY

SCAT (State Change Algorithm Terminology) is a conversational, real time, time sharing, process control system designed to run on a 4K or larger DEC (Digital Equipment Corporation) PDP-8 computer which is interfaced to a Grason-Stadler "Job Control Multiplexer."

SCAT software consists of two major parts. The first is the Executive and the second is the SCAT Language Processor. The Executive administers the use of the computer. It divides the processor time between the various experiments, or jobs, and the Teletype and other output devices. It allocates storage space for the various programs which are active. The SCAT Language Processor is itself divided into two sections--the SCAT translator and the SCAT interpreter. The SCAT translator accepts the SCAT statements which form the experimental description (the program), checks them for internal consistency and translates them into a code which the SCAT interpreter understands. The SCAT interpreter controls each experiment using the user generated program for guidance.

For more information contact:

Mr. Steven J. Stadler
Grason-Stadler Company
Box 2
West Concord, Massachusetts 01781

SUBMITTED BY
FORDAX Corporation

FORDAX Corp. is offering for sale its SAIBOL Compiler. The compiler resembles a COBOL compiler, but was designed specifically for the PDP-8 Family of computers. Although the system has been especially designed for business oriented applications, such as Payroll, Job Costing, Accounts Receivable, Accounts Payable, General Ledger and Inventory Control, it can be equally effective for scientific programming as well.

SAIBOL is an interpretive compiler which allows any PDP-8 Family computer to function as a character-oriented machine. It is designed to reside in a 4K PDP-8 with optional DECTape, DECdisk, high speed paper tape reader and punch and an

ASR-33 Teletype. It is core-resident, requiring about 3K of core. The remaining 1K is available for the user program statements.

Some important features include:

1. The system includes a Monitor which allows user programs to be stored on disk.

These programs may be called into core via keyboard commands.

The language includes six classes of commands:

a. Input/Output - for entry of data via keyboard and paper tape, and outputting data to printer and paper tape.

b. Arithmetic - for loading, storing, adding, subtracting, multiplying, and dividing quantities represented as BCD digit strings, and testing the result of arithmetic operations.

c. String manipulation - for moving and comparing strings of alphanumeric characters.

d. File - for filing and retrieving records of information on and from disk storage.

e. Monitor - for calling the Monitor, or requesting other programs on disk in the event of segmented programs.

f. PAL Language - Routines in the PDP-8 PAL III assembly language can be freely intermixed with SAIBOL statements.

The SAIBOL interpretive compiler is a core-resident interpreter which analyzes user statements stored in core. As each statement is analyzed, it is executed by SAIBOL, and the next statement is then accessed.

The SAIBOL interpreter is stored in the upper 23 pages of core. Page 0 is also used in part by the system for common storage and monitoring purposes.

The rest of core (locations 200-2177) is both word-addressable and character addressable. Characters are represented by six bits, and packed two to a word. The character in the high half of the word (bits 0-5) is defined as the first character, and the character in the low half of the word (bits 6-11) is defined as the second character. Thus, user core can be addressed as words 200-2177, or characters 400-4377.

2. Easy to Use and Learn - SAIBOL is conversational mode through the Teletype. SAIBOL will tell you where you went wrong and how to fix it; a truly turnkey system.

3. Easy to Interface - SAIBOL will interface to nonstandard I/O devices, i.e., if you require upper and lower case printing, color change and a variable width carriage, then SAIBOL will let you talk to a Flexowriter.

4. Precision - Data Fields are accurate to 10 significant digits (ideal for accounting purposes).

5. Internal Power - Interpretive Picture strings to direct data manipulation, editing and calculation.

Programs Available from FORDAX Corp.

1. Payroll - provides complete payroll accounting, from the maintenance of the basic employee payroll records to the preparation of checks, W-2 Forms and 941 Forms.
2. Job Cost Analysis - provides easy means of distributing labor and material costs across the appropriate departments for each job, with a complete profit report including the preparation of invoices if desired.
3. Accounts Payable - provides complete accounts payable account from the maintenance of the Master Vendor File to the preparation of checks and the generation of a Check Register File.
4. Accounts Receivable - provides complete accounts receivable accounting for daily updating of the accounts receivable accounts, billing, credit analysis, and activity reporting.
5. Inventory Control - provides a complete inventory control accounting system from the recording of all inventory transactions to the preparation of a Cost of Sales Report.
6. General Ledger - provides for classification, summarization, and recording of the cumulative effects of all transactions on assets, liabilities, revenue and expenses.
7. Display and Classified Ad Billing (Typesetting) - provide a complete display and classified billing system. Information prepared on off-line keyboards is read via the high speed paper tape reader and is stored and manipulated as required.
8. Circulation Package (Typesetting) - provides an integrated draw and billing system for all editions of one or more newspapers. Inputs may be entered on-line, or prepared off-line on punched paper tape and entered via high-speed reader.

FORDAX's newly formed Machine Tool Products Division in Los Angeles is offering a complete line of programs for the preparation of tape for numerically controlled machine tools. NC programs may be used in conjunction with FORDAX's business programs.

Programs Available for NC are:

1. Two and three axis point-to-point and two axis contouring programs for basic PDP-8/I or 8/L configurations.
2. Wire wrap program providing tapes for numerically controlled, hand aided, wire wrap systems. Program allows definition of panel layout and use of standard wire list information as input.
3. Full three axis APT language contouring software for expanded PDP-8/I and 8/L. Requires 8K core, 262K disk, high-speed paper tape I/O.
4. APT-III implemented on PDP-10.

For more information contact:

Mr. William Landis
FORDAX Corporation
20 Walnut Street
Wellesley Hills, Massachusetts 02181

EXCERPT FROM A TYPICAL SAIBOL-8 PAYROLL PROGRAM WITH NO COMMENTS

NEXTRECORD, READ 215 WRONGTAPE

HRS, ACCEPT HOURS HRS

TAKING REGHOURS MULTIPLY RATE
GIVING REGPAY 2 NOSIGN

TAKE OVRHOURS MULTIPLY RATE MULTIPLY
OVERTIME GIVING OVRPAY 2 NOSIGN

EXCERPT FROM A TYPICAL SAIBOL-8 PAYROLL DOCUMENTED WITH COMMENTS

NEXTRECORD, READ(EMPLOYEE'S PAY RECORD. IF MORE THAN) 215 (CHARACTERS, GO TO) WRONG TAPE

HRS, ACCEPT (REGULAR AND OVERTIME) HOURS (IF FORMAT ERROR, GO TO) HRS

TAKE REGHOURS (AND) MULTIPLY (BY) RATE GIVING REGPAY (WITH) 2 (DIGITS TO LEFT OF DECIMAL POINT AND) NOSIGN

SUBMITTED BY
CALCOMP, California Computer Products, Inc.

The following six subroutines constitute of the basic software packages available for the CalComp Plotter.

Subprogram AXIS - Provides the capability of drawing an annotated axis for linear graphs.

Subprogram SCALE - A functional subroutine which scans a set of values and computes a "desirable" scale factor to present the information at the desired size.

Subprogram LINE - Provides the capability of connecting data points with straight lines and/or producing centered symbols at specified data points.

Subprogram NUMBER - Provides the capability of converting a machine format number to decimal representation and plotting the number to the specified precision.

Subprogram SYMBOL - Provides capability of drawing the full character set of the particular computer at any specified location, size, and orientation. In addition, a number of additional characters are included for data point plotting.

Subprogram PLOT - Provides the basic capability of producing the necessary string of plotter commands to move the pen from one point to another. For on-line plotters, this subroutine includes the I/O Commands for driving the plotter; for off-line systems, all tape formatting, tape writing, and checking are included. This subroutine is the heart of the plotting package, and all data, whether from other subprograms in this group or user programs, are passed to this subroutine in the form of straight line segments for plotting.

In addition to the basic six routines described above; a FORTRAN program called SAMPLE is normally provided to exercise the subroutine package for initial installation and check-out.

SUBMITTED BY
STRATEGIC TIME-SHARING, INC.

	Calcomp Product No.	Computer	Interface	Tape Density	Plotter Series
1.	34000	PDP-8	DEC Interface	N/A	500
2.	35000	PDP-9	DEC Interface	N/A	500
3.	36000	PDP-10	DEC Interface	N/A	500
4.	36350	PDP-10	Calcomp 760 Off-line	500/2	500
5.	Time Sharing	PDP-10	Calcomp 210	N/A	500

Strategic Time-Sharing, Inc. of New York City is currently providing time-sharing services (STIDAC - STI Direct Access Computing) on the first available commercial TSS-8 system. Languages provided include BASIC, FORTRAN, FOCAL, ASSEMBLY, DDT and EDITOR.

STI's time-sharing computers have 24K words of core storage, operate with a cycle time of 1.5 microseconds, and have the capability of accommodating up to 32 simultaneous users. A high-speed swapping disk with 17 milliseconds average access time is used for system programs and active users programs. Large bulk storage is provided by removable disk packs, each of which holds 8.2 million characters. Magnetic tape and line printers are also available. The printer may be used for lengthy printouts which are not practical to transmit over telephone lines to the customer's terminal.

STIDAC prices are as follows:

\$6.50/hour terminal connect time
\$.03/unit CPU usage
\$1.75/unit storage - 2048 characters/unit

For more information contact:

Richard H. Hinkley
California Computer Products, Inc.
118 Cedar Street
Wellesley, Massachusetts 02181

Unlimited use and full-time accessibility are available to heavy time-sharing users at a cost of only \$1000 per month for a dedicated port (or channel) into the computer. STI will also operate complete systems dedicated to specific users or industries, for those who need a computer or communications system but want to avoid the programming and operational problems associated with an in-house data processing system.

SUBMITTED BY
INFOTEC, Inc.

Infotec, Inc. offers for sale an assembler for the PDP-8 computers which operates on the IBM-1130 computer. Source programs in PAL - III language are normally punched into cards and read by the 1130 card reader. The 1130 program assembles the PDP-8 program, prints out diagnostics, lists the DEC program on the printer and punches out a paper tape for input to the DEC binary loader. Sale price is \$1,500. Those in the vicinity of Rye, New York, may use the Infotec service bureau at a cost of five cents per printed line of assembly listing.

In addition to conventional time-sharing services, STI also offers what it calls "On-Time Processing." Data is entered into the computer from an on-line terminal, which permits the file information to be queried on a real-time basis. The reports or other information is processed later and supplied to the user at the time he requires--be it the next day, week, or month.

For further information contact:

Michael J. Kelly
Infotec, Inc.
22 Purchase Street
Rye, New York 10580

For more information contact:

Strategic Time-Sharing, Inc.
132 West 31 Street
New York, New York 10001

or

Call (212) 736-6266

Tel: (914) 967-1325

**PART IV
PROGRAM ABSTRACTS
AND
NUMERICAL INDEX**

**PDP-5 and PDP-8
INDEX**

PDP-5 and PDP-8 INDEX

<u>DECUS NO.</u>	<u>TITLE</u>	<u>TAPES AVAILABLE</u>	<u>LISTING</u>
6/8-12	PDP-8 Assembler for PDP-6	D	X
5/8-1.1	BPAK - A Binary Input/Output Package	B	X
5-2.1	OPAK - An On-Line Debugging Program	B	
5-3	BRL - A Binary Relocatable Loader with Transfer Vector Options for the PDP-5	B	
5-4	Octal Typeout of Memory Area with Format Option		X
5-5	Expanded Adding Machine		X
5-6	BCD to Binary Conversion of 3-Digit Numbers		X
5/8-7	Decimal to Binary Conversion by Radix Deflation on PDP-8		X
5-8	Obsolete		
5/8-9	Analysis of Variance PDP-5/8	B	X
5-10	Paper Tape Reader Test	B	
5-11	PDP-5 Debug System	B	
5-12	Pack-Punch Processor and Reader for the PDP-5	S	X
5-13	PDP-5 Assembler (for use on IBM 7044/7094)	Source Deck	
5/8-14	Dice Game for the PDP-5/8	B	
5/8-15	ATEPO: Auto Test in Elementary Programming and Operation of a PDP-5/8 Computer	B	
5-16	Tape Duplicator for the PDP-5	B	XX
5/8-17	Type 250 Drum Transfer Routine for use on the PDP-5/8	B,S	X
5/8-18A	Binary Tape Disassembly Program	B	X
5/8-18B	Obsolete		
5/8-18C	Disassembler with Symbols	B	X
8-19a	DDT-UP: Octal Symbolic Debugging Program	B	
5/8-20	Remote Operator FORTRAN System	B	X
5/8-21	Triple Precision Arithmetic Package for the PDP-5/8	B,S	X

Code

A - ASCII Source
 B - Binary Object
 D - DECTape

H - High Binary Loader
 L - LINCtape
 LL - Linking Loader
 R - RIM

S - Symbolic (Source)
 X - Listing with write-up
 XX - Listing available at a handling charge

Write-ups are available for all programs.

<u>DECUS NO.</u>	<u>TITLE</u>	<u>TAPES AVAILABLE</u>	<u>LISTING</u>
5-22	DEctape Duplicate (552)	B,S	X
5/8-23A	PDP-5/8 Oscilloscope Symbol Generator (4x6 Matrix)	B	X
5/8-23B	PDP-5/8 Oscilloscope Symbol Generator (5x7 Matrix)	B,S	X
5-24	Obsolete		
5-25	A Pseudo Random Number Generator	B	X
8-26A	Compressed Binary Loader (CBL)	B	X
8-26B.1	CBL2BN and BN2CBL	B	XX
8-26C	XCBL: Extended Memory CBL Loader	B	XX
8-26D	XCBL Punch Program	B	XX
5/8-27 & 27a	Bootstrap Loader and Absolute Memory Clear	B	X
5/8-28a	PAL III Modifications - Phoenix Assembler	B	X
5/8-29	BCD to Binary Conversion Subroutines	B,S	X
5-30	GENPLOT: General Plotting Subroutines for the PDP-5	B	
5-31	FORPLOT: FORTRAN Plotting Program for PDP-5	B	
5/8-32a	Program to Relocate and Pack Programs in Binary Format	B	
5/8-33	Tape to Memory Comparator	S	X
5-34	Memory Halt - A PDP-5 Program to Store HALT in Most of Memory	B	X
5/8-35	BCD to Binary Conversion Subroutine and Binary to BCD Subroutine (Double Precision)	S	X
5-36	Octal Memory Dump Revised	B,S	
5-37	Transfer II	B,S	X
5/8-38	FTYPE: Fractional Signed Decimal Type-In	B	X
5/8-39	DSDPRINT, DDTYPE: Double Precision Signed Decimal Input-Output Package	B	X
5-40	ICS DEctape Routines (One-Page-552 Control)	B,S	
5-41	Breakpoint	B,S	
5-42	Obsolete		
5/8-43	Unsigned Octal - Decimal Fraction Conversion	B,A	X
8-44	Modifications to the Fixed Point Output in the PDP-8 Floating Point Package (Digital 8-5-S)	B,S	X
5/8-45	PDP-5/8 Remote and Time-Shared System	B	

<u>DECUS NO.</u>	<u>TITLE</u>	<u>TAPES AVAILABLE</u>	<u>LISTING</u>
5/8-46a	PDP-5/8 Utility Programs	B	
8-47	ALBIN - A PDP-8 Loader for Relocatable Binary Programs	B,S	
5/8-48	Modified Binary Loader MKIV	R	X
8-49	Relativistic Dynamics	B	X
5/8-50	Additions to Symbolic Tape Format Generator (DEC-8-21-4)	B,S	X
5/8-51	Character Packing and Unpacking Routines	B,S	X
8-52	Tiny Tape Editor	B,S	X
5/8-53	COPCAT (DECTape Copy 552)	B,A	X
5/8-54	TIC-TAC-TOE Learning Program	B,S	X
5/8-55	PALEX - An On-Line Debugging Program for the PDP-5/8	B,S	X
8-56	Fixed Point Trace No. 1	B,A	X
8-57	Fixed Point Trace No. 2	B,A	X
8-58	One-Page DECTape Routines (552 Control)	S	X
8-59	PALDT - PAL Modifications for DECTape (552 Control)	B,S	X
8-60	Square Root Function by Subtraction Reduction	S	X
8-61	Improvement to Digital 8-9-F Square Root	S	X
8-62a	Obsolete		
5-63	SBUG-4	R	X
5/8-64	DECTape Programming System (552 & TCØ1 Controls)	D	XX
8-65	A Programmed Associative Multichannel Analyzer	B,R	
8-66	Editor Modified for DECTape (552)	B,S	X
8-67	PAL Modified for DECTape Input (552)	B,S	X
8-68a	LABEL for PDP-8	B	
5/8-69	LESQ29 and LESQ11	D,S	X
8-70	EAE Routines for FORTRAN Operating System (DEC-08-CFA3)	B,A	X
8-71	Perpetual Calendar	B,S	X
8-72	Matrix Inversion, Real Numbers	B,S	X
8-73	Matrix Inversion, Complex Numbers	B,S	X
8-74	Solution of System of Linear Equations: AX=B, by Matrix Inversion and Vector Multiplication	B,S	X

<u>DECUS NO.</u>	<u>TITLE</u>	<u>TAPES AVAILABLE</u>	<u>LISTING</u>
8-75	Matrix Multiplication - Including Conforming Rectangular Matrices	B,S	X
8-76	PDP NAVIG 2/2	B,S	
8-77	PDP-8 Dual Process System	B,S	X
8-78	Diagnose: A Versatile Trace Routine for the PDP-8 with EAE	B,A	X
8-79	TIC-TAC-TOE (Trinity College Version)	B,S	X
8-80	Determination of Real Eigenvalues of a Real Matrix	B,S	X
8-81	A BIN or RIM Format Data or Program Tape Generator	B,S	X
8-82	Library System for 580 Magnetic Tape (Preliminary Version)	B	X
8-83 A & B	Octal Debugging Package (with and without Floating Point)	B,A	X
8-84	One-Pass PAL III	B,A	X
5/8-85	Set Memory Equal to Anything		X
8-86	Obsolete		
8-87	XMAP	D	X
8-88	DECTape Symbolic Format Generator	D	
8-89	XOD: Extended Octal Debugging Program	B	
5/8-90	Histogram on Teletype	S	X
8-91	MICRO-8: An On-Line Assembler	B	
8-92	Analysis of Pulse-Height Analyzer Test Data with a Small Computer	B	X
8-93	CHEW - Convert Any BCD to Binary Double Precision	S	X
8-94A	BLACKJACK	B,S	X
8-94B	Patch for BLACKJACK	B	
8-95	TRACE for EAE	B,S	X
8-96	J Bessel Function (FORTRAN)	B,S	X
8-97	GOOF	S	X
8-98	3D DRAW for the 338	B,S	
8-99A	Kaleidoscope	B,S	X
8-99B	Kaleidoscope - 338	B	
8-100	Double Precision Binary Coded Decimal Arithmetic Package	S	X

<u>DECUS NO.</u>	<u>TITLE</u>	<u>TAPES AVAILABLE</u>	<u>LISTING</u>
8-101	Symbolic Editor with View (338)	B,S	
8-102a	A LISP Interpreter for the PDP-8	B	
8-103A	Four Word Floating Point Function Package	B,S	X
8-103B	Four Word Floating Point Rudimentary Calculator	B,S	X
8-103C	Four Word Floating Point Output Controller with Rounding	B,S	X
8-103D	Additional Instructions for use with Four Word Floating Point Package	B,S	X
8-104	Card Reader Subroutine for the PDP-8 FORTRAN Compiler	B,A	X
8-105	D-BUG	B,A	X
8-106	Readable Punch	B,S	X
8-107	CHESSBOARD Display on the 338	B	XX
8-108	INCMOD: Increment Mode Compiler (338)	B	XX
8-109	SEETXT Subroutine (338)	B	XX
8-110	DIREC: Directory Print	B	XX
8-111	DISKLOOK	B	XX
8-112	Sentence Generator	B,A	X
8-113	Conversion of Friden (EIA) to ASCII	B,A	X
8-114	Rounded Decimal Output Modifications for PDP-8 FORTRAN	B	X
8-115a	Double Precision Integer Interpretive Package	B,A	X
8-116	PDP-8 Automatic Magnetic Tape Control (Type 57A) Library System	B	
8-117	A PDP-8 Interface for a Charged-Particle Nuclear Physics Experiment		X
8-118	General Linear Regression	A	X
8-119	Off-Line TIC-TAC-TOE (PAL)	B,A	XX
8-120	Disk/DECtape FAILSAFE	B,A	XX
8-121	DECtape Handler (552 Control)	B,A	XX
8-122A	SNAP: Simplified Numerical Analysis Program (without EAE)	B	
8-122B	SNAP: Simplified Numerical Analysis Program (with EAE)	B	
8-123	UNIDEC Assembler	Source Deck	XX

<u>DECUS NO.</u>	<u>TITLE</u>	<u>TAPES AVAILABLE</u>	<u>LISTING</u>
8-124	PDP-8 Assembler for IBM 360/50 and above	Source Deck	XX
8-125	PDP-8 Relocatable Assembler for IBM 360/50 and above	Source Deck	
5/8-126	Cumulative Gaussian Distribution Curve Fitting	S	
8-127	XDDT: Extended Octal-Symbolic Debugging Program	B	XX
8-128	PDP-8 Oscilloscope Display of Mathematical Functions	A	X
8-129	PDP-8/57A Magnetic Tape Program Library System	B,S	X
8-130A	REBIL8: Relocating Binary Tape Loader for the PDP-8/S	B,S	X
8-130B	RELCON: Binary to Relocatable Binary Tape Converter	B,S	X
8-131	SRCD: Software Rapid Character Display		
8-132	STRIP: A Data Display and Analysis Program for the PDP-8, 8/I	B	X
8-133	First Order Kinetics	B,S	X
8-134	LSQ: Least Squares Subroutine	B,S	X
8-135	DNHELP: Directory Assistor Program	B	XX
8-136	Fourier Transform Program in FORTRAN II	S	X
8-137	Programs for Storage, Manipulation and Calculation of Data Using DECTape	D	X
8-138	PAL III.5	B	
8-139	Editor	B	
8-140	Binary Tape Consolidator	B	
8-141	SYSLUK	B	XX
8-142	Binary Punch - Extended Memory	B,S	X
8-143	FFTS-R: Fast Fourier Transform Subroutine For Real Valued Functions	B	
8-144	FFTS-C: Fast Fourier Transform Subroutine for Complex Data	B	XX
8-145	A Time-of-Flight Analyzer Based on a Small On-Line Computer	B	X
8-146	High Speed Interrupt Executive	S	X
8-147	Incremental Plotter Printout Subroutines	B,A	X
8-148	Plotter System	B	
8-149	Core Window	B,A	X
8-150	PTOD8 High and PTOD8 Low	B	X

<u>DECUS NO.</u>	<u>TITLE</u>	<u>TAPES AVAILABLE</u>	<u>LISTING</u>
8-151	On-Line TIC-TAC-TOE	A, B	
8-152	PDP-8 Music Program	B, S	
8-153	Tape/Disk Transfer Programs	D	X
8-154	SWAP	B	XX
8-155	HEP	B	
8-156	HEPTRACE	B	
8-157	Square Root Patch for DEC-8-5-5	B	
8-158	AX-Ø8 Symbol Generator	A, B	X
8-159	CINET-BASIC	B	X
8-160	FASTLOAD	B	X
8-161	EXPO: A Flexible PDP-8 Data-Aquisition Program	Source Deck, B	XX
8-162	Demonstration Programs for the PDP-8	B	X
8-163	See FOCAL Section		
8-164	Prime Number Determination	A, B	X
8-165	The PDP-8 Simulator System for Philco 212		
8-166	The PDPMAP Assembly System		
8-167	CIRCUITS	B, S	XX
8-168	CalComp Plotting Package	D	X
8-169	Physical Oceanography Data Reduction Programs for the PDP-8 (II)	A, B	X
8-170	FORTTRAN Source Conversion Program	A, B	X
8-171	Real-Time System for Behavioral Science Experiments		XX
8-172	Octal Systems Edit	A, B	XX
8-173	TIC 5/8 (Scope Version)	B	X
8-174	Medium	B	X
8-175	Post Stimulus Interval Histogram for AX-Ø8	B	XX
8-176	PAL CHOP	A, B	XX
8-177	COPY	A, B	XX
8-178	Reverse Assembler	A, B	XX
8-179	EAE Modifications for Binary Disassembler with Symbols	A, B	X
8-180	Editor and Assembler for 57A Magnetic Tape System	A	XX
8-181	Automatic Binary Loader and Duplicator-Coder for Auto Bin	A, B	XX
8-182	Memory Compare	B, S	X

<u>DECUS NO.</u>	<u>TITLE</u>	<u>TAPES AVAILABLE</u>	<u>LISTING</u>
8-183	The WANG Loader	B	X
8-184	Page Routine	B,S	XX
8-185	Modifications to Symbolic Editor and Symbolic Tape Format Generator	B	X
8-186	EAE FORTRAN Patch for the PDP-8	B	XX
8-187	Keyboard Controlled Binary Punch	A, B	X
8-188	Extended Memory Patch for Four Word Floating Point Package (DEC-08-FMHA-8B)	B	X
8-189	LKDN: Look into the Directory Name Block	B	XX
8-190	PATCH Utility Program	B	XX
8-191	Fields	B	XX
8-192	T.A.L.C. (Taylor's Algebraic Linear Calculator)	B	XX
8-193	DISP	A, B	X
8-194	NMR Simulator	B	XX
8-195	POLY BASIC	A, B	
8-196	DET: Detect Key Words		X
8-197	Overlay for Standard Editor and PAL III Assembler		X
8-198	SYSHLP: Monitor System Utility Program	B	XX
8-199	Accessing Data Arrays and Teletype Text Input/Output	A	
8-200	BOSS	B	X
8-201	DECSW: Decimal Switch	A, B	X
8-202	PLOT	B	XX
8-203	ALPHA	B	XX
8-204	PATCH: A PDP-8 Binary Paper Tape Patch Program	D	XX
8-205	MTSAFE	A, B	XX
8-206	DUMP	A, B	
8-207	Cube Root Subroutine	A, B	X
8-208	Evaluating Determinants		X
8-209	Editor-with-View (VD 8/1 or 34D Scope)	B	

**PDP-5 and PDP-8
PROGRAM ABSTRACTS**

PDP-5 and PDP-8 PROGRAM ABSTRACTS

DECUS No. 6/8-12

PDP-8 Assembler for PDP-6

Henry Burkhardt, Digital Equipment Corporation, Maynard, Massachusetts

Assembles PDP-8 programs written in PAL on a PDP-6 using any I/O devices.

DECUS No. 5/8-1.1

BPAK - A Binary Input/Output Package

P. T. Brady, New York University, New York, New York

A revision of the binary package originally written by A. D. Hause of Bell Telephone Laboratories. With BPAK the user can read in binary tapes via the photoreader and punch them out via the Teletype punch. It may be used with any in-out device, but is presently written for the photoreader and Teletype punch. A simple modification converts BPAK so that it reads from the Teletype reader if the photoreader is disabled. In its present form it occupies locations 7600 - 7777.

DECUS No. 5-2.1

OPAK - An On-Line Debugging Program

P. T. Brady, New York University, New York, New York

A utility program which enables the user to load, examine, and modify computer programs by means of the Teletype. This program is a revision of the program written by A. D. Hause, Bell Telephone Laboratories. Extensive use of the program has suggested many refinements and revisions of the original program, the most significant additions being the word search and the breakpoint. The standard version of OPAK is stored in 6200 to 7577 and also 0006. An abbreviated version is available (7000 to 7577, 0006), which is identical to the other except that it has no provision for symbolic dump. Both programs are easily relocated. Control is via Teletype, with mnemonic codes, (e.g. "B" for insert-ing breakpoint, "P" for proceed, etc.).

DECUS No. 5-3

BRL - A Binary Relocatable Loader with Transfer Vector Options for the PDP-5

P. T. Brady, Bell Telephone Laboratories, Inc., Murray Hill, New Jersey

A binary loader program occupying 4640g to 6177g registers,

* Note: Programs listed as DECUS No. 5-(number) indicate that they work on the PDP-5, and compatibility to the PDP-8 is uncertain. Programs marked DECUS No. 5/8-(number) indicate they can be used on both 5 and 8 computers. Those marked DECUS No. 8-(number) work on PDP-8, and compatibility to PDP-5 is uncertain.

also 160 to 177. It has two main functions:

- 1) It allows a PDP-5 operator to read a suitably prepared binary program into any page location in memory except the registers occupied by BRL.
- 2) It greatly simplifies the calling of programmed subroutines by allowing the programmer to use an arbitrary subroutine calling sequence when writing his program, instead of having to remember the location of the subroutines.

DECUS No. 5-4

Octal Typeout of Memory Area with Format Option

Donald V. Weaver, New York, New York

(Write-up and Listing Only)

DECUS No. 5-5

Expanded Adding Machine

Donald V. Weaver, New York, New York

Expanded Adding Machine is a minimum-space version of Expensive Adding Machine (DEC-5-43-D) using a table look-up method including an error space facility.

This is a basic version to which additional control functions can easily be added. Optional vertical or horizontal format, optional storage of intermediate result without reentry fixed-point output of results within reason, and other features that can be had in little additional space under switch register control. (Write-up and Listing Only)

DECUS No. 5-6

BCD to Binary Conversion of 3-Digit Numbers

Donald V. Weaver, New York, New York

This program is based on DEC-5-4 and is intended to illustrate the use of alternative models in program construction.

While not the fastest possible, this program has one or two interesting features. It converts any 3-digit BCD-coded decimal number, $D_1D_2D_3$ into binary in the invariant time of 372 microseconds. Efficient use is made of BCD positional logic to work the conversion formula $(10D_1 + D_2) 10 + D_3$ by right shifts in the accumulator. In special situations, it could be profitable to insert an initial test/exit on zero, adding 12 microseconds to the time for nonzero numbers. (Write-up and Listing Only)

DECUS No. 5/8-7

Decimal to Binary Conversion by Radix Deflation on PDP-8

Donald V. Weaver, New York, New York

(Write-up and Listing Only)

DECUS No. 5-8

Obsolete

DECUS No. 5/8-9

Analysis of Variance PDP-5/8

Henry Burkhardt, Digital Equipment Corporation, Maynard, Massachusetts

An analysis of variance program for the standard PDP-5/8 configuration. The output consists of:

- A. For each sample:
 - 1) sample number
 - 2) sample size
 - 3) sample mean
 - 4) sample variance
 - 5) sample standard deviation
- B. The grand mean
- C. Analysis of Variance Table:
 - 1) the grand mean
 - 2) the weighted sum of squares of class means about the grand means
 - 3) the degrees of freedom between samples
 - 4) the variance between samples
 - 5) the pooled sum of squares of individual values about the means of their respective classes
 - 6) the degrees of freedom within samples
 - 7) the variance within samples
 - 8) the total sum of squares of deviations from the grand mean
 - 9) the degrees of freedom
 - 10) the total variance
 - 11) the ratio of the variance between samples to the variance with samples.

This is the standard analysis of variance table that can be used with the F test to determine the significance, if any, of the differences between sample means. The output is also useful as a first description of the data.

Other Programs Needed: Floating Point Interpretive Package (DEC-8-5-S)

DECUS No. 5-10

Paper Tape Reader Test

Tony Schaeffer, Lawrence Radiation Laboratory, Berkeley, California

A test tape can be produced and will be continuously read as an endless tape. Five kinds of errors will be detected and printed out. The Read routine is in 6033-6040.

Storage Requirement: Locations 10, 11, 40-67 (save 63,64), and 6000-7777.

DECUS No. 5-11

PDP-5 Debug System

Tony Schaeffer and Don Zurlinden, Lawrence Radiation Laboratory, Berkeley, California

Purpose of this program is to provide a system capable of:

- 1. Octal dump 1 word per line.
- 2. Octal dump 10₈ words per line.
- 3. Modifying memory using the typewriter keyboard.
- 4. Clearing to zero parts of memory.
- 5. Setting to HALT codes part of memory.
- 6. Entering breakpoints into a program.
- 7. Initiating jumps to any part of memory.
- 8. Punching leader on tape.
- 9. Punching memory on tape in RIM format.
- 10. Punching memory on tape in PARITY format.
- 11. Load memory from tape in PARITY format.

DECUS No. 5-12

Pack-Punch Processor and Reader for the PDP-5

R. L. Becker, Boston College, Boston, Massachusetts

The processor converts a standard binary-format tape into a more compressed format, with two 12-bit words contained on every three lines of tape. Checksums are punched at frequent intervals, with each origin setting, or at least every 200 words.

The reader, which occupies locations 7421 to 7577 in the memory will load a program which is punched in the compressed format. A test for checksum error is made for each group of 200 or less and the program will halt on error detection. Only the most recent group of words need be reloaded. Read-in time is about 10% less than for conventional binary format, but the principal advantage is that little time is lost when a checksum error is detected, no matter how long the tape.

DECUS No. 5-13

PDP-5 Assembler (for use on IBM 7044/7094)

Tony Schaeffer, Lawrence Radiation Laboratory, Berkeley, California

This program accepts IBM 7044/7094 symbolic programs punched on cards and assembles them for the PDP-5. An assembly listing is produced, and a magnetic tape is generated containing the program. This magnetic tape can be converted to paper tape and then read into the PDP-5 or it can be read directly into a PDP-5 with an IBM compatible tape unit. Cards are available.

DECUS No. 5/8-14

Dice Game for the PDP-5/8

Edward Steinberger, Digital Equipment Corporation, Maynard, Massachusetts

Enables a user to play the game DICE on either the PDP-5 or PDP-8.

DECUS No. 5/8-15

ATEPO: Auto Test in Elementary Programming and Operation of a PDP-5/8 Computer

Submitted by: Rutgers University, Electrical Engineering Department, New Brunswick, New Jersey

The program will type questions or instructions to be performed by the operator of a 4K PDP-5/8. The program will check to see if the operator has answered the questions correctly. If this is the case, it will type the next question or instruction.

DECUS No. 5-16

Paper Tape Duplicator for the PDP-5

Henry Burkhardt, Digital Equipment Corporation, Maynard, Massachusetts

The Paper Tape Duplicator for the PDP-5 is a single-buffered read and punch program utilizing the program interrupt. It computes a character count and checksum for each tape and compares with checks at the end of the tape. Checks are also computed and compared during punching.

DECUS No. 5/8-17

Type 250 Drum Transfer Routine for use on PDP-5/8

S. Arthur MacIlroy, Foxboro Company, Foxboro, Massachusetts

Transfers data from drum to core (Read) or core to drum (Write) via ASR-33 Keyboard Control.

DECUS No. 5/8-18A

Binary Tape Disassembly Program

G. A. Sabin, NRL-USRD, Orlando, Florida

Disassembles a PDP-5 or 8 program, which is on tape in BIN format. It prints the margin setting, address, octal contents, mnemonic interpretation (PAL) of the octal contents. A normal program or a program which uses Floating Point may be disassembled.

DECUS No. 5/8-18B

Obsolete

DECUS No. 5/8-18C

Disassembler with Symbols

Eberhard Werner, University of California, Marine Physical Laboratory of the Scripps Institution of Oceanography, San Diego, California

This disassembler accepts a binary tape of standard format and produces a listing of the tape in PAL III mnemonics, and a cross-reference table of all addresses referenced by any memory-reference instruction. A symbol table may be entered to produce a listing similar to a PAL III Pass 3 listing. A patch to produce only a cross reference table is included. See DECUS No. 8-179.

Minimum Hardware: PDP-8 with 4K, ASR-33, High-Speed Reader, EAE

Storage Requirement: 20-1773_g for program, 1774-7577_g for scratch

DECUS No. 8-19a

DDT-UP: Octal-Symbolic Debugging Program

Michael S. Wolfberg and Robb N. Russell, The Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pennsylvania

DDT-UP is an octal-symbolic debugging program for a 4K PDP-8 which occupies locations 5600-7667. The mnemonics for the eight basic instructions are defined internal to this area. Other symbols are stored, four locations per symbol, from 5577 down towards 0000. The mnemonics for the standard OPR and IOT group instructions are initially defined in this area. Thus, the highest location initially available to the user is 5363. Beginning at this location the user may define symbols one at a time using the comma(,) operator.

From the Teletype, the user can symbolically examine and modify the contents of any memory location. DDT-UP allows the user to punch a corrected program in CBL format.

DDT-UP has a breakpoint facility to help the user run sections

DECUS No. 8-19a (Continued)

of his program. When this facility is used the debugger also uses location 0005.

DECUS No. 5/8-20

Remote Operator FORTRAN System

James Miller, Dow Badische, Freeport, Texas

Program modification and instructions to make the FORTRAN OTS version dated 2/12/65 operate from remote stations.

DECUS No. 5/8-21

Triple Precision Arithmetic Package for the PDP-5/8

Joseph A. Rodnite, Information Control Systems, Ann Arbor, Michigan

An arithmetic package to operate on 36-bit signed integers. The operations are add, subtract, multiply, divide, input conversion, and output conversion. The largest integer which may be represented is $2^{35} - 1$ or 10 decimal digits. The routines simulate a 36-bit (3 word) accumulator in core locations 40, 41, and 42 and a 36-bit multiplier quotient register in core locations 43, 44, and 45. Aside from the few locations in page 0, the routines use less core storage space than the equivalent double precision routines.

DECUS No. 5-22

DECtape Duplicate (552)

Jim Miller, Dow Badische, Freeport, Texas

A DECtape routine for the PDP-5 to transfer all of one reel (transport 1) to another (transport 2). Occupies one page of memory beginning at 7400. The last page of memory is not used during the operation of the program; however, the memory from 1 to 7436 is used to set the DECtape reels in the proper starting attitude and is then destroyed during duplication. Duplication will commence after which both reels will rewind. Parity error will cause the program to halt with 0040 in the accumulator.

DECUS No. 5/8-23A

PDP-5/8 Oscilloscope Symbol Generator (4 x 6 Matrix)

Gary H. Sanders, Columbia Radiation Laboratory, New York City, New York

The subroutine may be called to write a string of characters, a pair of characters, or a single character on an oscilloscope. Seventy (octal) symbols in ASCII Trimmed Code and four special "format" commands are acceptable to this routine. The program is operated in a fashion similar to the DEC Teletype Output Package.

DECUS No. 5/8-23B

PDP-5/8 Oscilloscope Symbol Generator (5 x 7 Matrix)

Larry T. Gell, Center for Visual Science, University of Rochester, Rochester, New York

This subroutine may be called to write a string of characters, a pair of characters, or a single character on a 34D Oscilloscope. Twenty-six alphabetic characters and 0 - 9 numeric characters are acceptable. However, there is space available to include any symbol the user desires. The program is operated in a fashion similar to the DEC Teletype Output Package (Digital 8-19-U).

Source Language: MACRO-8

Storage Requirement: $200_8 - 777_8$ registers

DECUS No. 5-24

Obsolete

DECUS No. 5-25

A Pseudo Random Number Generator

Paul T. Brady, New York University, Bronx, New York

The random number generator subroutine, when called repeatedly, will return a sequence of 12-bit numbers which, though deterministic, appears to be drawn from a random sequence uniform over the interval 0000_8 to 7777_8 . Successive numbers will be found statistically uncorrelated. The sequence will not repeat itself until it has been called over 4 billion times. (See DECUS, FOCAL-1).

DECUS No. 8-26A

Compressed Binary Loader (CBL)

Michael S. Wolfberg, Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pennsylvania

The CBL (Compressed Binary Loader) format in contrast to BIN format utilizes all eight information channels of the tape, thus achieving nearly 25% in time savings.

As BIN tapes include only one checksum at the end of the tape, CBL tapes are divided into many independent blocks, each of which includes its own checksum. Each block has an initial loading address for the block and a word count of the number of words to be loaded.

Storage Requirement: $7700 - 7777$

DECUS No. 8-26B.1

CBL2BN and BN2CBL

David M. Kristol, University of Pennsylvania, Philadelphia, Pennsylvania

CBL2BN is a short utility program which converts paper tape in CBL format to BIN and BN2CBL converts paper tape from BIN to CBL format. It offers high or low speed I/O and proper punching of field characters.

Program Language: PDPMAP - (DECUS No. 8-166)

Storage Requirement: 300g and 200g Buffer; 400g and 200g Buffer

DECUS No. 8-26C

XCBL: Extended Memory CBL Loader

Michael S. Wolfberg, Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pennsylvania

XCBL is used to load binary tapes punched in CBL format into a PDP-8 with more than standard 4K memory. This loader occupies locations 7670 through 7777 of any memory field.

DECUS No. 8-26D

XCBL Punch Program

Michael S. Wolfberg, Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pennsylvania

This program permits a user to prepare an XCBL tape of portions of a PDP-8 extended memory through the control of the keyboard of the on-line Teletype.

The program is loaded by the BIN Loader.

There are two versions of the program so that any section of memory may be punched:

LOW XCBL occupies 00000-00377
and its starting address is 00000.

HIGH XCBL occupies 17200-17577
and its starting address is 17200.

DECUS No. 5/8-27 and 5/8-27a

Bootstrap Loader and Absolute Memory Clear

Willard Crittenden, Ann Arbor Computer Corporation, Ann Arbor, Michigan

Bootstrap Loader inserts a bootstrap loading program in page

0 from a minimum of toggled instructions.

Absolute Memory Clear leaves the machine in an absolutely clear state and, therefore, cycling around memory obeying an AND instruction with location zero. Should not be used unless one plans to reinsert the loader program.

DECUS No. 5/8-28a

PAL III Modifications - Phoenix Assembler

Terrel L. Miedaner, Space Astronomy Laboratory, Madison, Wisconsin

This modification of the PAL III Assembler speeds up assembly on the ASR-33/35 and operates only with this I/O device. Operation is essentially the same as PAL III, except that an additional pass has been added, Pass 0. This pass, started in the usual manner, but with the switches set to zero, reads the symbolic tape into a core buffer area. Subsequent passes then read the tape image from storage instead of from the Teletype.

DECUS No. 5/8-29

BCD to Binary Conversion Subroutines

Terrel L. Miedaner, Space Astronomy Laboratory, Madison, Wisconsin

These two subroutines improve upon the DEC-supplied conversion routine. Comparison cannot be made to the DECUS-supplied fixed-time conversions, DECUS No. 5-6, because it is specified only for the PDP-5. One routine is designed for minimal storage, the other for minimal time. Both are fixed-time conversions; time specified is for a 1.5 - μ sec. machine.

Execution Time: Minimal Time routine - 73.6 μ sec,
32 locations
Minimal Storage routine - 85 μ sec,
29 locations
DEC routine - 64 - 237 μ sec, 37
locations

DECUS No. 5-30

GENPLOT: General Plotting Subroutines for the PDP-5

M. Adamowicz, Department of Electrical Engineering, New York University, New York City, New York

This self-contained subroutine is for the PDP-5 with a 4K memory and a CalComp incremental plotter. The subroutine can move (with the pen in the up position) to locations (x,y), make an "x" at this location, draw a line from this present position to location (x,y) and initialize the plotter location counters.

DECUS No. 5-31

FORPLOT: FORTRAN Plotting Program for PDP-5

Jerome Feder, Department of Electrical Engineering,
New York University, New York City, New York

FORPLOT is a general-purpose plotting program for the PDP-5 computer in conjunction with the CalComp 560 Plotter. It is self-contained and occupies memory locations 0000_g up to 4177_g. FORPLOT accepts decimal data inputted on paper tape in either fixed or floating point formats. Formats can be mixed at will. PDP-5 FORTRAN output tapes are acceptable directly and any comment on these are filtered out.

Storage Requirement: 0000-4177_g

DECUS No. 5/8-32a

Program to Relocate and Pack Programs in Binary Format

J. W. Bowman, Atomic Energy of Canada Ltd., Chalk
River, Ontario, Canada

This program provides a means to shuffle machine language programs around in memory to make the most efficient use of computer store.

DECUS No. 5/8-33

Tape to Memory Comparator

Milton Collins, Teradyne, Boston, Massachusetts

Tape to Memory Comparator is a debugging program which allows comparison of the computer memory with a binary tape. It is particularly useful for detecting reader problems, or during stages of debugging a new program. Presently uses high-speed reader, but may be modified for TTY reader.

DECUS No. 5-34

Memory Halt - A PDP-5 Program to Store HALT in Most of Memory

P. T. Brady, Department of Electrical Engineering, New
York University, New York City, New York

With Memory Halt and OPAK in memory, it is possible to store HALT (7402) in the following memory locations: 0001 to 0005, 0007 to 6177, and 7402 to 7403.

Other Programs Needed: OPAK (DECUS No. 5-2.1)

DECUS No. 5/8-35

BCD to Binary Conversion Subroutine and Binary to BCD Subroutine (Double Precision)

Selene H. C. Wise, Bermuda Press Ltd., Hamilton,
Bermuda

This program consists of a pair of relatively simple and straightforward double precision conversions.

DECUS No. 5-36

Octal Memory Dump Revised

Paul Hammond, Woods Hole Oceanographic Institution,
Woods Hole, Massachusetts

The Octal Memory Dump on Teletype is a DEC routine (DEC-5-8-U) which dumps memory by reading the switch register twice; once for a lower limit and again for an upper limit. It then types an address, the contents of the program and the next three locations, issues a CR/LF, then repeats the process for the next four locations. This leaves the right two-thirds of the Teletype page unused. The 78₁₀ instructions occupy two pages.

This revised routine uses the complete width of the Teletype page and occupies only one memory page, using less paper and two less instructions. Now an address and the contents of 15 locations are typed out before a carriage return.

DECUS No. 5-37

Transfer II

Paul Hammond, Woods Hole Oceanographic Institution,
Woods Hole, Massachusetts

For users who have more than one memory bank attached to the PDP-5/8, Transfer II may prove valuable in moving information from one field to another. When debugging, Transfer II enables a programmer to make a few changes in a new program and test it without reading in the original program again. Transfer II enables more extensive use of memory banks.

DECUS No. 5/8-38

FTYPE: Fractional Signed Decimal Type-In

P. T. Brady, Department of Electrical Engineering,
New York University, New York City, New York

Enables a user to type fractions of the form: .582, - .73, etc., which will be interpreted as sign plus 11 bits (e.g., 0.5 = 2000_g). Subroutine reads into 300-3177 and is easily relocated, as it will work on any page without modifications.

DECUS No. 5/8-39

DSDPRINT, DDTYPE: Double Precision Signed Decimal Input-Output Package

P. T. Brady, Department of Electrical Engineering, New York University, New York City, New York

DSDPRINT, when given a signed 24-bit integer, types a space or minus sign, and then a 7-digit decimal number in the range -8388608 to +8388607. DDTYPE enables a user to type in a signed decimal number in either single or double precision. These routines are already separately available, but the present subroutine package occupies only one memory page and allows for more efficient memory allocation. Located in 3000-3177, but will work on any page.

DECUS No. 5-40

ICS DECTape Routines (One-Page 552 Control)

Submitted by: Information Control Systems, Inc., Ann Arbor, Michigan

The routines will read or write from the specified DECTape unit and delay the program until all I/O is completed. The last block read will overflow the specified region and destroy one core location. Only standard 129 word DECTape blocks will be read or written. The routines will halt if an error occurs with the status bits in the AC.

DECUS No. 5-41

Breakpoint

Arthur R. Miller, Woods Hole Oceanographic Institution, Woods Hole, Massachusetts

This debugging routine has been reduced to a minimum operation. It is a mobile routine which can operate around any program that leaves an extra 30 cells of memory space.

Its function is to insert break points in any given location of the program being debugged, and to hold the contents of AC and Link. The programmer may examine any locations desired and then continue to the next breakpoint. It is presently located in 140g - 170g, but may be easily relocated.

Storage Requirement: 140g - 170g

DECUS No. 5-42

Obsolete

DECUS No. 5/8-43

Unsigned Octal - Decimal Fraction Conversion

Frank Ollie, Defence Research Telecommunications Establishment, Ottawa, Ontario, Canada

This routine accepts a four-digit octal fraction in the accumulator and prints it out as an N-digit decimal fraction where N = 12 unless otherwise specified. After N digits, the fraction is truncated. Programs are included for use on the PDP-5 with Type 153 Automatic Multiply-Divide and the PDP-8 with Type 182 Extended Arithmetic Element.

Storage Requirement: 55g locations for the PDP-5.
47g locations for the PDP-8.

DECUS No. 8-44

Modifications to the Fixed Point Output in the PDP-8 Floating Point Package (Digital 8-5-S)

A. R. McKenzie, Data Systems Division, Standard Telephone & Cables, Ltd., England

The Floating Point Package (Digital 8-5-S) includes an Output Controller which allows output in fixed point as well as floating point format. This Output Controller takes the form of a certain number of patches to the "Floating Output E Format" routine, plus an additional page of coding.

Using the Calculator program (Digital 8-10-S), which includes the Floating Point Package, certain deficiencies were noted in the fixed-point output format, particularly the lack of any automatic rounding off.

This new version of the Output Controller is also in the form of patches to the Floating Output with an additional page of coding, thereby not increasing the size of the Floating Point Package.

The following summarizes this new version:

1. The number output is automatically rounded off to the last digit printed, or the sixth significant digit, whichever is reached first. Floating point output is rounded off to six significant figures since the seventh is usually meaningless.
2. A number less than one is printed with a zero preceding the decimal point (e.g., "+0.5" instead of "+.5").
3. A zero result, after rounding off, is printed as "+0" instead of "+".
4. The basic Floating Point Package includes the facility to specify a carriage return/line feed after the number using location 55 as a flag for this purpose. The patches for the Output Controller caused this facility to be lost. This version restores this facility.

DECUS No. 5/8-45

PDP-5/8 Remote and Time-Shared System

James Miller, Dow Badische Chemical Company, Freeport, Texas

A time-shared programming system which allows remote stations immediate access to the computer and a wide selection of programs.

DECUS No. 5/8-46a

PDP-5/8 Utility Programs

Edward Della Torre, American-Standard, Princeton, New Jersey

Consists of seven programs (listed below) each of which may be selected via the Teletypewriter. When the program is started, either by a self-starting binary loader or by manually starting the computer in address 200g, it is in its executive mode. In this mode, it will respond only to eight keys and perform the following functions:

- B - go to BIN to QK Converter Program
- E - go to Editor Program
- F - FORTRAN Tape formatter
- L - type a section of leader and stay in executive
- N - go to Editor program without typing leader
- P - go to Page Format Program
- T - Assembly language tape formatter
- Q - go to QK to BIN Converter Program

DECUS No. 8-47

ALBIN - A PDP-8 Loader for Relocatable Binary Programs

J. L. Visschers, P. U. ten Kate and M. A. A. Sonnemans, Instituut Voar Kernfysisch Onderzoek (IKO), Amsterdam, The Netherlands

ALBIN is a simple method for constructing relocatable binary formatted programs, using the PAL III Assembler. Allocation of these programs can be varied in units of one memory page (128₁₀ registers). When loading an ALBIN program, the actual absolute addresses of indicated program elements (e.g., the keypoint of subroutines) are noted down in fixed program-specified location on page zero. In order to make a DEC symbolic program suitable for translation into its relocatable binary equivalent, minor changes are required which, however, do not influence the length of the program. Due to its similarity to the standard DEC BIN loader, the ALBIN loader is also able to read-in normal DEC binary tapes. ALBIN requires 122₁₀ locations, RIM loader included. Piling-up in core memory of ALBIN programs stored on conventional or DECTape can be achieved using the same method with some modifications..

DECUS No. 5/8-48

Modified Binary Loader MK IV

R. Ward, American-Standard Research Division, New Brunswick, New Jersey

The Mark IV Loader was developed to accomplish four objectives:

1. Incorporate the self-starting format described in DECUS 5/8-27, Bootstrap Loader.
2. Select the reader in use, automatically, without switch register settings.
3. Enable a newly-prepared binary tape to be checked prior to loading by calculating the checksum.
4. Reduce the storage requirements for the loader so that a special program would fit on the last page of memory with it.

DECUS No. 8-49

Relativistic Dynamics

G. Sharman, Southampton University, Southampton, England

Prints tables for relativistic particle collisions and decay in the same format as the Oxford Kinematic Tables. It can be used in two ways:

1. Two-particle Collisions - Given the masses of incident, target, and emitted particles, the incident energy and centre-of-mass angles, the program calculates angles and energies of the emitted particles in the Lab frame. If the process is forbidden energetically, program outputs "E" allowing the threshold energy to be found.
2. Single-Particle Decays - By specifying $M_2=0$ (target), the problem will be treated as a decay, and similar tables to the above will be printed.

DECUS No. 5/8-50

Additions to Symbolic Tape Format Generator (DEC-8-21-4)

Richard Merrill, Digital Equipment Corporation, Maynard, Massachusetts

These routines allow the user to perform further useful functions by the addition of a few octal patches. By making the appropriate octal patches via the toggles, the Format Generator can also format FORTRAN tapes, shorten tape by converting space to tabs, and convert the type of tape.

DECUS No. 5/8-51

Character Packing and Unpacking Routines

Richard Merrill, Digital Equipment Corporation, Maynard, Massachusetts

ASCII characters may be packed two to a word and recovered. Control characters are also packable but are preceded by a 37 before being packed into the buffer.

Storage Requirement: 6310 words

DECUS No. 8-52

Tiny Tape Editor

Richard Merrill, Digital Equipment Corporation, Maynard, Massachusetts

This Tiny Tape Character Editor fits in core at the same time as the PAL III or MACRO-8 assemblers. A tape may be duplicated at three speeds and stopped at any character for insertion or deletion. The toggle switches control the speed and the functions desired.

Storage Requirement: 7210 registers.

DECUS No. 5/8-53

COPCAT (DECtape Copy 552)

Russell Winslow, Digital Equipment Corporation, Maynard, Massachusetts

COPCAT is a tape-to-tape copy routine for the PDP-5 and PDP-8 DECtape (552 Control).

DECUS No. 5/8-54

TIC-TAC-TOE Learning Program

Michael Green, Stevens Institute of Technology, Hoboken, New Jersey

This program plays TIC-TAC-TOE basing its moves on stored descriptions of previously lost games. The main program is written in FORTRAN. There is a short subroutine written in PAL II used to print out the TIC-TAC-TOE board. The program comes already educated with about 32 lost games stored.

Other Programs Needed: FORTRAN Object Time System

DECUS No. 5/8-55

PALEX - An On-Line Debugging Program for the PDP-5/8

Robert Berger, Bell Telephone Laboratories, New York, New York

One problem with programs written in Program Assembly Language (PAL) for operation on a PDP-5/8 computer is the danger of an untested program being self-destructive, running wild, destroying other programs residing in memory such as loading programs. PALEX prevents any of the above unwanted operations from occurring while it gives the operator-programmer valuable debugging information and enables him to make changes in his program and try out the modified program. Once running, PALEX cannot be destroyed by any program or instruction in memory, the operator need not touch any manual console controls, and all required information is printed in easy-to-read format on the Teletype console.

DECUS No. 8-56

Fixed Point Trace No. 1

B. J. Biavati, Columbia University, New York, New York

A minimum size monitor program which executes the users' program one instruction at a time and reports the contents of the program counter, the octal instruction, the contents of the accumulator and link and the contents of the effective address by means of the ASR-33 Teletype. (See DECUS No. 8-57)

Storage Requirement: two pages.

DECUS No. 8-57

Fixed Point Trace No. 2

B. J. Biavati, Columbia University, New York, New York

Similar to Fixed Point Trace No. 1 (DECUS No. 8-56) except that the symbolic tape provided has a single origin setting instruction of 6000. Any four consecutive memory pages can be used, with the exception of page zero, by changing this one instruction.

DECUS No. 8-58

One-Page DECtape Routine (552 Control)

Submitted by: Massachusetts Institute of Technology, Cambridge, Massachusetts

A general-purpose program for reading, writing, and searching of magnetic tape. This program was written for the Type 552 Control. It has many advantages over both the standard DEC routines and also over the DECUS No. 5-40. The routines are one page long and can be operated with the interrupt on or off. The DEC program delays the calling program while waiting for the unit and movement delays to time-out. This routine returns control to the calling program. This saves 1/4

DECUS No. 8-58 (Continued)

second every time the tape searches forward and half that time when it reverses. In addition, it will read and write block 0. This program is an advantage over the previous one-page routines in that it allows interrupt operations, does not overflow by one location, interprets the end zone correctly and not as an error, and provides a calling sequence identical to the DEC program.

DECUS No. 8-59

PALDT - PAL Modifications for DECTape (552 Control)

George Friedman, Massachusetts Institute of Technology, Cambridge, Massachusetts

When assembling programs, PALDT requires that the symbolic tape be read in only once. The program writes on the library tape itself after finding the next available block from the directory. During pass 0 the tape is read in using the entire user's symbol table. During passes 1,2,3, as much of the symbol table is used as possible. This means the fewest tape passes as possible. As an added advantage pass 0 ignores blank tape, leader-trailer, line feeds, form feeds, and rubouts; saving space. The whole program decreases the users symbol table by only three pages: one for the DECTape program above, one for pass 0, and one for the minimal length read-in buffer.

DECUS No. 8-60

Square Root Function by Subtraction Reduction

George Friedman, Massachusetts Institute of Technology, Cambridge, Massachusetts

A single precision square root routine using EAE. This routine is usually faster than the DEC routine and can easily be modified for double precision calculation at only twice the computation time.

DECUS No. 8-61

Improvement to Digital 8-9-F Square Root

George Friedman, Massachusetts Institute of Technology, Cambridge, Massachusetts

An improved version of the DEC Single Precision Square Root Routine (without EAE). Saves a few words of storage and execution is speeded up 12 percent.

DECUS No. 8-62a

Obsolete

DECUS No. 5-63

SBUG-4

Robert LaFore, Lawrence Radiation Laboratory, Berkeley, California

SBUG-4 allows the PDP-5 to execute one instruction of any given program at a time, returning to SBUG-4 following each instruction and printing out the contents of various registers. This permits following the path of a program which has gone astray or examining some defective operation.

DECUS No. 5/8-64

DECTape Programming System (552 & TCØ1 Controls)

Submitted by : DEC Software Services Group, Digital Equipment Corporation, Maynard, Massachusetts

This program provides rapid access to DEC software and utilizes routines through the use of DECTape. Programs may be stored, edited, assembled, listed, or executed without reliance upon paper tape.

May be used with both TCØ1 and 552 DECTape Controls. When requesting this program please specify which version.

DECUS No. 8-65

A Programmed Associative Multichannel Analyzer

G. C. Best, Atomic Energy Research Establishment, Harwell, England

The program describes the use of a small computer as an associative analyzer with special reference to the PDP-8. The advantages and limitations of the method are discussed in the write-up, and general program algorithms are presented.

DECUS No. 8-66

Editor Modified for DECTape (552)

Robin B. Wadleigh, Johns Hopkins University, Baltimore, Maryland

This program consists of modifications to the Digital 8-1-S Symbolic Editor to enable reading and writing on DECTape. This results in considerable time savings in assembling PAL programs since PAL has also been modified to accept the symbolic program directly from DECTape. The DECTape compatibility is also useful for storing text for later use and for regaining Editor memory space lost due to delete and change commands.

DECUS No. 8-66 (Continued)

In addition, the overflow detection routine is now foolproof and results in a HALT.

Storage Requirement: Editor: <Ø, 1502>
Modifications: <1462, 1502>
<6376, 7177>
DECtape Routines: <7200, 7577>

Minimum Hardware: PDP-8 with EAE, ASR-33, DECtape

DECUS No. 8-67

PAL Modified for DECtape Input (552)

Robin B. Wadleigh, Johns Hopkins University, Baltimore, Maryland

This program is a modification to the Digital 8-3L-S PAL Assembly Program enabling PAL to obtain the symbolic program from DECtape (in addition to paper tape), and outputting the assembled program in the usual manner. (The symbolic program is written onto DECtape by use of the "Editor Modified for DECtape" Program.) This modification also makes it possible to assemble sections or commands from the keyboard with those from DECtape. The resulting assembly is limited in speed mainly by the punching of the assembled program during Pass 2; and Pass 1 is speeded considerably. Also included is a tabulator interpreter, providing Pass 3 listings in tabulated format.

Storage Requirement: PAL III: <Ø, 3561> plus symbol table
Modifications: <6555, 7177>
DECtape Routines: <7200, 7577>

Minimum Hardware: PDP-8 with EAE, ASR-33, DECtape

DECUS No. 8-68a

LABEL for PDP-8

Michael S. Wolfberg, Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pennsylvania

The LABEL Program punches labels for paper tapes on the Teletype punch. When a key on the Teletype keyboard is depressed, no echo is performed, but a few characters of tape are punched which form the outline of the character associated with the key. Outlines are punched for all characters whose code is between 240 and 337.

Storage Requirement: Locations 200-677 of any memory field. 400-677 of Readable Punch.

Note: See DECUS No. 8-106

DECUS No. 5/8-69

LESQ29 and LESQ11

Michael W. King, Phillips Petroleum Company, Idaho Falls, Idaho

The purpose of the program is to fit the best sequences of parabolas to a given 400 point data curve in order to remove extraneous noise; rather than rely on a single 400 point parabola least squares fit to approximate a given data curve. Approximately 400 individual parabolas are computed as follows.

LESQ29

Data values 1 through 29 are subjected to a second order Least Squares fit. The median point of the resulting parabola (point #15) is then substituted for the original data value #15.*

A second parabola is then computed using data values 2 through 30. The median point of this parabola (point #16) is then substituted for point #16 of the original data curve.

This procedure is repeated until all data values have been replaced (except for the first and last 14 points which are excluded by the mechanics of the operation).

LESQ11

Process identical to LESQ29 except that an 11 rather than a 29 point smooth interval is used. First point replaced is point #6, and only the first and last 5 points are excluded from smoothing.

LESQ11 will preserve higher frequency data than LESQ29 for a given data curve with constant time between data points.

Minimum Hardware: 4K PDP-5 or PDP-8, Teletypewriter (plotter, DECtape optional)

Other Programs Needed: Floating Point Interpretive Package (Digital 8-5-S) and appropriate data handling routines.

Storage Requirement: LESQ11: 400-564; 700-716
LESQ29: 400-564; 700-751

Execution Time: (PDP-5) LESQ11: 1 minute.
LESQ29: 2.5 minutes.

Restrictions: Positive integer data <3777₈>; time between data points constant.

*See B. J. Power, R. N. Hagen, S. O. Johnson, "SPORT, A System for Processing Reactor Transient Data on the IBM-7040 Computer," pp. 4-8, AEC Research and Development Report (IDO-17078), Available from: The Clearinghouse for Federal Scientific and Technical Information, National Bureau of Standards, U. S. Department of Commerce, Springfield, Virginia.

DECUS No. 8-70

EAE Routines for FORTRAN Operating System (DEC-08-CFA3)

Russell B. Ham, U. S. Public Health Service, Winchester, Massachusetts

These are two binary patches to the FORTRAN Operating System which utilizes the Type 182 EAE hardware for single precision multiplication and normalization, replacing the software routines in FOSSIL (the operating system). The binary tape is loaded by the BIN Loader after FOSSIL has been loaded. Execution time of a Gauss-Jordan matrix inversion is reduced by approximately 30%.

Minimum Hardware: PDP-8 with Type 182 EAE

Other Programs Needed: FORTRAN Operating System
DEC-08-CFA3-PB dated March 2, 1967

DECUS No. 8-71

Perpetual Calendar

E. Singer, McGill University, Montreal, Quebec, Canada

The program is designed as a computer demonstration. When a valid date is fed into the computer, the corresponding day of the week is typed out. The program is based on the Gregorian Calendar and is limited to years between 1500 and 4095.

Minimum Hardware: PDP-8 with an ASR-33 Teletype

Storage Requirement: 20-1333

DECUS No. 8-72

Matrix Inversion, Real Numbers

A. E. Sapega, Trinity College, Hartford, Connecticut

The program inverts a matrix, up to size 12×12 , of real numbers. The algorithm used is the Gauss-Jordan method. A unit vector of appropriate size is generated internally at each stage. Following the Gauss sweep-out, the matrix is shifted in storage, another unit vector is generated and the calculation proceeds.

Minimum Hardware: PDP-8

Other Programs Needed: FORTRAN Compiler and FORTRAN Operating System

Storage Requirement: Uses all of core not used by the FORTRAN Operating System.

Execution Time: Actual computation takes less than 10 seconds. Data read-in and read-out may take up to five minutes.

DECUS No. 8-73

Matrix Inversion, Complex Numbers

A. E. Sapega, Trinity College, Hartford, Connecticut

The program inverts a matrix, up to size 6×6 of complex numbers. The algorithm used is the Gauss-Jordan method, programmed to carry out complex number calculations. A unit vector of appropriate size is generated internally. Following the Gauss sweep-out, the matrix is shifted, another unit vector is generated, and the calculation proceeds.

Other Programs Needed: FORTRAN Compiler and FORTRAN Operating System

Storage Requirement: This program uses essentially all core not used by the FORTRAN Operating System

Execution Time: Actual computation takes less than 10 seconds. Data read-in may take up to five minutes.

DECUS No. 8-74

Solution of System of Linear Equations $AX = B$, by Matrix Inversion and Vector Multiplication

A. E. Sapega, Trinity College, Hartford, Connecticut

This program solves the set of linear algebraic equations $AX = B$ by inverting matrix A using a Gauss-Jordan method. When the inverse matrix has been calculated, it is printed out. At that point, the program requests the B-vector entries. After read-in of the B-vector, the product is computed and printed out. The program then loops back to request another B-vector, allowing the system to solve many sets of B-vectors without the need to invert matrix A again. Maximum size is 8×8 .

Other Programs Needed: FORTRAN Compiler and FORTRAN Operating System

Storage Requirement: This program uses essentially all of core not used by the FORTRAN Operating System

DECUS No. 8-75

Matrix Multiplication - Including Conforming Rectangular Matrices

A. E. Sapega and Chester Sic, Trinity College, Hartford, Connecticut

This program multiplies two matrices, not necessarily square but which conform for multiplication.

Other Programs Needed: FORTRAN Operating System and FORTRAN Compiler

DECUS No. 8-76

PDP NAVIG 2/2

M. Talwani and J. Dorman, Lamont Geological Observatory, Columbia University, Palisades, New York

This program utilizes the output of the U. S. Navy's AN/SRN-9 satellite navigation receiver to obtain fixes on a PDP-8 or PDP-8/S. This program, except for some details of input and output, follows very closely NAVIG2 written for the IBM 1620 which in turn is derived from the TRIDON program written at the Applied Physics Laboratory of Johns Hopkins University for the IBM 7090.

PDP NAVIG 2/2 is written in PAL III for 4K machine with ASR-33. Floating point numbers using two 12-bit words as mantissa and one 12-bit word as exponent are employed.

Restriction: The accuracy is slightly less than that using 7 decimal digits per word.

Minimum Hardware: PDP-8 with an ASR-33.

DECUS No. 8-77

PDP-8 Dual Process System

Richard M. Merrill, Digital Equipment Corporation, Maynard, Massachusetts

The purpose of this system is to expedite the programming of multiprocessing problems on the PDP-8 and PDP-8/S. It maximizes both the input speed and the portion of real time actually used for calculations by allowing the program to run during the intervals between issuing I/O commands and the raising of the device flag to signal completion of the command. The technique also allows queuing of input data or commands so that the user need not wait while his last line is being processed, and so that each line of input may be processed as fast as possible regardless of its length. The system uses the interrupt facilities and has less than 3% overhead on the PDP-8/S (about 0.1% on the PDP-8).

This method is especially useful for a slower machine where the problem may easily be calculation limited but would, without such a system, become I/O bound.

The program may also be easily extended to handle input from an A/D converter. Here, the input would be buffered by groups of readings terminated either arbitrarily in groups of N or by zero crossings.

This program can increase the I/O to computation efficiency of some programs by 100%. It can do this even for single Teletype. Each user will probably want to tailor the program to his individual needs.

Storage Requirement: 600_g registers for two TTY's plus buffer space. (Several device configurations are possible.)

DECUS No. 8-78

Diagnose: A Versatile Trace Routine for the PDP-8 with EAE

Keith B. Oldham, North American Aviation Science Center, Thousand Oaks, California

This trace routine will track down logical errors in a program (the "sick" program). Starting at any convenient location in the "sick" program, instructions are executed, one at a time, and a record of all operations is printed out via the Teletype. To avoid tracing proven subroutines, an option is provided to omit subroutine tracing. The present routine is significantly more versatile than two other trace routines in the DECUS Library (DECUS Nos. 8-56 and 8-57) for the PDP-8 in that it is able to trace "sick" programs containing floating point, extended arithmetic and a variety of input/output instructions. Diagnose is, however, at a disadvantage compared with DECUS No. 8-56 in requiring more memory space (five pages as opposed to two); and compared with DECUS No. 8-57 in not possessing the trace-suppression features of the latter. The mode of operation of Diagnose is quite different from the other trace routines.

Minimum Hardware: PDP-8 with EAE

Other Programs Needed: Floating Point Package needed for floating point tracing. (DEC-8-5-5)

Miscellaneous: Program is Relocatable

DECUS No. 8-79

TIC-TAC-TOE (Trinity College Version)

Gunnar Walmet, Trinity College, Hartford, Connecticut

This TIC-TAC-TOE game is programmed, using internal logic, so that the computer will either win or stalemate, but not lose a game. At the termination of a game, the program restarts for the next game.

DECUS No. 8-80

Determination of Real Eigenvalues of a Real Matrix

A. E. Sapega, Trinity College, Hartford, Connecticut

This is a two-part program for determining the real eigenvalues of a real-valued matrix. The matrix does not have to be symmetric. Part I uses the power method of iterating on an eigenvector to determine the largest eigenvalue of the matrix. Part II then deflates the matrix using the results of Part I so as to produce a matrix of order one less than that solved for in Part I. Part I can then be reloaded, and the next eigenvalue in line may be calculated. In this, all the real eigenvalues may be computed in order.

DECUS No. 8-81

A BIN or RIM Format Data or Program Tape Generator

R. F. Templeman, The Physical Laboratories, The University, Manchester, England

This program enables a PDP-8 operator to generate tapes under Teletype control in RIM or PAL BIN format without formal assembly, assuming the operator knows the octal codes corresponding to each instruction. This is particularly useful when one is dealing with small programs for testing interface equipment or when making small modifications to larger programs saving reassembling time. Tapes generated using this program can be appended to existing BIN or RIM tapes and can then be loaded with the original tape into core with the appropriate loader. Another use of this program is in the preparation of data tapes in RIM or BIN format so that data can be loaded directly into PDP-8 core via the usual loaders. The program also generates leader/trailer code and a checksum under program control.

Storage Requirement: Locations 6000-6077.

DECUS No. 8-82

Library System for 580 Magnetic Tape (Preliminary Version)

G. Sharman, University of Southampton, Southampton, England

The system provides for storing program files (or other files) on the 580 Magnetic Tape with PDP-8, and recalling them at will without altering the state of the rest of the computer. In general principle, it is similar to the DECTape Library System, and the only effective storage requirement is the last page of memory.

At present, the system consists of three programs known as BOOTSTRAP 1, BOOTSTRAP 2, and the LIBRARY Routines.

BOOTSTRAP 1 is a minimal loader program which resides in the last page of memory. Its function is to rewind the tape and load BOOTSTRAP 2 into the last page, automatically transferring control to it. Bootstrap saves the area of core to be used by the system as a record on the magnetic tape, loads the LIBRARY Routines into core, and transfers control to them.

The LIBRARY Routines comprise a Directory of the files on tape, an Input-Output package, enabling communication with the Teletype, and four system programs:

LlSt	Types out the names of files in the Directory
CAIl	Transfers a file into core and exits
DUmp	Writes a file on tape, rewrites the Directory, and exits
EXit	Restores the computer to its original state, with BOOTSTRAP 1 and BIN on the last page.

The magnetic tape subroutine and some control functions are included in BOOTSTRAP 2. Each entry in the directory consists of three words: the name of the file, its first location in core, and the number of words it occupies. The capacity of the directory is 22₁₀ entries.

DECUS No. 5/8-83A & B

Octal Debugging Package (with and without Floating Point)

James Rothman, Digital Equipment Corporation, Maynard, Massachusetts

This program is an on-line debugger which will communicate with the operator through the ASR-33 Teletype. It allows register examination and modification, octal dumping, binary punching, multiple and simultaneous breakpoints, starting a program, and running at a particular location with preset AC and link. ODP is completely relocatable at the beginning of all pages except page zero, and is compatible with the PDP-5, the PDP-8, and the PDP-8/S.

Storage Requirement: The high version of ODP requires locations 7000-7577. The low version requires locations 0200-0777. All versions will require three pages. Also, location 0002 is used for a breakpoint pointer to ODP.

Minimum Hardware: The standard PDP-5, 8, or 8/S, with ASR-33 Teletype is required. A high-speed punch is optional.

DECUS No. 8-84

One-Pass PAL III

Krause and Riedl, Siemens, Erlangen, Germany

This is a modification to Digital 8-3L-5, for use on an 8K PDP-8 with ASR-33. The principle of the modification is to store the incoming characters during Pass 1 into the memory extension and taking them from there during Pass 2 and 3. Source programs must be limited to 4095 characters. This modification can save about 40% of assembly time.

Operation of the program is the same as for PAL III except that the reading of the source program for Pass 2 and 3 need not be repeated. For these passes, one simply presses CONTINUE after setting the correct switches.

Restriction: The program does not work with high-speed reader and punch.

DECUS No. 5/8-85

Set Memory Equal to Anything

Roy S. Taylor, Department of Defense, Fort George G. Meade, Maryland

This program will preset all locations to any desired settings, thus, combining a memory clear, set memory equal to HALT, etc. into a single program. The program is loaded via the switch registers into core.

DECUS No. 8-86

Obsolete

DECUS No. 8-87

XMAP

Curtis Jansky and Robert B. Brown, Communications Systems, Inc., Paramus, New Jersey

This program types out the contents of the DECTape directory on TTY keyboard. The list includes the name of the program, its initial block number, the amount of blocks used, the starting address and the location(s) of the program in core. The above restriction is only a format restriction due to the line length on the TTY unit. At present, this program is operational only with the TCØ1 control; however, the symbolic version may be modified for use with the 552 control.

Storage Requirement: 0000-1232, 6000-6577 (directory)

Restrictions: Each program on tape is assumed to occupy no more than three successive sequences of memory pages.

DECUS No. 8-88

DECTape Symbolic Format Generator

Jack Harvey, Communications Systems, Inc., Paramus, New Jersey

These are DECTape versions of the Symbolic Tape Format Generator, Digital 8-21-U, that operate under the DECTape Programming System, DECUS No. 5/8-64. They provide neat format for symbolic files generated with XEDIT, and a means to get symbolic programs out on paper. They compact a program containing extra spaces and give the number of blocks actually used in the output file. The library tape is executable on TCØ1 equipment only, but instructions are given for altering it for 552 equipment.

Minimum Hardware: PDP-8 with TCØ1 Control

Other Programs Needed: XRDCT, XWDCT, XBUFF, (DECUS No. 5/8-64)

DECUS No. 8-89

XOD: Extended Octal Debugging Program

Michael S. Wolfberg, The Moore School of Electrical Engineering, Philadelphia, Pennsylvania

XOD is an octal debugging program for a PDP-8 with extended memory which preserves the status of program interrupt system at breakpoints. The program occupies locations 6430 through 7577 of any memory field.

From the on-line Teletype, the user can examine and modify the contents of any memory location. Positive and negative block searches with a mask also may be performed.

XOD includes an elaborate breakpoint facility to help the user run sections of his program. When this facility is used, the debugger also uses locations 0005, 0006, and 0007 of every memory field. (See DECUS No. FOCAL-2)

Restrictions: The ability to punch binary tapes is not included in XOD.

DECUS No. 8-90

Histogram on Teletype

J. B. Levin, University of Arizona, Tucson, Arizona.

This routine plots histograms on the Teletype when there is no CRT display available or a means of making a permanent copy of a CRT display. Input to the routine consists of a vertical scaling factor, the size of the table to be plotted (limited only by the size of the Teletype print line), the starting address of two core areas: one containing the data to be plotted, and one for use as temporary storage by the machine.

Storage Requirement: 128₁₀ words plus tables

DECUS No. 8-91

MICRO-8: An On-Line Assembler

K. F. Kinsey, State University of New York, Geneseo, New York

M. E. Nordberg, Jr., Cornell University, Ithaca, New York

MICRO-8 is a short assembler program for the PDP-8 that translates typed mnemonic instructions into the appropriate binary code and places them in specified memory locations immediately ready to function. It processes the typed instructions by a table-lookup procedure.

It is especially useful for programs of less than one page which are to be run immediately. Only octal (not symbolic) addresses may be specified, but the user has control of the zero page and indirect addressing bits. An octal typeout routine permits examination of any memory location.

DECUS No. 8-91 (Continued)

Storage Requirement: 3200-4200
Restrictions: MICRO-8 is quite capable of modifying itself.

DECUS No. 8-92

Analysis of Pulse-Height Analyzer Test Data with a Small Computer

E. McDaniel and J. W. Woody, Jr., Oak Ridge National Laboratory, Oak Ridge, Tennessee

This PDP-8 computer program is used in the evaluation of test data for multichannel pulse-height analyzers. The program determines integral and differential nonlinearities and examines smooth spectra of radioactive decay.

DECUS No. 8-93

CHEW - Convert Any BCD to Binary - Double Precision

Louis O. Cropp, Sandia Corporation, Albuquerque, New Mexico

This subroutine converts a double precision (6-digit) unsigned-integral binary-coded decimal (BCD) number with bit values of 4, 2, 2, and 1 to its integral-positive-binary equivalent in two computer words. It is possible to change the bit values to any desired values and thereby convert any BCD number to binary.

Storage Requirement: 0109₁₀

DECUS No. 8-94A

BLACKJACK

Dennis J. Frailey, Ford Motor Company, Dearborn, Michigan

This program enables a person to play BLACKJACK with the computer. The computer acts as dealer and keeps track of bets, cards played, etc.

Storage Requirement: 0 - 3777₈

Minimum Hardware: PDP-8 with EAE

DECUS No. 8-94B

Patch for BLACKJACK

Steven L. Bard, U. S. Army Nuclear Defense Laboratory, Edgewood Arsenal, Maryland

This patch contains two overlays for BLACKJACK (DECUS No. 8-94A). The first eliminates the need for the EAE hardware, the second allows one to "double down" on any

two cards with the instruction "D" (Ø response to "HIT?" is made invalid).

Minimum Hardware: PDP-8, 8/S, or 8/I

Other Programs Needed: DECUS No. 8-94A

DECUS No. 8-95

TRACE for EAE

Eberhard Werner, Scripps Institution of Oceanography, University of California, San Diego, California

TRACE interpretively executes a PDP-8 program. At the same time a printout is provided of the contents of the program counter, the instruction, the link, accumulator, and multiplier-quotient registers, and where applicable the effective address and the contents of the effective address. This printout may be for all or a selected type of instruction within selected memory bounds. The program is capable of handling any PDP-8 instruction including IOT, two-word EAE, and interrupt instructions. TRACE cannot be destroyed by the program being traced while TRACE is in control.

Minimum Hardware: PDP-8 with Type 182 EAE, ASR-33 Teletype

Storage Requirement: 400₈ or 500₈ locations.

DECUS No. 8-96

J Bessel Function (FORTRAN)

J. A. Crawford, Communications Systems, Inc., Paramus, New Jersey

This program computes the J Bessel Function for a given argument and order. It is a complete PDP-8 FORTRAN program that operates in a conversational mode.

Other Programs Needed: FORTRAN Compiler/Operating System

DECUS No. 8-97

GOOF

Peter Andrews and Charles Wagner, Fairchild R & D, Palo Alto, California

A one-page program which allows insertion of instruction (xxxx) in location (nnnn) by means of the TTY keyboard. A feature of automatically incrementing the current address permits rapid insertion of blocks of data or instructions. Typing "RUB-OUT" reinitializes the program.

Storage Requirement: 175₈ locations (1 page)

DECUS No. 8-98

3D DRAW for the 338

Barry Wessler

This program is a demonstration of the capabilities of the 338 system. The program allows the user to sketch three dimensional objects on the scope and rotate them in real time.

Minimum Hardware: PDP-8 with 338 Display

DECUS No. 8-99A

Kaleidoscope

The program creates pictures on the PDP-8 or PDP-8/S with 34D Display. They are varied by manipulating the sense switches (within the range 0000 - 0007). The program was submitted without comments by an anonymous donor.

DECUS No. 8-99B

Kaleidoscope - 338

Michael S. Wolfberg, Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pennsylvania

The program creates varied pictures by manipulating the buttons of the 338 Display pushbutton bank.

Storage Requirement: 200₈ - 274₈

DECUS No. 8-100

Double Precision Binary Coded Decimal Arithmetic Package

Richard M. Merrill, Digital Equipment Corporation, Maynard, Massachusetts

Consists of the following routines:

BCDADD - The single precision BCD addition routine is the basic component of the BCD arithmetic package. This routine functions simply by masking out and adding together corresponding BCD digits (i.e., four bits) and checking for carry (i.e., when the sum of two four-bit numbers is greater than 9 (1001)).

MPYBCD - This routine multiplies a single precision (three digit) number times a double precision one to produce another double precision number. Overflow is indicated in the link; the arguments are not affected.

SUBBCD - One double precision BCD number is subtracted from a second by this routine. It uses a 9's complement routine and the double precision add routine.

DOLOUT - Special formats: ("XXXX.YY "). ("XXXXXX "); (3 nonprinting data codes); ("XXX ").

DECUS No. 8-101

Symbolic Editor with View (338)

Barry Wessler

This program is an extended version of the standard PDP-8 Symbolic Editor (high-speed I/O) program. One extra command has been added, "V", which takes the lines specified by the arguments and displays them on the CRT (338). The program, otherwise, operates in the same way as the Editor. The following pushbutton options are provided:

- Ø: Count Up Scale
- 1: Count Down Scale
- 2: Count Up Intensity
- 3: Count Down Intensity

Minimum Hardware: 8K PDP-8, 338 CRT, and VC-38 character generator.

DECUS No. 8-102a

A LISP Interpreter for the PDP-8

Dr. G. van der Mey and Dr. W. L. van der Poel, Technical University of Delft, The Netherlands

LISP is a programming language for list manipulation. The system is particularly suitable for conversational use and teaching. There are very few restrictions to the language apart from the total storage space. More than half of the storage is used as list space.

Minimum Hardware: 4K PDP-8 and ASR-33

DECUS No. 8-103A

Four Word Floating Point Function Package

D. A. Dalby, Bedford Insitute of Oceanography, Dartmouth, Nova Scotia, Canada

This program package, written for use with Digital's Four Word Floating Point Package (DEC-08-FMHA-PB), includes subroutines to evaluate square, square root, sine cosine, arctangent, natural logarithm, and exponential functions.

DECUS No. 8-103B

Four Word Floating Point Rudimentary Calculator

D. E. Wells, Bedford Insitute of Oceanography, Dartmouth, Nova Scotia, Canada

This is a minimum space program to perform calculations with the 10.5 decimal place precision of Digital's Four Word Floating Point Package (DEC-08-FMHA-PB), and uses the Four Word Floating Point Function Package (DECUS No. 8-103A). Operations are performed in the sequence in which they are entered. One storage register is provided. Up to five user-defined operation routines may be called.

DECUS No. 8-103C

Four Word Floating Point Output Controller with Rounding

C. K. Ross, Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada

This subprogram is almost identical to the output controller for the Three Word Floating Point Package (Digital 8-5-S) with the rounding addition (DECUS No. 8-44) except that the Four Word Floating Point Package (DEC-08-FMHA-PB) is used.

DECUS No. 8-103D

Additional Instructions for use with Four Word Floating Point Package

C. K. Ross, Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada

These subroutines allow the Four Word Floating Point Interpreter to perform the operations: read a floating point number, skip positive floating point accumulator, skip zero floating point accumulator, no operation, unconditional jump, negate floating point accumulator, and halt. The two skip instructions and the jump instruction allow forward or backward jumping up to 15 locations from the location of the instruction.

DECUS No. 8-104

Card Reader Subroutine for the PDP-8 FORTRAN Compiler

Steven Sullivan, Oregon State University, Corvallis, Oregon

Modifications and additions which allow the PDP-8 FORTRAN Compiler to read source programs from cards. The standard FORTRAN card format is used with only minor modifications.

Minimum Hardware: 8K PDP-8 and a Type CRO1-C Card Reader

DECUS No. 8-105

D-BUG

F. K. Williamson, Solartron Electronic Group Ltd., Farnborough, Hampshire, England

D-BUG is an aid used in debugging PDP-8 programs by facilitating communication with the program being run. Communication between operator and program is via the ASR-33 Teletype. D-BUG is similar to DEC's program ODT II (DEC-08-COAI-PB); however, it uses the DEC Floating Point Interpreter (Digital 8-5-S).

Two modes of operation are possible, fixed and floating point. D-BUG features include register examination and modification, control transfer, octal dumping, and instruction trap-outs to D-BUG control. Registers containing floating

point numbers may also be examined, and break-traps can be inserted in floating point programs.

DECUS No. 8-106

Readable Punch

A. M. Lane-Nott, Letchworth College of Technology, England

This program enables the user to type a character on the keyboard and produce the character in readable form on paper tape. The program uses the high-speed punch. The readable characters on tape are produced by means of a table which contains the format of a 6 x 5 matrix using three words of storage per character to be punched. In addition, channel 8 is punched throughout. The program is terminated by typing a carriage return which generates 6 inches of tape. (Reference DECUS No. 8-68a).

DECUS No. 8-107

CHESSBOARD Display on the 338

Michael S. Wolfberg, Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pennsylvania

This program displays a chessboard on the screen of a DEC 338 Display with all thirty-two chessmen set up on their initial board positions. There is no provision to move them about the board; it is just a demonstration picture.

Storage Requirement: 03000 - 04230g

Minimum Hardware: PDP-8 with 338 Display

DECUS No. 8-108

INCMOD: Increment Mode Compiler (338)

Michael S. Wolfberg, Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pennsylvania

The INCMOD program for the DEC 338 Display allows the user to build a display subroutine composed of increments only. The user inputs information by pointing with the light pen. The program displays the figure he is constructing in each of the four available scale settings. The program is of value as a demonstration and may be of help for maintenance purposes. It occupies locations 00000-01231 and builds the increment mode display file beginning at location 01232.

Storage Requirement: 0000-1231g

Minimum Hardware: PDP-8 with 338 Display

DECUS No. 8-109

SEETXT Subroutine (338)

Michael S. Wolfberg, Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pennsylvania

SEETXT is a subroutine for the DEC 338 Display which can be called instead of the normal timeout subroutine. In addition to typing, it displays all printed characters on the screen corresponding to the last twenty lines which have been typed out.

The program includes the option of suppressing the typing so that output can occur at a much higher rate than ten characters per second. The user has the option of controlling the length of a delay loop in the subroutine so that output rate may range from nearly immediate to Teletype rate.

The maximum number of lines displayed, the scale, and intensity may be altered at any time. There is also the option of clearing the screen or displaying a blinking marker at the current typing position.

Minimum Hardware: PDP-8 with 338 Display

DECUS No. 8-110

DIREC: Directory Print

Michael S. Wolfberg, Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pennsylvania

DIREC is a system program to be used with the PDP-8 Disk Monitor System. The program lists an index of the file directory for the disk on the on-line Teletype. The user has the option of seeing the index to system files or user files, or both.

DIREC can also be used in conjunction with the SEETXT Subroutine for the 338 Display to obtain a listing of the directory on the display screen.

Other Programs Needed: Disk Monitor System

Minimum Hardware: PDP-8 with Disk

DECUS No. 8-111

DISKLOOK

Michael S. Wolfberg, Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pennsylvania

DISKLOOK is a small utility program for a PDP-8 with a 32K DF32 Disk. Using the on-line Teletype, the user may examine and alter any location (in octal) on the disk. Masked searches are also available.

Minimum Hardware: PDP-8 with 32K DF32 Disk

Storage Requirement: 200 - 777_g

DECUS No. 8-112

Sentence Generator

D. Dymont, Digital Equipment of Canada Ltd., Carleton Place, Ontario, Canada

This program generates random English language sentences, using a dictionary (provided by the user) of ten basic word groups (A - J). The dictionary is used in conjunction with a random number generator and a syntactical algorithm to provide an output of randomly constructed English language sentences.

The program is an excellent vehicle for computer demonstration purposes. It may also be used in English teaching programs to aid students in perceiving sentence structure and errors in the use of words.

DECUS No. 8-113

Conversion of Frieden (EIA) to ASCII

John F. Puterbaugh, Continental Aviation and Engineering Corporation, Toledo, Ohio

This program will translate tapes prepared on a Friden Flexowriter (EIA) into ASCII for direct assembly, further editing, or feeding into the FORTRAN program. Alphabetic characters may be in either upper or lower case. The program uses a table lookup and comparison with the negative complement of the EIA character, then outputs the corresponding ASCII character.

Note: This is not Frieden FIO-DEC.

Storage Requirement: 213_g including 2 autoindex registers

DECUS No. 8-114

Rounded Decimal Output Modification for PDP-8 FORTRAN

G. R. Hervey, University of Leeds, England

The program loads over the PDP-8 FORTRAN Operating System (DEC-08-AFA3-PB) and provides output in conventional decimal form: rounded, aligned, and with plus sign, leading zeros (other than one, in the case of fractional numbers), and trailing decimal point replaced by spaces. The FORTRAN trigonometrical routines are over-written. The source program must begin with two statements assigning integer variables representing, respectively, the numbers of digits required to the right of the decimal point, and the total number of digits (these can be reassigned, by program or manually). Output is called in the normal way, i.e. by TYPE statements referring to FORMAT statements containing the symbol E. If output of a number is not possible in the format requested, the decimal point is shifted to the right in the field; if formatted output is still impossible, or if zero or negative total digits were requested, output reverts to "E" format.

Restrictions: FORTRAN source language programs must begin with two special statements defining format required.

DECUS No. 8-115a

Double Precision Integer Interpretive Package

Roger E. Anderson, Lawrence Radiation Laboratory,
Livermore, California

This program is similar in operation to the Floating Point Package (Digital 8-5-5). It consists of addition, subtraction, multiplication, division, load, store, jump and branch sub-routines coupled to an interpreter. It allows direct and indirect addressing in the normal assembly language manner. The operation is faster and more compact than the collected individual double precision subroutines.

Minimum Hardware: PDP-8, 8/S, or 8/I.

Storage Requirement: 14 words in page 0 and an additional 2 pages of memory

DECUS No. 8-116

PDP-8 Automatic Magnetic Tape Control (Type 57A) Library System

Robert E. McCullough and Jeffery B. Pearce, Laboratory for Atmospheric and Space Physics, University of Colorado, Boulder, Colorado

The PDP-8 Automatic Magnetic Tape Control (Type 57A) Library System is a series of bootstrap programs which load library programs into memory from an IBM-compatible magnetic tape read using a Type 57A Automatic Magnetic Tape Control. A program is selected by entering the appropriate code number into the switch register on the computer console.

A copy of the IBM-compatible library tape may be obtained by sending a 1/2" magnetic tape to the author.

DECUS No. 8-117

A PDP-8 Interface for a Charged-Particle Nuclear Physics Experiment

W. R. Burrus, E. Madden, C. O. McNew, and R. W. Peelle

Documentation (only) describing an interface constructed to use a PDP-8 computer with a charged-particle detector system employing three solid-state detectors and flight-time analysis. Up to 48 bits from each randomly-occurring event are transferred through the data (break) channel to a hardware-selected buffer region in the core of a PDP-8 computer. Designed for use as a magnetic tape analyzer for the most complex cases, the system assumes that the 48 bits originate in flag bits set by fast logic and in (presently four) amplitude digitizers, all of which are assumed to contain information for the same event. The system includes some limited capability for controlling the course of the experiment, and provides for read-out through the computer of a series of external fast counters. The report summarizes the design concepts, shows schematic flow diagrams, defines the computer in-

DECUS No. 8-117 (Continued)

structions associated with the interface system, and gives simple model programs to illustrate methods of applications.

DECUS No. 8-118

General Linear Regression

Ian E. Bush, Medical College of Virginia, Richmond, Virginia

The major section of this program is the "Main Arithmetic IX" which consists of four initializing statements; an input section; a weighting section; a section which cumulates means, sums of squares, etc.; a section which calculates the relevant regression coefficients, etc.; and a sections which calculates confidence limits as variances.

The section which calculates the relevant regression coefficients allows for both cases of linear regression, and in the computation of standard error of the intercept, uses (N-2) degrees of freedom to provide a better estimate for small values of N while providing negligible differences from conventional calculation when N is larger.

The section which calculates confidence limits as variances provides a calculation of the variance of the error of the estimate of the dependent variable again using (N-2) degrees of freedom for the general case. This calculation is fully corrected for both random variance within the tested population of data and for the difference between the independent variable and the mean of the independent variable for the population of data.

DECUS No. 8-119

Off-Line TIC-TAC-TOE (PAL)

Dave Hawkins, Foxboro Company, Foxboro, Massachusetts

TIC-TAC-TOE is a self-learning program which will improve its game as it plays. Whenever its human opponent wins, the program changes its strategy such that it can never be beaten again in the same way. Thus, the program gains "experience" every time it loses. The program will punch its experience on paper tape in binary format on request. This experience tape can be reread by the program at any time and will reset the program to the level of experience it had when the tape was punched. The program will notify the operator if any error is made in reading the experience tape and gets very upset if the player tries to cheat.

Storage Requirement: locations 10-4000 (approximately) and will operate with low or high speed tape input/output equipment

Minimum Hardware: PDP-8, ASR-33, or high-speed reader and punch

DECUS No. 8-120

Disk/DECtape FAILSAFE

Charles Conley, Digital Equipment Corporation, Maynard, Massachusetts

This program will punch the contents of the disk (or DECtape) onto paper tape which can be loaded back onto the disk using the same program. The paper tape is punched in 200g word blocks in binary format, with a checksum for each block. FAILSAFE simplifies and speeds the process of re-building the Disk System Monitor after running disk tests.

Minimum Hardware: PDP-8, 8/S, 8/I, with 32K
Disk or DECtape

DECUS No. 8-121

DECtape Handler (552 Control)

B. Eiben, III Physikalisches Institut der T. H. Aachen, Aachen, West Germany

This program allows quick, controlled data-block transfers between the PDP-8 and DECtape. It reads, writes and searches in minimum time (interrupt mode), requires minimum space (overlay with last page BIN, RIM, DECSYS Loaders) and occupies only two blocks on tape (block 0 = System, block 1 = Return-System). It is protected against destruction and gives, after the transfer, the status levels for testing purposes. It is usable as a Switch Register controlled program or as a subroutine with or without interrupt, giving the possibility of quick data storage, program shuffling and overlay technique with PDP-8 and DECtape.

Minimum Hardware: PDP-8, DECtape 552 Control

DECUS No. 8-122A

SNAP: Simplified Numerical Analysis Program (Without EAE)

Developed at Harvard Medical School, Boston, Massachusetts, under an NIH grant.

SNAP is a computer language for real-time interactive computation which can be learned in less than one hour. It is particularly useful in teaching programming to beginners.

A unique feature of SNAP is its ability to interact on-line with other laboratory instruments. SNAP can accept electrical inputs directly and can read inputs from a real-time clock. Both of these functions are incorporated in a single SNAP instruction.

Another feature particularly useful for biological problems is Table Instructions. A list of 100 numbers may be entered from the keyboard or from punched paper tape.

DECUS No. 8-122B

SNAP: Simplified Numerical Analysis Program (With EAE)

See DECUS No. 8-122 for Abstract.

DECUS No. 8-123

UNIDEC Assembler

C. Stephen Carr, University of Utah, Salt Lake City, Utah

The UNIDEC Assembler runs on the Univac 1108 and passes assembled PDP-8 code over the electronic link between the 1108 and PDP-8. The source statements are punched on cards for input into the 1108 in a format nearly identical to that of MACRO-8. A printed listing and object code are produced as fast as the cards can be read.

Note: Source deck and documentation only available.

DECUS No. 8-124

PDP-8 Assembler for IBM 360/50 and above

V. Michael Powers, University of Michigan, Ann Arbor, Michigan

The 360/PDP-8 Assembler is a collection of programs written mostly in FORTRAN IV (G) which operates on the IBM 360/50 and above. It assembles programs for PDP-5 and PDP-8 computers. Once a program has been assembled, it may be punched on cards, saved in a file, or transmitted through the Data Concentrator over data lines. It is also possible to obtain binary paper tapes by use of the Data Concentrator.

The Assembler follows the PAL III operation code and addressing conventions. The input format and program listing conventions are slightly different from those of PAL III, because it is organized around a line format, while PAL III is organized around a paper tape format.

Note: Source deck and documentation only available.

DECUS No. 8-125

PDP-8 Relocatable Assembler for IBM 360/50 and above

D. L. Mills and V. Michael Powers, University of Michigan, Ann Arbor, Michigan

The documentation available describes a method for segmenting PDP-8 programs for the purpose of facilitating program maintenance and residence in MTS (Michigan Terminal System) files. The method provides for program storage on a page-relocatable basis with relocation information contiguous to but not necessarily integral with text information. Linkages between separately assembled program segments are provided in a form very similar to those used in IBM System/360 systems.

DECUS No. 8-125 (Continued)

Currently available utilities within MTS provides assembly and link-editing facilities, using programs stored either as punched card decks or in MTS files. Utilities are also included for the purpose of paper tape transcription either in PAL-compatible format or in a special format useful for dynamic loading via a data link to a remote machine. In addition to these MTS utilities, two relocating PDP-8 loaders are available which operate using the special dynamic-loading format. Each of these programs occupies one dedicated page of PDP-8 memory and operates in a multicore-bank environment. One of these programs is designed to operate as a stand-alone utility, while the other is designed to operate within the RAMP system.

DECUS No. 5/8-126

Cumulative Gaussian Distribution Curve Fitting

Gerald E. Zajac

Submitted by: Howard A. Sholl, University of Connecticut, Storrs, Connecticut

This a curve fitting program that will take a set of any number of points with any spacing describing a cumulative Gaussian distribution and determine the mean and standard deviation by an iterative least squares differential-correction technique. The mean square error of the final fitted curve is also computed.

Other Programs Needed: FORTRAN Compiler and Operating System

Source Language: PDP-5/8 FORTRAN

DECUS No. 8-127

XDDT: Extended Octal-Symbolic Debugging Program

Michael S. Wolfberg, Robb N. Russell, Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pennsylvania

XDDT is an octal-symbolic debugging program for extended memory which preserves the status of the program interrupt system at breakpoints. It is the result of merging the features of the DDT-UP (DECUS No. 8-19a) and XOD (DECUS No. 8-89) debugging programs, and it includes many improvements over its predecessors.

From the Teletype, the user can symbolically examine and modify the contents of any memory location in a variety of formats. Positive and negative block searches with a mask may also be performed.

XDDT includes an elaborate single-breakpoint facility to help the user run sections of his program.

The ability to punch binary tapes is not included in XDDT.

DECUS No. 8-127 (Continued)

Minimum Hardware: Basic PDP-8, but recommended for 8K or more

Source Language: PDPMAP (DECUS No. 8-166)

Storage Requirement: With initial symbol table, 4200-7577 of any memory field.

DECUS No. 8-128

PDP-8 Oscilloscope Display of Mathematical Functions

A. E. Sapega and S. G. Wellcome, Trinity College, Hartford, Connecticut

This is a general-purpose FORTRAN program for oscilloscope display of single-valued functions, $y = f(x)$. The FORTRAN statement of the function can be changed by the user so as to display specific functions of interest to the user. The user must specify a range for the independent variable. Scaling of the function for an appropriate display is carried out automatically by the program. The user may then interrupt the display to respecify the range of either independent or dependent variable. The display will be flicker free on a conventional (nonstore) oscilloscope.

Minimum Hardware: 4K PDP-8, Type 34D Display Unit

Other Programs Needed: FORTRAN compiler and operating system, PAL Assembler

Source Language: FORTRAN (main program), PAL (subroutine)

DECUS No. 8-129

PDP-8/57A Magnetic Tape Program Library System

Donald C. Uber, Lawrence Radiation Laboratory, University of California, Livermore, California

Programs may be written on and called off IBM-compatible tape by name from the Teletype. BIN and RIM loaders may also be called in from the Teletype. Only the last page of core is used. Library programs may be corrected, modified, or added to at any time. When called in, programs may be relocated in core. It is possible to subdivide programs as they are written on tape and then individually relocate each portion as it is loaded in.

Minimum Hardware: Standard PDP-8, 57A Tape Control

Source Language: MACRO-8

Storage Requirement: 7600-7777

DECUS No. 8-130A

REBIL8: Relocating Binary Tape Loader for the PDP-8/S

R. F. LaFontaine, C.S.I.R.O., University of Melbourne, Victoria, Australia

Sections of the DEC-08-LBAA-LA Binary Loader have been rewritten to extend its duties to loading of suitably prepared relocatable binary program tapes as well as address and data modifications. Requirements are the same as the standard DEC loader, and REBIL8 will load standard DEC binary tapes.

Minimum Hardware: PDP-8/S and ASR-33

Source Language: MACRO-8

DECUS No. 8-130B

RELCON: Binary to Relocatable Binary Tape Converter

R. F. LaFontaine, C.S.I.R.O., University of Melbourne, Victoria, Australia

RELCON is used to tag data, used by memory reference instructions for indirect addressing, with the Data Modification Mark (376 Code). It may also be used to adjust addresses so that the relocatable version begins loading memory at page 0 if no address modification is specified. This does not mean that the program will operate in this area of memory but serves to simplify address specification at load time.

DECUS No. 8-131

SRCD: Software Rapid Character Display

David M. Kristol, Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pennsylvania

SRCD (Software Rapid Character Display) is not a program but a method for quick display of a maximum number of text characters. A listing of increment-mode command words is supplied for the sixty-four characters on the Teletype keyboard. Each character is drawn within a 5 x 7 dot matrix followed by two blank points to provide spacing. It is mostly useful for displaying buffers of text, such as for editing programs or in utilization of the display as a satellite processor in time-sharing systems. In these applications, the PDP-8 is frequently sitting in a loop, "listening" for keyboard characters, or simply doing nothing. With SRCD, the main frame is constantly engaged in background work, helping to display characters, and I/O is handled by interrupt servicing routines.

DECUS No. 8-132

STRIP: A Data Display & Analysis Program for the PDP-8, 8/1

John C. Alderman, Jr. Georgia Institute of Technology, Atlanta, Georgia

This program accepts paper tape data listings and displays the result on the display unit. Some elementary computations are made on the data and are also displayed. The program is deliberately designed to be open ended, and most users will want to add features peculiar to their own problem. Almost all functions are carried out in subroutine form, and these subroutines can be called either from the keyboard or within another subroutine.

DECUS No. 8-133

First Order Kinetics

Kenneth B. Wiberg, Yale University, New Haven, Connecticut

First order kinetic processes are common in chemistry and in other areas. This program accepts up to 42 data points, calculates the rate constant and intercept by the method of least squares, and gives the rms deviation, the correlation coefficient, and an estimate of the error in slope. It permits graphical (CRT) examination of deviations from the least squares line and iteration to a "best" infinity value. It also provides options for plotting the deviation between observed and calculated quantities on a CRT and may be used in other cases in which one wishes to correlate the natural logarithm of one quantity with another, as in linear free energy relationships.

Source Language: MACRO-8

Storage Requirement: The program occupies essentially all of core.

DECUS No. 8-134

LSQ: Least Squares Subroutine

Kenneth B. Wiberg, Yale University, New Haven, Connecticut

The subroutine calculates the slope and intercept for the equation $y_i = mx_i + b$ by the method of least squares. It also returns the rms deviation of y , the correlation coefficient and an estimate of the error in the slope. The calculated values of y and the differences between the given and calculated values are also available on return from the subroutine.

Other Programs Needed: FLOAT, floating point interpreter "C" - (Digital 08-YQYA)

Source Language: MACRO-8

Storage Requirement: 1.5 pages plus page 0 locations

DECUS No. 8-135

DNHELP: Directory Assistor Program

David M. Kristol, Moore School of Electrical Engineering,
University of Pennsylvania, Philadelphia, Pennsylvania

DNHELP is a four-page disk utility program that may reside in core with DIREC (DECUS No. 8-110) and DISKLOOK (DECUS No. 8-111). It is designed to assist programmers in investigating the contents of the DN and SAM blocks on the disk under the DEC Disk Monitor System.

Minimum Hardware: PDP-8 with DF-32 Disk, or
TCØ1 DECTape.

Other Programs Needed: System Monitor Head [DEC
Disk (Tape)Monitor System]
and SYSIO.

Storage Requirement: 5000-5777, Buffer from
7400-7577

DECUS No. 8-136

Fourier Transform Program in FORTRAN II

W. D. Strecker, Carnegie-Mellon University, Pittsburgh,
Pennsylvania

The program, written in PDP-8 FORTRAN II, performs the discrete Fourier Transform of a function defined over $N(N \leq 200)$ evenly spaced points. I/O is via the ASR-33. The program requests the number of function points, then that number of function values, and then prints out the values of the sine and cosine components of the function at each defined harmonic. A conventional (not Cooley-Tukey) algorithm is used since I/O time relative to computing time is significant.

DECUS No. 8-137

Programs for Storage, Manipulation and Calculation of Data Using DECTape

D. Eugene Hokanson, Veterans Administration Hospital,
Seattle, Washington

These programs use DECTape for the storage of data files. Once data has been stored on DECTape, the statistical or calculation programs will operate on particular parts of it selected by the user. All programs are conversant. They ask questions regarding execution and accept answers via the Teletype.

DATRIT is a program to write data on DECTape directly from the ASR-33. Numerical data is stored on DECTape in floating point format.

EDATA is a program to edit data files created on DECTape by DATRIT.

DECUS No. 8-137 (Continued)

SDT is a program to calculate Mean and Standard Deviation from data files stored on DECTape.

FORT calculates an analysis of variance table similar to DECUS No. 5/8-9 using data files stored on DECTape.

COVAR calculates the necessary values for an analysis of covariance from data files stored on DECTape. The paired input consists of matching files of x and y data.

LCOVAR is a semi-logarithmic version of COVAR. y values are converted to log y before calculation so that each "Y" in the output format means log y. This program is useful for semi-logarithmic regression analysis.

TPAIR performs a paired T test on data files stored on DECTape. The input consists of paired files x and y data.

BCALC enables the user to do calculations using data files on DECTape as variables in the calculation. Results of calculation are stored on DECTape. BCALC is a master program for handling the data files. The user must supply a floating point program, which is called by BCALC as a subroutine, for each specific calculation.

LCALC enables the user to do calculations from data stored on DECTape using specific lines of a file as variables in the calculation. The result of the calculation may be stored on one line of the same file or a different file. LCALC is similar to BCALC.

SUBS is a package of four subroutines used by most of these programs. SUBS contains six pointers on page zero and subroutines in the area from 4000 to 7577.

These subroutines are:

MESSAGE	Type packed text
UNFLOAT	Unfloat floating point numbers
RWTAPE	Read and write DECTape
FPOINT	Floating point output controller

FLEX is an extended version of Floating Point which lacks the Output Controller. It is used to overlay the FPOINT section of SUBS in the programs which use extended Floating Point.

DECUS No. 8-138

PAL III.5

James C. Kilbane, Belmont, Massachusetts

PAL III.5 features several mods making pass 3 output more legible. The line number feature makes subsequent editing significantly easier. With the exception of SR Bit 2, normal operating instructions apply. The tapes are complete (not an overlay to PAL III).

DECUS No. 8-139

Editor

James C. Kilbane, Belmont, Massachusetts

This editor is a program which adheres fairly closely to DEC traditions in the area of text editors with major exceptions, such as line numbers, line specification, buffer capacity, and availability.

Storage Requirement: $\emptyset_8 - 25\emptyset_7_8$

DECUS No. 8-140

Binary Tape Consolidator

James C. Kilbane, Belmont, Massachusetts

The Binary Tape Consolidator is an extremely useful system-generation tool. It will make a single tape from any number of smaller ones and may be used for duplicating tapes.

DECUS No. 8-141

SYSLUK

David M. Kristol, Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pennsylvania

SYSLUK is a four-page utility program for examining and modifying blocks on the system I/O device, i.e., DF32 Disk or TC01 DECTape. Its operation is independent of which monitor head is resident, provided either is there. The user has the facility to examine and modify locations and to perform masked searches.

Minimum Hardware: PDP-8 with DF32 Disk or TC01 DECTape

Other Programs Needed: SYSIO - "system device" routine for DEC Disk (Tape) Monitor System

Source Language: MACRO-8

Storage Requirement: 200-1177 (buffer from 7377-7577)

DECUS No. 8-142

Binary Punch - Extended Memory

W. L. Lord, Argonne National Laboratory, Argonne, Illinois

This program is a revision of Digital 8-5-U Binary Punch which allows for extended memory. Tapes produced may be loaded by Digital 8-2-U Binary Loader.

Source Language: MACRO-8

Storage Requirement: 7600-7730

DECUS No. 8-143

FFTS-R: Fast Fourier Transform Subroutine for Real Valued Functions

James E. Rothman, Digital Equipment Corporation, Maynard, Massachusetts

This subroutine computes the Fast Fourier Transform (FFT) or its inverse of a data sequence which has been stored in core. It will accommodate up to 2048 time samples and will transform that number in under 5 seconds.

Minimum Hardware: PDP-8 or 8/1 with EAE

Source Language: PAL

Storage Requirement: 3-7, 20-107, 400-6401

DECUS No. 8-144

FFTS-C: Fast Fourier Transform Subroutine for Complex Data

James E. Rothman, Digital Equipment Corporation, Maynard, Massachusetts

FFTS-C enables computation of the Discrete Fourier Transformation in a minimum amount of time. By using the Cooley-Tukey algorithm, up to 1024 points may be transformed in only 4.5 seconds, introducing a reduction of 99 percent in computation time.

Minimum Hardware: PDP-8 or PDP-8/1

Source Language: PAL III

Storage Requirement: 3-7, 20-55, 400-5777

DECUS No. 8-145

A Time-of-Flight Analyzer Based on a Small On-Line Computer

H. J. Metzdorf, CCR-Euratom, Ispra/Varese, Italy

This program enables the computer to interact with the TOF-converter and to generate spectrum displays on an oscilloscope. The TOF Converter provides the computer with digital information about the time a neutron takes to travel from the scattering sample to a detector (up to 12 detectors can be accommodated) and which detector was involved.

The TOF analyzer for which this program was written is in use with a double chopper facility installed at the ISPRA-1 reactor. It consists of a PDP-8 on-line computer with 4K memory, the automatic restart option, and a display unit; a TOF Converter; and conventional counting electronics.

DECUS No. 8-146

High Speed Interrupt Executive

R. L. Steel, University of Saskatchewan, Saskatoon, Saskatchewan, Canada

These routines are designed to handle the priority scheduling of up to 12 interruptable devices. Each I/O device is assigned a priority level, and upon receipt of an interrupt from that device, execution of its routine is initiated. If the priority of an I/O device "x" is less than that of an I/O device "y" which is currently being serviced, device "x" will be queued until "y" has been serviced. These routines allow a user to prohibit interrupts on any (or all) levels.

Minimum Hardware: PDP-8 with EAE
Source Language: MACRO-8
Storage Requirement: Three memory pages

DECUS No. 8-147

Incremental Plotter Printout Subroutines

Michael P. Stryker and Phillip J. Best, University of Michigan, Ann Arbor, Michigan

A group of subroutines providing character-output facilities for the incremental plotter is presented as a package. Virtually all the ASCII characters may be printed in any of 8 formats and 63 sizes. One routine sets a control code to determine the size and orientation of the characters and the direction the line is to run, another prints out a string of characters according to this code, a third prints just one character held in AC 6-11, and a fourth routine prints the signed decimal equivalent of the contents of the accumulator.

Minimum Hardware: PDP-8, Type 350 Plotter and Control
Other Programs Needed: Digital 8-12-U "Incremental Plotter Subroutine"
Storage Requirement: Five memory pages (1177 locations)

DECUS No. 8-148

Plotter System

Bruce J. Biavati, Computer Applications, Inc., New York, New York

This is a generalized plotting system for the CalComp Plotter allowing "plot time" modification of the data. The main program tape accepts all plotting commands and data from the Teletype. Patch tape #1 modifies the system to a high-speed reader. Patch tape #2 modifies all input through the high-speed reader.

DECUS No. 8-148 (Continued)

Minimum Hardware: PDP-8, CalComp Plotter, and High-Speed Reader
Source Language: MACRO-8
Storage Requirement: 4K

DECUS No. 8-149

Core Window

Donald C. Uber, Lawrence Radiation Laboratory, University of California, Livermore, California

The 34D Scope displays the octal contents of any 64 consecutive core locations, beginning at the address set in the Switch Register and Data Field switches (if Extended Memory is used). There are 16 lines, each with an address plus four memory words. A special character generator program refreshes the display 11 times per second.

Minimum Hardware: PDP-8, 34D Scope
Source Language: MACRO-8
Storage Requirement: 15; 7240g-7573g

DECUS No. 8-150

PTOD8 High and PTOD8 Low

R. A. Gruenewald, Dr. Neher Laboratory, Netherlands Postal and Telecommunications Service, Leidschendam, Netherlands

PTOD8 (PTT Trace and Octal On-Line Debugging Program for the PDP-8), is a means to debug a running user's program. It features: register examination and modification, multiple breakpoints (traps), memory protection of a chosen block, word search (masked or not masked), tracing a running users program (gives a full printout of consequently executed instructions), is interrupt proof, and also features binary tape punching (automatic leader-trailer code and checksum).

Storage Requirement: PTOD8 requires 1343g registers
PTOD8 HIGH: 6200g - 7543g,
PTOD8 LOW: 200g - 1543g

DECUS No. 8-151

On-Line TIC-TAC-TOE

Richard B. Rothman, Groton School, Groton, Connecticut

This program plays the game of TIC-TAC-TOE with the user. By means of a previously stored algorithm, it selects the best move for any given situation. Conversation and ultimate defeat is via the Teletype.

Source Language: PAL

DECUS No. 8-152

PDP-8 Music Program

Submitted by: D. A. George
R. G. Smith and D. J. Harrison, Carleton University,
Carleton, South Carolina

The coding program allows the user to type a song on the Teletype and produce a coded binary tape of that song. It accepts musical information in a form more compatible with ordinary sheet music and converts it to a coding scheme.

The playing program plays the song "Penny Lane" via the coding program with the use of a power amplifier and speaker.

Minimum Hardware: PDP-8 with D/A Converter, power amplifier, and speaker

Source Language: PAL III

Restrictions: 6577_g notes

DECUS No. 8-153

Tape/Disk Transfer Programs

Daniel Parrish, Veterans Administration Hospital, Seattle, Washington

This series of programs was written to create and recall disk images on magnetic tape. They were written initially to facilitate rebuilding the disk system in the event of an accidental or deliberate wipe out. The usefulness of the DF-32 was significantly enhanced by the ability to store and easily recall a number of different disk images. A single reel of DECTape can hold up to five complete images, each of which occupies 400_g blocks.

Minimum Hardware: PDP-8 with DF-32 Disk and TCØ1 DECTape.

Source Language: PAL III

DECUS No. 8-154

SWAP

David M. Kristol, Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pennsylvania

Using self-contained I/O, SWAP may be employed to load the disk from or dump the disk onto DECTape. It is faster and more versatile than the Disk to DECTape FAILSAFE.

Minimum Hardware: PDP-8 with DF-32 and TCØ1 DECTape

Source Language: PDPMAP (DECUS No. 8-166)

Storage Requirement: 600_g + 4200_g buffer

DECUS No. 8-155

HEP

Dr. A. K. Head, C. S. I. R. O. , University of Melbourne, Parkville, Victoria, Australia

HEP is a program which gives calculating machine type operation and stored program operation. It is based on Floating Point Package (DEC-8-5-S-D) and Floating Point Controller (DECUS No. 8-44). Calculations have an accuracy of just over six decimal digits and printout is rounded to six decimal digits. It includes facilities for format control, program control and tests, subroutines, and an array of variables. Although it was designed mainly for quick results from small calculations, it also has facilities and space for quite large and elaborate programs. Note, HEPTRACE, DECUS No. 8-156.

Minimum Hardware: PDP-8 with Teleprinter

Storage Requirement: 0003_g - 7577_g

DECUS No. 8-156

HEPTRACE

A. K. Head, C.S.I.R.O., University of Melbourne, Parkville, Victoria, Australia

This program is used in conjunction with HEP (DECUS No. 8-155) to give trace and one shot facility during the execution of HEP programs.

DECUS No. 8-157

Square Root Patch for DEC-8-5-S

A. K. Head, C.S.I.R.O., University of Melbourne, Parkville, Victoria, Australia

This program is a patch to standard SQRT routine (DEC-8-5-S). It is a shorter and faster way of giving exact roots of exact squares.

Storage Requirement: 6656_g-6747_g

DECUS No. 8-158

AX-Ø8 Symbol Generator

D. Dyment, Digital Equipment of Canada, Ltd., Carleton Place, Ontario, Canada

This subroutine may be called to display single characters or a string of characters on the oscilloscope of an AX-Ø8 (LAB-8) system. Sixty different symbols, in addition to four special "format" codes, are provided by the routine. Software control of character scaling and "margins" on the display is provided.

Minimum Hardware: LAB-8 with oscilloscope

DECUS No. 8-158 (Continued)

Source Language: PAL
Storage Requirement: 223₁₀ locations

DECUS No. 8-159

CINET-BASIC

Bud Pembroke and David Gillette, Computer Instruction NETWORK, Salem, Oregon

This interpretive compiler was patterned after Dartmouth's BASIC. It was built by modifying DEC's FOCAL, and uses many of the same subroutines and/or methods. Error messages are given in terms of an error number and line number.

Storage Requirement: Main program locations 0000-3252 and 4600-7600 and user's code from 3252 on.
Minimum Hardware: A PDP-8 with 4K and an ASR-33

DECUS No. 8-160

FASTLOAD

Doug Dyment, Digital Equipment of Canada, Ltd., Carleton Place, Ontario, Canada

FASTLOAD is a minimal bootstrap loader for the PDP-8, requiring only eight instructions to load in the upper page of memory.

DECUS No. 8-161

EXPO: A Flexible PDP-8 Data-Acquisition Program

Bruce Arne Sherwood, California Institute of Technology, Pasadena, California

EXPO is a PDP-8 program which reads various kinds of data from experimental apparatus, optionally logs data on magnetic tape, and accumulates one - or two-dimensional histograms of selected variables. These histograms may be displayed on the Teletype or scope, simultaneously with data-acquisition. From the keyboard the user defines what variables are to be histogrammed and under what conditions; variable names are symbolic and numerical parameters are decimal. Also from the keyboard, the user may call for Teletype or scope output with some control of format. Because of its flexible user-oriented input-output, EXPO has proven to be very useful in debugging and utilizing complex apparatus in a high-energy physics experiment; it is likely to be useful in similar experimental situations in science or engineering. The write-up includes a useful general discussion of interrupt handling on the PDP-8.

Minimum Hardware: 4K PDP-8 with EAE, Magtape, Scope Display, and Plotter optional

DECUS No. 8-161 (Continued)

Source Language: LRL Assembler (DECUS No. 5-13) on cards
Storage Requirement: 0-7177 if all options used

DECUS No. 8-162

Demonstration Programs for the PDP-8

1. World War I - Snoopy (338 Display)
2. PDP-8 Music
3. Night Watchman's Clock (338 Display)
4. Matching Pennies

DECUS No. 8-163

See FOCAL Section

DECUS No. 8-164

Prime Number Determination

Richard D. Cherrington, U. K. Atomic Energy Authority, Springfield Works, Salwick, Preston, England

This program types out by successive division all previously determined primes which are less than or equal to square roots of the numbers being evaluated.

Short additional programs cause additional type out of all nonprime numbers as a product of two integers.

Other Programs Needed: Floating Point Interpretive Package (DEC-8-5-S)

Storage Requirement: 4K

DECUS No. 8-165

The PDP-8 Simulator System for Philco 212

Neal Laurance, Ford Motor Company, Dearborn, Michigan

A program has been developed which provides the facility to simulate the operation of a PDP-8 computer within a Philco 212 computer. The system includes the ability to assemble PDP-8 programs in assembly language, produce paper tapes suitable for running on a PDP-8 and to simulate the execution of a PDP-8 program completely within the Philco 212. The simulation facility should be of use to people who are anticipating the delivery of a PDP-8 computer, and who wish to do program development before its arrival. The simulator portion is written in Philco 212 assembly language (it is not 211 compatible), and the remainder of the system is written in the MAD language.

Write-up only available.

DECUS No. 8-166

The PDPMAP Assembly System

Thomas H. Johnson and Michael S. Wolfberg, Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pennsylvania

This report describes the PDPMAP Assembly System which is used to assemble symbolic programs written for a PDP-8 or DEC-338 with up to 16K memory locations. The system is implemented at the University of Pennsylvania on an IBM 7040 and DEC PDP-8 connected by a high-speed data channel (IBM 7904 and DEC DM03). The PDPMAP System uses the powerful assembler of a large computer (IBM 7040 MAP Assembler) to quickly assemble programs for a small computer.

Report only available.

DECUS No. 8-167

CIRCUITS

D. Whiteley, International Computers, Ltd., Kidsgrove, Stoke-on-Trent, Staffs., United Kingdom

CIRCUITS is a program which enables Electronic Circuits to be drawn using the DEC-338 Display system. The complete circuit can be stored on paper tape and read in for future modifications.

Minimum Hardware: A PDP-8 with 338 Display, Teletype, High-Speed Reader and Punch, and character generator

DECUS No. 8-168

CalComp Plotting Package

John W. Fitzgerald, Stanford Medical School, Stanford University, Stanford, California

This package is a series of subroutines designed to be used with the CalComp and PDP-8. The subroutines are:

- PLOTX - a modified 8-12-U, general move routine
- ALPHA - alphanumeric packed string plotting
- DLTR - an 8-bit ASCII letter drawer
- AXIS - an axis drawing routine
- NUMBER - a signed 11-bit binary number output routine
- DSYM - centered symbol drawing routine
- LINE - vector plotting routine.

This package is issued only on DECTape.

Minimum Hardware: A PDP-8 computer with DECTape 350B interface and CalComp Model 565 digital plotter with a step size of 0.01 inches.

DECUS No. 8-169

Physical Oceanography Data Reduction Programs for the PDP-8 (II)

C. K. Ross, R. Reiniger and A. B. Grant
Submitted by: Joann E. Gavan, Department of Energy, Mines & Resources, Marine Sciences Branch, Dartmouth, Nova Scotia, Canada

This system gives the capability of automating and improving handling and processing of oceanographic data at sea.

It presents an oceanographic data processing system for use at sea on a small computer with a basic configuration of 4K memory, ASR-33 Teletype, high-speed paper tape reader/punch and a 31 inch CalComp Plotter. The system was written:

- 1) to increase the speed, ease and accuracy of the data reduction at sea.
- 2) to give quality control on the original data. This allows malfunctioning instruments to be quickly detected so that appropriate action may be taken.
- 3) to calculate various parameters which are used by the oceanographer. The manual calculation of these parameters is not practical because of their complexity.
- 4) to digitize the data suitable for transfer to a larger and more powerful shore-based system.

This PDP-8 oceanographic data processing system is capable of accepting pressure, temperature, salinity, oxygen and silicate as measured parameters. It is usual to have the information necessary to calculate the pressure and temperature shortly after the completion of an oceanographic station. However, it is not possible to complete the determination of the chemistry (salinity, oxygen and silicate) until several hours later. Hence, the data input to the system is divided into two parts. The first basic input contains the information from the 'deck sheet' which is used to calculate the corrected temperatures and observed pressures. A least square polynomial is fitted to the observed pressures to give a final pressure at each sampling depth. At this point a plot of temperature vs. pressure may be obtained. To continue processing, it is necessary to have the chemistry data which constitutes the second basic input to the system. For each station the chemistry data are combined with the pressures and corrected temperatures. From these data the depth, specific volume anomaly, potential temperature and density anomalies are calculated.

Certain approximations were made in the system because of the limited core memory and to simplify the programming. However, in all cases sufficient accuracy has been retained to ensure meaningful results.

DECUS No. 8-169 (Continued)

The following routines are included:

Temperature Formatting
Additions to Floating Point Package
Pack Thermometer Calibration
Pressure Curve Fit
Final Pass
DHUN
PLOPRM
Distance and Bearing
Formatting of Chemistry
Department PLOTCO

DECUS No. 8-170

FORTRAN Source Conversion Program

Charles Conley
Submitted by: Richard Palmer, Digital Equipment Corporation,
Maynard, Massachusetts

This program will allow the user to convert FORTRAN source programs written for DEC-08-AFC1 (FORTRAN Compiler, Old Version) to the new format, FORTRAN (DEC-08-AFC1-PB).

DECUS No. 8-171

Real-Time System for Behavioral Science Experiments

Robert H. Tedford, Union Carbide, Tuxedo, New York

This program controls the operations of ten behavioral chambers using four classical experimental designs; Punishment Discrimination (PD), Nondiscriminated Avoidance (NDA), Fixed Ratio (FR), and Differential Rate of Low Response (DRL). Besides controlling the experiments, certain statistics are accumulated during the experiments for printout at the end of each test run.

Write-up only available.

Minimum Hardware: PDP-8 with an ASR-33, Requires a special interface between computer and behavioral equipment.

Storage Requirement: 4K

DECUS No. 8-172

Octal Systems Edit

Edward A. Taft III, St. Mark's School, Southboro,
Massachusetts

Octal System Edit allows advanced users to perform direct octal editing of the information on their systems device. It makes block format compatible with system blocks. All editing is via the Teletype; commands allow reading, writing, and moving blocks; listing, changing, and punching individual words in a block.

Minimum Hardware: PDP-8, 8/1, 8/S with DF-32 or TCØ1/TU55

Other Programs Needed: Disk/DECtape monitor (DEC-D8-SBAC-PB)

Source Language: PAL-D

Storage Requirement: 200g-1177_g (may be reassembled into any 4 pages)

Restrictions: Requires that Monitor Head be present in 7600_g-7777_g

DECUS No. 8-173

TIC 5/8 (Scope Version)

Jim Gillespie, Lawrence Radiation Laboratory, Berkeley,
California

TIC 5/8 plays a master game of TIC-TAC-TOE on the display scope. The program can be reset to a learning configuration by hitting two keys on the Teletype, and will begin to learn winning strategies from each game it loses until it has become a master player again. The program makes use of the program interrupt facility and makes necessary changes for a PDP-5 or PDP-8.

Minimum Hardware: PDP-5/8 family and 34D scope

Source Language: LRL PDP Assembly Language (DECUS No. 5-13)

Storage Requirement: 1-3 and 41-3000

Restrictions: Should not be copied after use. Execution time excludes use on PDP-8/S. All program interrupt flags must be cleared for use (room is provided).

DECUS No. 8-174

Medium

Lance A. Carnes

Submitted by: James A. Gillespie, Lawrence Radiation Laboratory, Berkeley, California

Medium is a demonstration program for use on the PDP-5 or PDP-8 family. Messages typed on the Teletype are displayed on the scope, advancing across the screen from right to left similar to the Times Square News Sign.

Minimum Hardware: PDP-5 or PDP-8 family with 34D or VC8/I Scope.

Source Language: LRL PDP-5 Assembly Language (DECUS No. 5-13)

Storage Requirement: 41g-1500g

DECUS No. 8-175

Post Stimulus Interval Histogram for AX-Ø8

Peter Goldstern, Digital Equipment Corporation, Anaheim, California

This program, using the Schmitt triggers, generates a post stimulus interval histogram for one channel.

Minimum Hardware: LAB-8

Other Programs Needed: LAB-8 compiler

Restrictions: Maximum count per interval is 4095₁₀
Maximum number of epochs is 4095₁₀
Maximum number of intervals is 3456₁₀

DECUS No. 8-176

PAL CHOP

Edward A. Taft, III, St. Mark's School, Southboro, Massachusetts

PAL CHOP produces minimum-length copies of PAL source tapes by removing all comments, tabs, multiple spaces, and multiple carriage-return/line-feed's. It is especially useful in facilitating the handling and storage of sections of extremely large programs which have been debugged.

Minimum Hardware: PDP-8, 8/I, 8/L and ASR-33. High-Speed reader and punch optional.

Source Language: PAL-D

Storage Requirement: Program occupies 10g-366g; uses 400g-1177g as buffer

Execution time: I/O limited

DECUS No. 8-177

COPY

Alexander Symthe

Submitted by: Theodore Green, Taft School, Waterbury, Connecticut

COPY is an extension of PIP. Its purpose is to copy disk files onto paper tape and vice-versa. COPY's major advantage is that it saves time in putting files on and off the disk. This can be very useful for those with one disk and limited space.

Minimum Hardware: PDP-8, 8/I or 8/S with disk and Teletype

Other Programs Needed: Disk Monitor I/O routine in core and command decoder stored on disk starting in block 15.

Source Language: PAL-D

Storage Requirement: 0-2777g: only 0-1474g for program - rest buffers

DECUS No. 8-178

Reverse Assembler

Henry G. duPont, St. George's School, Newport, Rhode Island

The Reverse Assembler accepts a paper tape in binary format and produces either a printed listing or a paper tape that is acceptable to the PAL Assembler as a symbolic tape. It produces the mnemonics for almost all input-output devices as well as PAL III and Floating Point instructions.

Minimum Hardware: PDP-8 with ASR-33

Source Language: PAL III

Storage Requirement: 0-5400g

Execution time: Input/Output limited two-five seconds for ASR-33 per line.

DECUS No. 8-179

EAE Modifications for Binary Disassembler with Symbols

Alec Smythe

Submitted by: Theodore Green, The Taft School, Waterbury, Connecticut

This patch permits use of the Binary Disassembler with Symbols, (DECUS No. 5/8-18C) by users without EAE. The patch shortens the space for the cross reference table by approximately one page, and changes all EAE instructions to JMS's to routines which take their place. The patch also changes the octal type routine to make space for links on page zero.

Minimum Hardware: PDP-8 with 4K, ASR-33, High-Speed reader

Other Programs Needed: Binary Disassembler with Symbols (DECUS No. 5/8-18C)

DECUS No. 8-180

Editor and Assembler for 57A Magnetic Tape System

Donald C. Uber, Lawrence Radiation Laboratory, Livermore, California

The Symbolic Editor and MACRO-8 Assembler have been modified to replace paper tape with IBM-compatible magnetic tape for more rapid and convenient program development. The system requires an 8K PDP-8 and a 57A Tape Control with one transport.

The Editor reads and writes ASCII text in a file on magnetic tape. Text is stored in "pages" which may be individually accessed by Teletype commands. All the original operations are retained, including paper tape I/O.

MACRO-8 assembles the text file, completing all three passes before halting. Binary output is on high or low speed paper tape. The symbol table and Pass 3 listing may be on Teletype or written in a second tape file for listing on a line printer.

A third program moves pages of text from one area of tape to another whenever re-editing and re-assembly are necessary.

Minimum Hardware: PDP-8, 8K memory, ASR-33, 57A Magnetic Tape Control with one transport.

Other Programs Needed: Symbolic Editor (DEC-08-ESAB) High-Speed MACRO-8 (DEC-8-8-S)

Storage Requirement: Fields 0 and 1; locations 0-7577

Source Language: MACRO-8

Restrictions: The 57A needs modification for Extended Memory operations.

DECUS No. 8-181

Automatic Binary Loader and Duplicator-Coder for Auto Bin

Michael A. Robinton, National Semiconductor, Santa Clara, California

Automatic Binary Loader will automatically start tapes it has loaded into core in any memory field.

The Duplicator-Coder for Auto Bin computes checksums and notifies the operator of an error. It will select the correct input/output devices to be used. It can also be used to format the tapes for the Automatic Binary Loader.

Minimum Hardware: Basic PDP-8

Source Language: PAL

Storage Requirement: Automatic Binary Loader 7600g-7754g
Duplicator-Coder for Auto Bin 0010g-0431g

Restrictions: These programs will not load tapes formatted for automatic, memory extension control. (i.e. channel 8 punched); both programs will indicate a checksum error.

DECUS No. 8-182

Memory Compare

Ray H. Jones, Digital Equipment Company, Ltd., Reading, England

Memory Compare resides in page 36g of either field. It compares contents of similar addresses in pages 0-35g of both fields and outputs any differences detected.

Minimum Hardware: PDP-8 with extended memory

Source Language: PAL-D

Storage Requirement: 1 page

DECUS No. 8-183

The WANG Loader

L. C. Wang

Submitted by: Richard E. Hummer, University of Maryland, College Park, Maryland

The WANG Loader will load any program that ends at location 7777. The program consists of 8 instructions that are loaded via the toggle switches, and a tape that will boot-in the BIN and RIM loaders.

Minimum Hardware: PDP-8 with ASR-33

DECUS No. 8-184

Page Routine

F. Weil, Automatic Control Engineering, Ltd., Kent, England

This program will arrange listings in page lengths and sequentially number the pages.

Minimum Hardware: PDP-8 with ASR-33
Source Language: PAL III
Storage Requirement: Approximately 200g words
Restrictions: Maximum of 99 pages per listing.

DECUS No. 8-185

Modifications to Symbolic Editor and Symbolic Tape Format Generator

G. R. Hervey, University of Leeds, The School of Medicine, Leeds, England

The modifications to Symbolic Editor (DEC-08-ESAB) are: 200g code becomes a valid character which can be stored or generated; T and F output 200g code; all three (3) punching commands, T, F and P are followed by halts to enable the punch to be turned on; T also halts after punching trailer. These changes simplify editing of tapes which contain sections of text or data separated by lengths of leader/trailer.

The modified Format Generator produces a symbolic format which saves tape, editor buffer space and Teletype time.

Minimum Hardware: PDP-8
Other Programs Needed: Symbolic Editor (DEC-08-ESAB) and Symbolic Tape Format Generator (Digital 8-21)
Source Language: PAL III

DECUS No. 8-186

EAE FORTRAN Patch for the PDP-8

P. D. Siemens, Lawrence Radiation Laboratory, University of California, Livermore, California

This patch to the PDP-8 FORTRAN Operating System utilizes the extended arithmetic unit option (Type 182 EAE). Four arithmetic routines were rewritten - alignment, normalize, multiply and divide. The reduction in execution time is rather significant.

Another improvement besides the faster execution time was gained with EAE FORTRAN. Since the multiply routine calculates a full 48-bit product and rounds instead of truncates to 24-bits, an increase in significance of the product was noted.

These modifications work with the FORTRAN Operating System of March 2, 1967. They have not been tested with any other version, but would "probably" work. No changes must be made in operating procedure or any other portion of the program, as this modification loads over the regular arithmetic sub-routines.

Minimum Hardware: PDP-8 with Type 182 EAE
Other Programs Needed: FORTRAN Operating System (DEC-08-AFCO)
Source Language: FORTRAN

DECUS No. 8-187

Keyboard Controlled Binary Punch

Edward A. Taft III, St. Mark's School, Southboro, Massachusetts

This program makes binary tape copies of selected areas of core. It is entirely keyboard controlled, and has provisions for punching leader, data, checksums and field marks for extended memory programming.

Minimum Hardware: PDP-8, High-Speed Punch and Extended Memory (optional)
Source Language: PAL-D
Storage Requirement: 1 page (versions included occupy 1, 36 and 37).

DECUS No. 8-188

Extended Memory Patch for Four Word Floating Point Package (DEC-08-FMHA-8B)

Peter Goldstern, Digital Equipment Corporation, Anaheim, California

This patch will allow the DEC Floating Point Package to be entered from any memory bank if the arguments and operands processed by the Floating Point Routine all reside in the same memory bank that the package is called from. The patch only uses free locations within the package.

Other Programs Needed: Floating Point Package (DEC-08-FMHA-8B)

DECUS No. 8-189

LKDN: Look into the Directory Name Block

Barbara M. Rollman, Educational Testing Service, Princeton, New Jersey

LKDN will find the appropriate directory name entry when given a file name. It will decode and type out the contents the entry. The output gives the disk location of the directory entry (in xxx.yyy form, see DISKLOOK DECUS No. 8-111) and, optionally, the disk block locations for each core page stored.

Minimum Hardware: PDP-8 with DF32 Disk

Other Programs Needed: Disk Operating System (DEC-08-SDAA)

Source Language: PAL-D

Storage Requirement: Program - location 12 and 20₀-1377₈, Buffer - 18₀ - 1400₈ - 1777₈. If stored on disk, the program requires 6 blocks; it can be saved with the command "SAVE LKDN ! 0-1377; 200"

DECUS No. 8-190

PATCH Utility Program

James A. McDonough, Concord Control, Boston, Massachusetts

This program, a utility routine, allows duplicating and updating of a DECTape file of any PDP-8 TCØ1 format. It is derived from a combination of ODT (DEC-08-COBO-D) and XDUP (DECUS No. 5/8-64). The user should be familiar with the operation of both of these programs.

Minimum Hardware: PDP-8 with TCØ1 Control

DECUS No. 8-191

Fields

D. Whiteley, International Computers Limited, Kidsgrove, Stoke-on-Trent, England

Fields, a demonstration program, calculates and displays the surface potential of a given boundary conditional plane. Each output facility is called by a 338 Display pushbutton giving a numerical and/or pictorial result.

Minimum Hardware: PDP-8 with High-Speed punch ASR-33 Teletype and 338 Display

Storage Requirement: 8K

DECUS No. 8-192

T.A.L.C. (Taylor's Algebraic Linear Calculator)

Bruce J. Taylor, Submitted by: Theodore Green, The Taft School, Waterbury, Connecticut

T.A.L.C. is a general-purpose calculator designed to evaluate a general algebraic equation, given all quantities involved in the equation. In effect, T.A.L.C. turns any of the family-of-eight computers into a powerful desk calculator capable of evaluating complex algebraic, trigonometric, and logarithmic functions. In addition, T.A.L.C. utilizes the concept of "idiot-proofing" to virtually eliminate the possibility of an operator error invalidating the equation. Thus, T.A.L.C. is easy to use and presents unlimited possibilities in any field where fast and accurate calculations are required.

Minimum Hardware: 4K PDP-8, High-Speed Reader, DF32 Disk File and ASR-33/35

Other Programs Needed: Floating Point Package (Digital-8-5-S)

Storage Requirement: 4K

Source Language: PAL III

DECUS No. 8-193

DISP

S. G. Wellcome, Trinity College, Hartford, Connecticut

DISP provides a simple means of using the 34D Display with FORTRAN-D. It allows the operator to display varying numbers of points with movable X and Y axes.

Minimum Hardware: 4K PDP-8 with DF32 Disk

Other Programs Needed: FORTRAN-D Compiler (DEC-08-AFCO)

Source Language: PAL-D

Storage Requirement: 600-777₈, 7400-7577₈

Restrictions: Destroys FORTRAN-D disk read/write option (e.g. Read 3, 10)

DECUS No. 8-194

NMR Simulator

D. F. Juers, R. J. Boettcher, V. J. Hull, and H. E. Zimmerman, University of Wisconsin, Madison, Wisconsin

NMR Simulator is designed to calculate the theoretical spectrum of compounds containing hydrogen, fluorine, carbon-13 and other nuclei of spin 1/2. The calculated theoretical spectrum is displayed on an oscilloscope.

DECUS No. 8-194 (Continued)

Options for punched and typewritten output, change in X-axis offset (sweep offset) and spectrum resolution are available. Chemical shifts and coupling constant parameters may be varied successively until the displayed spectrum matches that obtained experimentally. Redisplay of a "library" of theoretical spectra is possible by retaining punched output tapes.

Minimum Hardware: 8K PDP-8, Oscilloscope, and High-Speed Reader/Punch
Source Language: PAL III
Storage Requirement: 8K
Execution Time: 1 second to 15 minutes

DECUS No. 8-195

POLY BASIC

Lenny Elekman and Richard Lary, Digital Equipment Corporation, Long Island, New York

POLY BASIC is a compiler and operating stand-alone system designed for the PDP-8 family. It has a total user program storage of 32K characters in which the disk is utilized. Some of the features of the compiler are:

- a. It has all BASIC system commands,
- b. It has all BASIC operations,
- c. It contains all built-in functions except TAN,
- d. Its accuracy is 1 part in 2^{23} rather than 1 part in 2^{35} , because of word size difference,
- e. Maximum program size is 6144 characters as in regular (Dartmouth) BASIC,
- f. Maximum usable statement number 4095 rather than 99999,
- g. Maximum array space is 3600 characters, and maximum number of statements is 330; however, these can be traded off against one another at the rate of 25 array elements per statement,
- h. There are no matrix operations,
- i. The argument "EDIT resequence" is implemented and the command "EDIT" rennumbers the user file from line number 100 in steps of 10,
- j. There is a set of error messages to signal compilation errors and a set for execution errors.

Minimum Hardware: PDP-8 with ASR-33 Teletype and DF32 Disk

DECUS No. 8-196

DET: Detect Key Words

S. G. Cannon, UNIVAC, Salt Lake City, Utah

DET will detect a key word or words from any sentence that is typed via the Teletype. This program contains "spell",

a routine that will check the spelling of all the States in the U.S.

DECUS No. 8-197

Overlay for Standard Editor and PAL III Assembler

John Knox, International Controls Corporation, Houston, Texas

This overlay enables the user of Editor (DEC-08-ESAB) and PAL III Assembler (DEC-08-ASAC) to save approximately half the time required when using the ASR-33/35. This patch has proven to be a great time saver when debugging was necessary.

Minimum Hardware: PDP-8 with 8K
Other Programs Needed: Editor (DEC-08-ESAB) and PAL III (DEC-08-ASAC)

DECUS No. 8-198

SYSHLP: Monitor System Utility Program

David M. Kristol, Moore School of Electrical Engineering, University of Pennsylvania, Philadelphia, Pennsylvania

SYSHLP is a combined version of DNHELP (DECUS No. 8-135) and SYSLUK (DECUS No. 8-141). Besides more convenient alternation between the two programs, SYSHLP features improved search coding in the SYSLUK portion.

Minimum Hardware: PDP-8 with DF32 or TC01
Other Programs Needed: System Monitor Head (DEC-D8-SDAA)
Source Language: PDPMAP (DECUS No. 8-166)
Storage Requirement: 200g - 2177g

DECUS No. 8-199

Accessing Data Arrays and Teletype Text Input/Output

David G. Frutchey, Beckman Instruments, Inc., Fullerton, California

These two subroutines provide the user with a powerful, yet concise, programming methodology when used with the Floating Point Package (DEC-08-FMHA).

The array accessing subroutine permits the user to access both fixed and floating point data located anywhere in the first 2K words of core storage regardless of page overlap. Both data storage and retrieval can be performed on terms analogous to single variable, subscripted FORTRAN array terms such as "ARRAY (a*J+b)."

The second subroutine, TTY Text I/O, provides a concise facility for text output (63 characters), character input,

DECUS No. 8-199 (Continued)

line spacing and page tabulation.

Other Programs Needed: Floating Point Package (DEC-08-FMHA)
Source Language: PAL III
Storage Requirement: Array Accessing - 119₁₀ words; Teletype Text I/O - 56₁₀ words

DECUS No. 8-200

BOSS

Dr. A. S. French,
Submitted by: Dr. R. B. Stein, University of Alberta,
Edmonton, Alberta, Canada

BOSS allows a series of system programs to be brought into core and executed in either one or any number of runs without keyboard input, other than the initial listing of programs and a single decision input at the end of each run.

Minimum Hardware: PDP-8 with DF32 or DEC-tape
Source Language: PAL III
Other Programs Needed: Disk Monitor System (DEC-08-SDAA)
Storage Requirement: Disk - 2 blocks
DECtape - 3 blocks
Restriction: File name must begin with a letter.

DECUS No. 8-201

DECSW: Decimal Switch

Kenneth B. Wiberg, Yale University, New Haven, Connecticut

DECSW is a subroutine which accepts the contents of decimal switches at a remote location and converts the number into the following forms:

1. As an insert into a BCD string which may be typed out or displayed on CRT screen.
2. As a floating point number in the floating point accumulator.
3. As the binary equivalent in the accumulator, if the number was an integer.

Minimum Hardware: PDP-8 with Digital Switches

DECUS No. 8-202

PLOT

J. J. Spruit and L. R. Davila, Fels Research Institute, Yellow Springs, Ohio

PLOT will plot data points on a graph; calculate and plot a linear, least squares regression line and print out the coefficient of correlation, the equation of the regression line and other pertinent parameters.

Minimum Hardware: 4K PDP-8 with a Houston Instrument Complot Plotter Model 6650, DP-1-1 or equivalent

Other Programs Needed: Floating Point Package (Digital 8-5C-5), ALPHA (DECUS No. 8-203), requiring extended memory if used.

Storage Requirement: 2, 3, 15, 16, 17, 20-177, 200-2277. 2300-4656 for storage and 4757-up for Floating Point Package. (all numbers are octal)

Restriction: Maximum number of data points is 220.

DECUS No. 8-203

ALPHA

J. J. Spruit and L. R. Davila, Fels Research Institute, Yellow Springs, Ohio

ALPHA is used for titling graphs on the plotter. It can be used in conjunction with (DECUS No. 8-202).

Minimum Hardware: 4K PDP-8 with a Houston Instrument Complot Plotter Model 6650, DP-1-1 or equivalent

Storage Requirement: 2, 10, 11, 12, 20-167, 200-3654, 4000-7777 is reserved for storage

Restriction: When used in conjunction with PLOT (DECUS No. 8-202) extended memory is required.

DECUS No. 8-204

PATCH: A PDP-8 Binary Paper Tape Patch Program

Charles McComas, Digital Equipment Corporation, Maynard, Massachusetts

PATCH provides a simple, convenient means for making changes to PDP-8 binary format paper tapes, and for creating short binary tapes. Single binary tapes may be patched or merely copied. Several tapes may be combined, with or without

DECUS No. 8-204 (Continued)

changes being made. Additions to tapes may be created. Whole pages of code may be moved or deleted. In certain cases binary words may be inserted within existing binary data. Field expressions may be inserted, changed or deleted.

Changes and creations are made via the the Teletype keyboard using simple commands. Data is typed in octal.

NOTE: The DECTape available for this program is in PDP-10 format.

Minimum Hardware: 4K PDP-8, Teletype, or high-speed reader/punch

DECUS No. 8-205

MTSAFE

John Alderman, Georgia Institute of Technology, Atlanta, Georgia

MTSAFE is a TC-58 version of DECUS No. 8-120, Disk/DEC-tape FAILSAFE. It is fairly self-explanatory and incorporates additional messages for the operator to service the magtape.

Minimum Hardware: PDP-8 with TC-58 Magtape

Other Programs Needed: Disk Monitor System (DEC-D8-SDAA)

Storage Requirement: SA-0200; occupies 100-1377₈ and uses 1400-2177₈ as buffer

DECUS No. 8-206

DUMP

Barbara M. Rollman, Educational Testing Service, Princeton, New Jersey

DUMP types out the octal contents of any 128-word block on-tape or disk. The link (129th) word will be printed and identified. The typeout may be halted in the middle to proceed to the next block on the same device, to switch to a different block and/or device, or to return to the monitor.

Minimum Hardware: 4K PDP-8 with DF32 Disk or TC01 DECTape

Other Programs Needed: DECTape Operating System (DEC-08-SOBO) or Disk Operating System (DEC-08-SDAA)

Source Language: PAL-D

Storage Requirement: Location 0-1177; starting address is 1000; 2000-2200 is used as buffer.

DECUS No. 8-207

Cube Root Subroutine

James Kelly, Digital Equipment Corporation, Maynard, Massachusetts

The Cube Root Subroutine is called with an effective "JMS CUBE" with the argument in the accumulator. The subroutine returns to the memory location following "JMS CUBE" with the result in the accumulator and the remainder in MAGIC. The algorithm makes use of the fact that the third order difference of any list of consecutive cubes is always equal to 6 (six).

Source Language: PAL

Storage Requirement: 27₁₀ locations

DECUS No. 8-208

Evaluating Determinants

A. Moses, Computer Application Engineering Co., El Paso, Texas

Evaluates determinants with the order in the range from 2 through 17.

Other Programs Needed: FORTRAN Compiler and Operating System (DEC-08-AFCD)

Source Language: FORTRAN

Storage Requirement: 4K

Execution Time: Less than 30 seconds

DECUS No. 8-209

Editor-with-View (VD 8/I or 34D Scope)

John C. Alderman, Georgia Institute of Technology, Atlanta, Georgia

Editor-With-View is the same as the library distributed version of the Disk Editor (DEC-D8-ESAB) with the exception of the V(View) command addition. This command is exactly like the L command for the TTY, except that results are displayed on a storage scope via the software character generator, and the VD8/I or 34D scope controller. The ALT MODE key will display the next line of the text buffer.

Minimum Hardware: 8K PDP-8 with VD8/I or 34D Scope

FOCAL INDEX

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FOCAL-2	XOD Modification for use with FOCAL	B	
FOCAL-3	DISK FOCAL		X
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Code

A - ASCII
 B - Binary Object
 D - DECtape

H - High Binary Loader
 L - LINCtape
 LL - Linking Loader

R - RIM
 S - Symbolic
 X - Listing with write-up
 XX - Listing available at a handling charge

Write-ups are available for all programs.

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FOCAL-28	Column Width, TRAVERSE, Least Square "Linear" Fit, Nozzle Weight Flow, Filter Design, Ohm's Law		X
FOCAL-29	Second Order Differential Equation		X
FOCAL-30	One Line Routines, X^3 and Circle, Superposition, Circle		X
FOCAL-31	Sines, Factors, Figure Eight, Right Triangle Solutions		X
FOCAL-32	Translation Table (French)		
FOCAL-33	Square Matrix Multiply, Least Common Multiple, Base to Base Integer Conversion, Prime Number Generator, Repeating Decimal		X
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FOCAL-38	Magic Square Generator		X
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FOCAL-40	Simple Chi-Square Test	B	X
FOCAL-41	Från the Barmaid	B	X
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**FOCAL
PROGRAM ABSTRACTS**

FOCAL PROGRAM ABSTRACTS

DECUS No. FOCAL-1

A Pseudo Random Number Generator for the PDP-8 for use with FOCAL

Gary A. Griffith, Georgia Institute of Technology, Atlanta, Georgia

A Pseudo Random Number Generator developed by P. T. Brady (DECUS No. 5-25) for the PDP-5 computer has been adapted to the PDP-8 computer. To facilitate the testing of this generator, it was rewritten to replace the random number generator of the 4K FOCAL language.

This random number generation algorithm has been previously tested by Mr. Brady. It was felt that further testing, using more sensitive tests, would give a better indication of the reliability of this generation algorithm.

The test for randomness is called the length-of-run test. This test involves testing the length of monotonically increasing (or decreasing) subsequences of random numbers. An analytical method has been formulated to determine the expected lengths of runs for any length of sequence sample. This analytical value is compared with the results of the generation algorithm under consideration to determine the randomness of that generator.

A test for the uniformity of a generating algorithm involves the generation of a large sample space, approximately 16 million random numbers, and determining its distribution. This test required an addition of two machine language subroutines to the 4K FOCAL language.

DECUS No. FOCAL-2

XOD Modification for use with FOCAL

John C. Alderman, Georgia Institute of Technology, Atlanta, Georgia

Modifications to XOD (DECUS No. 8-89), which allows it to be used to debug FOCAL, and also change the command character set as follows:

<u>Old Char</u>	<u>New Char</u>	<u>Function</u>
!	C	Continue from breakpoint
"	B	Breakpoint assignment
#	F	Field-of-operation assignment
%	S	Set contents of locations LL through UL to the octal value

<u>Old Char</u>	<u>New Char</u>	<u>Function</u>
'	G	Go to locations
*	.	Current location pointer

These changes make the command characters more nearly like ODT-2, which is desirable for installations with many inexperienced users.

DECUS No. FOCAL-3

DISK FOCAL

D. E. Wrege and J. C. Alderman, Georgia Institute of Technology, Atlanta, Georgia

A dialect has been developed utilizing the disk (DF32 or RF08) for both text and variable storage in a 4K PDP-8. Variable storage is via the arrayed function FNEW, while text is stored via the LIBRARY command which has been pre-empted for the purpose. Limitations of programming complexity in the current version limit the user to about 6 complete FOCAL program images and 1320 DISK FNEW variables (8K of the disk). A trivial modification to the coding will allow the user to expand the disk area. The package was written for the DF32 disk, but changes required for the RF08 are easily made by a user of such. The Disk/DECtape Monitor does not protect the user's files generated by the use of the package, but a program to implement the protection is under development.

DECUS No. FOCAL-4

PRIME NUMBER PLOTS

Richard Merrill, Digital Equipment Corporation, Maynard, Massachusetts

This program plots successive primes while cycling over a specified prime interval. The interpretation of the results are left to the user.

DECUS No. FOCAL-5

The Sumer Game

Doug Dyment, Digital Equipment of Canada, Ltd., Carleton Place, Canada

This is a simulation program/game which will run on a minimal PDP-8 system. The economy of a Sumerian city in the year 3000 B.C. is simulated in the fashion of a modern-day "business game."

DECUS No. FOCAL-6

FOCAL-8 Patch for LINC-8 Display

Peter Goldstern, Digital Equipment Corporation, Anaheim, California

This patch causes FDXS and FDYS commands in FOCAL to be displayed on the LINC-8 Display. This patch applies only to DEC-08-AJAD-PB, FOCAL.

DECUS No. FOCAL-7

STRIP FOCAL - Storage of Data Arrays

D. E. Wrege, Georgia Institute of Technology, Atlanta, Georgia

This program, written for FOCAL W. on an 8K machine, accepts data from paper tape on the high speed reader, and displays it on the Type 34 display unit. The data is stored in upper core, or on the disk, using the FNEW array. An ERASE or ERASE ALL command will not wipe out the stored data. Several sets of data may be stored in different sections of the array with the user keeping track of the indices.

DECUS No. FOCAL-8

Magtape FOCAL

J. C. Alderman, Georgia Institute of Technology, Atlanta, Georgia

A sophisticated handler package for the TC58 IBM compatible magtape controller is available in the FOCAL language. Data is transmitted to/from the FNEW arrayed storage in FIELD 1. The features of I/O overlap with program execution, defeatable error diagnostics, and programmable tape density and unit selection have been incorporated into the coding. Syntax is via the LIBRARY command, and there is extensive error checking of user calls.

The FIELD 1 resident portion of the magtape handler is removable by other users, and the result is a general purpose LIBRARY command handler package, capable of being linked to any device using the interrupt. A functional argument is transmitted to the FIELD 1 coding, and any number of numerical arguments may be evaluated.

DECUS No. FOCAL-9

Hexapawn

Ralph Mayer, Lexington High School, Lexington, Massachusetts

The object of this program is to have the computer "learn" to play a game, called Hexapawn.

Hexapawn is played on a square board and each player has three pawns. A pawn can move forward to an empty space or diagonally forward to capture an opponent's pawn. One wins by having anyone of his pawns reach the opponent's side of the board, by making it impossible for the opponent's pawns to move, or by capturing all of the opponent's pawns.

The computer "learns" to play this game by remembering each of the possible board configurations when it is encountered during a game, and then determining and remembering all of the possible moves applicable to each board configuration.

DECUS No. FOCAL-10

Patch to FOCAL W. for LINC-8 A to D Converter

Dr. T. Nichols, Department of the Army, U. S. Army Natick Laboratory, Natick, Massachusetts

This patch allows FOCAL W. programs to use the LINC-8 analog to digital converter.

Calls to the function are in the format:

SET A= FADC(K)

Where A is any FOCAL variable, and K is the decimal number of the channel to be sampled. The function returns values in the range of -256 to +255, corresponding to minus and plus 1 volt respectively.

Execution of each function call requires approximately 10 milliseconds, limiting the maximum sampling rate to 100 SPS.

Minor changes to the patch will allow the execution of any single LINC instruction (stored at LINSTR) by FOCAL programs. Such a function could be designated FNEW by placing its starting address in FNTABF+ 15 (location 413 in FOCAL W.).

DECUS No. FOCAL-11

EAE Routines for FOCAL

J. Dwight Aplevich, University of Chicago, Committee on Mathematical Biology, Chicago, Illinois

This patch replaces the floating point system in FOCAL with one nearly identical to the standard EAE Floating Point package. A new floating integer subroutine is included, as well as a multiplicative-congruential pseudo random number generator.

DECUS No. FOCAL-12

QUIPI: QUIck Plot in Quadrant 1

D. A. Dalby, Bedford Institute of Oceanography, Dartmouth, Nova Scotia, Canada

The implementation of an additional extended function named "FLOT" in FOCAL to generate a straight line plot on a CalComp 563 incremental plotter considerably increases the usefulness of FOCAL for simple plotting applications. QUIPI is a program in FOCAL language which demonstrates one use of the FLOT function: to generate a general XY plot in the first quadrant. The user simply types the control parameters and (x,y) values on the keyboard. An infinite set of plotting symbols of continuously variable size, width-to-height ratio, symbol order (number of strokes), and positive (counter-clockwise) or negative (clockwise) rotation is available by simply typing the appropriate parameters on the keyboard.

DECUS No. FOCAL-13

3-D PLOTTER

John M. Jamieson, Georgia Institute of Technology, Atlanta, Georgia

This program plots a function, Z, of two other variables, X and Y, on the memoscope or X-Y plotter. The function must be written in Cartesian space.

DECUS No. FOCAL-14

Least Squares Fit to a Straight Line

Edward T. Chow, Georgia Institute of Technology, Atlanta, Georgia

This is a program using the principle of least squares to fit a straight line to a set of up to 35 experimental data points.

The program requires one pass of the data. At the end of the pass the output gives the values of the slope and the intercept of the straight line equation. In addition, the calculated values of the experimental data based on the straight line equation are pointed out. Finally, the program gives the value of R which is a criterion of fitness of equation to the input data.

DECUS No. FOCAL-15

Least Squares Fit to a Cubic Polynomial

Edward T. Chow, Georgia Institute of Technology, Atlanta, Georgia

This is a program using the method of least squares to fit a cubic polynomial to a set of experimental data. The program demands two passes of the data for its completion; however, the coefficients of the polynomial are outputted after the

first pass, and at the end of the second pass the output gives the value of R which is a criterion of fitness and gives the calculated values of the experimental data based on the cubic polynomial.

In addition, a section of the program can be used as a self-contained program for solution of a set of N by N linear equations.

DECUS No. FOCAL-16

One-Sample Statistics, Two-Sample Statistics, Welch Procedure; One-Way Analysis of Variance; Sheffe's Contrast Between Means

M. J. McKeown, University of Chicago, Department of Obstetrics and Gynecology, Chicago, Illinois

A three part program used to perform one-sample and two-sample statistics, Welch Procedure; One-Way Analysis of Variance; and Sheffe's Contrast Between Means, which allows one to investigate more thoroughly the source of the difference between group means.

DECUS No. FOCAL-17

FOCAL: How to Write New Subroutines and Use Internal Routines

Doug Wrege, Engineering Experiment Station, Georgia Institute of Technology, Atlanta, Georgia

The aim of this document is to help the user to code specific routines in FOCAL so that his dialect of FOCAL can be applied to his application (without being forced to understand in detail all the working of FOCAL). In this way, perhaps, each and every user can make his particular dialect of FOCAL "perfect."

It is assumed that the reader has a basic knowledge of PDP-8 processor instructions, PAL mnemonics, as well as a familiarity with the Floating Point Package. In addition, he should be familiar with the FOCAL language.

This document is an attempt to explain how user-developed software can be interfaced to the basic FOCAL package, without requiring the user to spend valuable time trying to understand all of its detailed workings. Section II deals with a general discussion of how FOCAL works, in a descriptive fashion. Section III is concerned with the philosophy of the language, and the last few sections are technically oriented toward helping the user actually code his additions. Several examples and ready-coded routines, which may be used to simplify the user's problems are included.

DECUS No. FOCAL-18

T-ASK

J. Alderman, Georgia Institute of Technology, Atlanta, Georgia

This subroutine, available in two versions, Standard FOCAL Version and FNEW Array FOCAL Version, allows the user to enter an input unit, as well as a number, and converts the number to a common unit before returning to the calling program. It is particularly useful for programs utilizing TIME as an input parameter, since the program will convert the following units to seconds: YEARS, DAYS, HOURS, MINUTES, SECONDS, AND FORTNIGHT.

DECUS No. FOCAL-19

Least Squares Fit to an Exponential

Submitted by: J. W. Lynn, Georgia Institute of Technology, Nuclear Research Center, Atlanta, Georgia

This program is used in conjunction with "FOCAL" to make the best two parameter least squares fit of

$$Y = A * \text{EXP}(\text{ALPHA} * X)$$

to the user's data.

DECUS No. FOCAL-20

MULTIPULSE

Chris Hamilton, Georgia Institute of Technology, Atlanta, Georgia

This program was written to check the differential linearity of any multichannel pulse height analyzer.

DECUS No. FOCAL-21

MULTIPULSE-2

Chris Hamilton, Georgia Institute of Technology, Atlanta, Georgia

MULTIPULSE-2 (M-2) will calculate the differential non-linearity of a multichannel pulse height analyzer using as data a Compton spectrum on paper tape which has been expanded through all channels whose channel width deviation is under study.

DECUS No. FOCAL-22

Monte Carlo Solution to Neutron Penetration Problem

Bryan W. McGhee, Georgia Institute of Technology, Atlanta, Georgia

This display is a one axis display (Z coordinate only) of each scattering event - though scattering is calculated in 3-dimensions. The axis shifts upward for each new neutron to facilitate ease of following collisions.

DECUS No. FOCAL-23

Seismic Refraction Sloping Layer Program

David D. Prentiss, Atlantic Oceanographic Laboratory, Bedford Institute, Dartmouth, Nova Scotia, Canada

This program, developed for a PDP-8 4K machine, requires the full library of functions. It calculates a seismic refraction model using the slope-intercept method of M. Ewing, G. P. Woollard and A. C. Vine proposed in 1939 and the notation of J. I. Ewing's article on marine seismic refraction and reflective methods appearing in Volume III of "The Sea."

The program initially accepts "NMAX" the maximum number of layers to be considered and V(1), the sound velocity of the water (1st) layer, under Group 1 instructions. The program then proceeds to accept under Group 9 the Velocity (inverse slope) and time intercept at the A end of a reversed refraction profile VA and TA) and from the B end of the profile (VB, TB) for successive values of N, the layer index. It calculates and types a true Velocity for the next layer "V(N)" and dip "W(J)" of the Jth interface positive values corresponding to increased depths of the interface under the B end. Thickness normal to the interface is computed and typed out for each end "HA", "HB" and finally an approximate semi-depth (thickness projected on the Z axis) under the A and B end is computed and typed out in statement 9.48 after which control is returned to Group 1. The program continues to accept data and type out values for succeeding (N) layers until N is equal to "NMAX".

Input dimensions are usually KM/SEC for Velocities and seconds for time intercepts. Output is in KM/SEC, degrees of dip and kilometers of depth. With a 4K PDP-8 the program can calculate a 4 layer case before running out of storage. If statement 9.48 is erased (Z = H for dips under 2°) 5 layers can be handled.

DECUS No. FOCAL-24

GRADE: A Grade Averaging and Display Program

D. E. Wrege, Georgia Institute of Technology, Atlanta, Georgia

This program will average grades from a number of quizzes, taking into account weighting factors of relative importance between quizzes, and plot a histogram of the number of grades in a given percentile.

DECUS No. FOCAL-25

Payroll Calculations (California, 1968)

G. L. Helgeson, Helgeson, Nuclear Services, Inc., Pleasanton, California

This routine is used to calculate payrolls. It is based on the California State Unemployment Insurance rate, FICA rate and withholding tax.

This program could be modified easily to fit the rules of any particular state. If some of the pay ranges would not be used, they could be omitted from the two tables, making more room for other routines, such as providing running totals on gross pay, deductions, and net pay.

DECUS No. FOCAL-26

CURVE FITTING

Richard Rothman, Groton School, Groton, Connecticut

This program finds the best curve of a set of points. There are three types of curves involved:

Exponential Curve. $Y = Ae^{BX}$

The variables solved for are A and B. The function is reduced to linear form by logarithms: $LOG Y = BX + LOG A$. A table of values is formed and solved simultaneously to get the values of A and B.

Power Curve $Y = AX^N$

This function is reduced to linear form: $LOG Y = N LOG X + LOG A$. Once a table of values is made, it is solved simultaneously for A and N.

Linear Line $Y = MX + B$

A table is made and solved simultaneously for the value of M and B.

DECUS No. FOCAL-27

Δ - Y Complex, Y - Δ Complex, Series Resonant Circuit Analysis

David H. Tyrrell, Middlesex County College, Edison, New Jersey

Δ - Y Complex - This program does a DELTA-WYE transformation for A-C circuits.

Y - Δ Complex - This program does a WYE-DELTA transformation for A-C circuits.

Series Resonant Circuit Analysis - This program computes resonant frequency, bandwidth, Q, and values of inductive and capacitive reactance at resonance for a given R-L-C series circuits. It also produces, upon request, a table

of impedance and phase angle for 10 points each side of the resonant frequency. Distance between points is determined by a user inputted DELTA-F.

DECUS No. FOCAL-28

Column Width, TRAVERSE, Least Square "Linear" Fit, Nozzle Weight Flow, Filter Design, Ohm's Law

Submitted by: Digital Equipment Corporation, Maynard, Massachusetts

Column Width - Used for typesetting calculations.

TRAVERSE - A civil engineering and surveying application to compute a closed traverse given bearings and distances.

Least Square "Linear" Fit - Finds slope and Y-intercepts for the equation $Y = MX + B$ given a set of data observations.

Nozzle Weight Flow - Checks inlet pressure ratio and calculates the weight flow through the nozzle (from Hamilton Standard).

Filter Design - Plots filter output as well as numerical answers to a digital filter design problem.

Ohm's Law - Computes Ohm's Law.

DECUS No. FOCAL-29

Second Order Differential Equation

Submitted by: Digital Equipment Corporation, Maynard, Massachusetts

This is a routine to solve $\frac{D^2X}{DT^2} - K1 \cdot \frac{DX}{DT} + K2 \cdot X = \emptyset$ given K1, K2, and initial values for X, $\frac{DX}{DT}$, and $\frac{D^2X}{DT^2}$.

The user also selects the time interval DT. The result is plotted on the TTY from time zero until interrupted.

A check is made for off-scale values.

DECUS No. FOCAL-30

One Line Routines, X^3 and Circle, Superposition, Circle

Submitted by: Digital Equipment Corporation, Maynard, Massachusetts

One Line Routines - Demonstrates the ability to create a one line program loop to plot using library functions of the FOCAL language.

X^3 and Circle - Use of subroutines if function plotting.

Superposition - The ability to superimpose multiple functions with different print characters in one output plot.

Circle - A circle of radius 10 plotted by residuals.

DECUS No. FOCAL-31

Sines, Factors, Figure Eight, Right Triangle Solutions

Submitted by: Digital Equipment Corporation, Maynard, Massachusetts

Sines - Plotting several variables using sine functions.

Factors - Determines whether a number is prime or gives its factors.

Figure Eight - Will plot various sizes of figure eights by means or residuals. This is represented by a simple fourth order equation.

Right Triangle Solutions - Applies trigonometry relations and the Pythagorean theorem for a right triangle.

DECUS No. FOCAL-32

Translation Table (French)

Submitted by: Iroquois Falls and Calvert District High School, Iroquois Falls, Ontario, Canada

FOCAL commands translated into French.

DECUS No. FOCAL-33

Square Matrix Multiply, Least Common Multiple, Base to Base Conversion, Prime Number Generator, Repeating Decimal Program

Submitted by: Digital Equipment Corporation, Maynard, Massachusetts

Square Matrix Multiply - The arduous task of multiplying two square matrices is quickly done by this FOCAL Matrix Multiplication routine. The user inputs "N" indicating the number of rows and columns each matrix will have. The computer then requests input of the elements of the two matrices. The result of the multiplication is typed out in an understandable matrix-like format.

Notable characteristics of this program are:

- a. It is expressed in only five lines of FOCAL script so that it loads quickly.
- b. It will process matrices of varying dimensions. Size of each matrix is limited only by memory capacity. (In 4K FOCAL the limit is about 6 rows and columns.)
- c. Because it inputs and outputs the matrix values in a matrix-like format, input transcription errors are less likely to occur.

The readers are invited to investigate the generalization of this algorithm to extend it to the processing of rectangular matrices.

Least Common Multiple (LCM) - The LCM routine is a neat, short program which will compute the LCM of any number of positive integers. Input is in two stages. First, the number "N" of integers is requested. This is followed by the input of the integers.

It is interesting to note that this program actually includes two subroutines. First, in Part 1, the maximum of the set of integers must be found. In Part 2, the actual LCM computation takes place.

This program would probably find its greatest use in classrooms of the lower grades. It could be a tremendous aid to the teaching of fractions.

Base to Base Integer Conversion - The FOCAL Base to Base Conversion routine will convert any positive integer less than 2048 from one base system to another. Such a program would find use in the teaching of high school mathematics where such problems in number theory are encountered. The program does not handle fractions, and it does not check the input number to be sure that all of the digits are allowed in the specified base. Readers are invited to write a more universal conversion routine.

Prime Number Generator - The Prime Number Generator is a program which will accept a number, N, and type out all primes less than that value. As soon as the program is finished, it loops back and starts over again by asking for N.

One use for this program would be found in computer-aided instruction in the lower grades where primes are first encountered.

Repeating Decimal Program - This routine computes the decimal equivalent to any rational number whose absolute value is less than 1. Such a program would be very useful in the teaching of fractions in school. Readers are invited to investigate computations with fractions greater than 1.

DECUS No. FOCAL-34

Simultaneous Equations, Abbreviated Simultaneous Equations, Curve Fittings

Submitted by: Digital Equipment Corporation, Maynard, Massachusetts

Simultaneous Equations - A familiar multi-variable problem is solved for 1st - 6th order equation sets (9th order if extended functions are gone).

Abbreviated Simultaneous Equations

Curve Fittings - Plot of exponential equation.

DECUS No. FOCAL-35

ROOTFINDER Program

Ron Dorman, Georgia Institute of Technology, Nuclear Research Center, Atlanta, Georgia

The ROOTFINDER program is a simple procedure, for use in determining the real roots of any suitable function. The program uses a conventional search to find root-containing intervals followed by a binary search (successive approximation method) to converge on the root value.

DECUS No. FOCAL-36

DETERMINOT Program

Ron Dorman, Georgia Institute of Technology, Nuclear Research Center, Atlanta, Georgia

The DETERMINOT program is a simple program which may be used to find the determinant of a square matrix of dimension 2 x 2 to 6 x 6. The method used in finding the determinant is based on the definition of the determinant and involves an N summation of products of N matrix terms with the proper inversion sign.

DECUS No. FOCAL-37

Nth Degree Polynomial Data Point Fitting Routine,
Nth Degree Polynomial Data Point Fitting Routine with
RMS Error

R. E. McCullough, University of Colorado, Denver,
Colorado

N-th Degree Polynomial Data Point Fitting Routine - This program accepts the x- and y- coordinates for an unlimited number of data points and calculates for the equation

$$Y = A_0 + A_1X + A_2X^2 + \dots + A_NX^N,$$

the coefficients A_N which best fit the equation to the data points. The fitting criterion is "least squares." The program allows the user to select the degree, N, of the fitting equation. N may be as large as 7.

N-th Degree Polynomial Data Point Fitting Routine with RMS Error - This program is the same as N-th Degree Polynomial Fitting Routine except that it calculates the RMS error between the y-coordinates of the data points and the evaluated fitting equation. It will accept only a limited number of data points and the maximum equation degree allowed is inversely related to this number.

DECUS No. FOCAL-38

Magic Square Generator

Doug Dymont, Digital Equipment of Canada, Ltd., Carleton Place, Canada

The magic square generator will generate an odd order magic square of the indicated size (11 x 11 is the largest that will fit unless the format specification in line 2.8 is altered), using a set of sequential integers, beginning with the number specified.

DECUS No. FOCAL-39

Rectangular to Polar Conversion, Polar to Rectangular Conversion

David H. Tyrrell, Middlesex County College, Edison,
New Jersey

Rectangular to Polar Conversion - Converts complex numbers in rectangular form to polar form.

Polar to Rectangular Conversion - Converts complex numbers in polar form to rectangular form.

DECUS No. FOCAL-40

Simple Chi-Square Test

Michael J. McKeown, University of Chicago, Chicago,
Illinois

The program will type out the data matrix and cell contents. Each cell will contain two values; O = xxx.xxx and E = xxx.xxx. The "O=" number is the "OBSERVED" value which was typed in by the user. The "E=" value is the expected value calculated by the program. The program will also type out row-sums (RS=) and column sums (CS=), and the grand total (T=). The last line of output will be "X2=" and "DF=" . These are the CHI-SQUARE and degrees of freedom.

DECUS No. FOCAL-41

Fran the Barmaid

Dr. Murray Vernon King, Massachusetts General Hospital,
Boston, Massachusetts

When loaded under control of the FOCAL system, Fran the Barmaid is started by typing GO, and then she types out a recipe for a cocktail, using random numbers to choose ingredients and to specify quantities of each.

DECUS No. FOCAL-42

The Hangman Game

Dan Miller, Glastonbury, Connecticut

The program allows the user to play the game of Hangman with the computer.

DECUS No. FOCAL-43

A Collection of FOCAL Patches

Edward A. Taft, III, St. Mark's School, Southborough, Massachusetts

The following assembly-language patches are designed to correct some errors and deficiencies in the FOCAL interpreter and to add some welcome FORTRAN-like versatility to the input and output.

These patches will operate properly with FOCAL, 8/68 (DEC-08-AJAC-PB) and with its 8K extension. It will also work in Field 0 of 2-user FOCAL, though not Field 1

- No. 1 Corrections to the E-Format Output Routine
- No. 2 Corrections to the Rounding Routine
- No. 3 Modifications to the greatest integer routine, used to convert floating point numbers to integers (and called by the function FITR).
- No. 4 Modification to FRAN. The function FRAN currently present in FOCAL cannot be used for serious statistical analysis of any sort. Certain numbers (notably zero) occur very often, and the distribution is poor.

The Random Numbers routine is adapted from DECUS No. 5-25 and has been shortened and rewritten for FOCAL. The method is the power-residue algorithm; $R_{\text{new}} = R_{\text{old}} \times (2^{17} + 3) \text{ mod}$

36 bits. FRAN returns a number between zero and one; the results are well-distributed, statistically sound, and will not repeat until FRAN has been called over four billion times.

- No. 5 I/O Features. The final patch adds two new functions to FOCAL's repertoire, FIN and FOUT, intended to extend input/output versatility. FATN and FADC are sacrificed to allow the new functions to be inserted (FNEW is still available as a user function).

FIN (), which must be called with zero argument, is equal to the numerical code of the next ASCII character read from the Teletype (or the high-speed reader, if activated). FOUT (X) will print the ASCII Character whose code is the value of the argument. A list of decimal ASCII codes is appended to this article.

FIN and FOUT permit the handling of letters, numbers, and symbols of all types. FIN provides for the input of single characters or strings for processing; FOUT simplifies such operations as plotting, printing digit strings outside the range of normal output, and punching leader code and other characters.

FOUT also enables the high-speed punch. Calling FOUT with a negative argument will cause all subsequent output (including keyboard echo and error messages) to be punched on the high speed punch. Normal Teletype output is restored by calling FOUT with zero argument.

**PDP-6 and 6/10
INDEX**

PDP-6 and 6/10 INDEX

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6-3	PUNCH	D	X
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6-7	DTALST ALIAS PIP-3	D	X
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6-22	MEM2 and MEM4	D	X

Code

A - ASCII Source
 B - Binary Object
 D - DECtape

H - High Binary Loader
 L - LINCtape
 LL - Linking Loader

R - RIM
 S - Symbolic (Source)
 X - Listing with write-up
 XX - Listing available at a handling charge

Write-ups are available for all programs.

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6-37	PACK, UNPACK, REPACK	D	X	
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6/10-38.1	ALVINE			
6/10-39	GIST	D (1)		
6/10-40	SCOPE TECO	D (1)		
6/10-41	Rapid Program Generation System	D (3)		
6/10-42	LST9: A Program to List PDP-9 DECtapes on a PDP-10 Line Printer	D (1)	X	
6/10-43	PDP-8 Simulator on the PDP-10 (note no documentation other than that produced by the DECtape is available)	D (1)		
6/10-44	LaPlace Transform Computer Program	D (1)		

**PDP-6 and 6/10
PROGRAM ABSTRACTS**

PDP-6 and 6/10 PROGRAM ABSTRACTS

DECUS No. 6-1

ALPHAS

Richard Gruen, Digital Equipment Corporation, Palo Alto, California

ALPHAS contains a set of frequently used ASCII characters (letters, numbers, and a few other characters) for use with the 340 Display. Included also, is a small driver program illustrating use of the display in time sharing.

DECUS No. 6-2

LPFOL

Richard Gruen, Digital Equipment Corporation, Palo Alto, California

LPFOL displays a square at the last point seen by the light pen and follows the light pen as it moves around the screen.

DECUS No. 6-3

PUNCH

Richard Gruen, Digital Equipment Corporation, Palo Alto, California

This program accepts characters from the Teletype and punches them onto paper tape (in hand-readable format). It can be easily modified for use as a titling subroutine.

DECUS No. 6-4

NUMBER

Richard Gruen, Digital Equipment Corporation, Palo Alto, California

NUMBER converts 7-digit telephone numbers into mnemonics. It prints all mnemonics for a given phone number on four pages of line printer paper.

DECUS No. 6-5

TIMEF4

Richard Gruen, Digital Equipment Corporation, Palo Alto, California

TIMEF4 calls each of the FORTRAN IV Library routines 20,000 times and publishes the average time per call. It uses randomly-generated numbers as input. This program was used to calculate the timings shown in the FORTRAN IV Library write-up.

DECUS No. 6-6

DTADIR

I. D. Pugsley, The University of Western Australia Computing Centre, Nedlands, Western Australia

DTADIR is a 1K program which manipulates DECTape directories. Its functions are:

- Zeroize a DECTape directory,
- List a DECTape directory
- Save a DECTape directory file,
- Get a saved file and write-up as a DECTape directory.

DECUS No. 6-7

DTALST ALIAS PIP-3

I. D. Pugsley, The University of Western Australia Computing Centre, Nedlands, Western Australia

This program lists DECTape data with minimal processing. The output format is controlled by switches included in the command string. It can be used for:

- Debugging programs with DECTape output,
- reading data with parity errors on the tape,
- teaching, and general program listings.

DECUS No. 6-8

BELL STAR

C. B. Horan, The University of Western Australia Computing Centre, Nedlands, Western Australia

BELL STAR consists of two subroutines which operate in DDT submode on the user's Teletype. BELL outputs two Teletype bells, and STAR outputs a carriage return and an asterisk, thus enabling FORTRAN programs to be written to accept input in the standard CUSP command manner.

DECUS No. 6-9

LININV

D. W. G. Moore, The University of Western Australia Computing Centre, Nedlands, Western Australia

LININV is a matrix inversion and/or linear equation solver. All I/O is from the user's Teletype.

DECUS No. 6-10

DATE

I. D. Pugsley, The University of Western Australia Computing Centre, Nedlands, Western Australia

DATE returns today's date in form suitable for output from a FORTRAN program.

DECUS No. 6-11

MATINV

Submitted by: The University of Western Australia Computing Centre, Nedlands, Western Australia

Gauss-Jordan total pivotal elimination subroutine for matrix inversion, solution of linear equations with multiple right-hand sides, and determinant evaluation.

DECUS No. 6/8-12

PDP-8 Assembler for PDP-6

Henry Burkhardt, Digital Equipment Corporation, Maynard, Massachusetts

Assembles PDP-8 programs written in PAL on a PDP-6 using any I/O devices.

DECUS No. 6-13

Obsolete

DECUS No. 6-14

The Dots Playing Program

David Gross, Digital Equipment Corporation, Maynard, Massachusetts

The Dots Playing Program allows the PDP-6 computer to play the game of dots against a human opponent. This program illustrates the strengths and weaknesses of tree-searching methods and the methods of eliminating branches from the tree.

DECUS No. 6-15

DREDIT

William Meier, Applied Logic, Princeton, New Jersey

DREDIT is an editor for sequentially numbered files. Operation is similar to DEC's DECTape Editor. It permits copying of old files to new files so they can be used on devices other than DECTape.

DECUS No. 6/10-16

FILER

R. N. Freedman, Massachusetts Institute of Technology, Laboratory for Nuclear Science, Cambridge, Massachusetts

This program uses magtape as a large random access storage. Under Teletype control, it copies specified files from an input device onto magtape and later extracts desired files for further manipulation. The capacity of a magtape is much larger than DECTape, but the access time is still much shorter than card or paper tape files.

Minimum Hardware: PDP-6 or 10 with magtape

Source Language: MACRO-6

Storage Requirement: 2K

Restrictions: The program has been running only on Type 50 Tape Units, but should work on other units.

DECUS No. 6-17

FIT

C. L. Jarvis and D. G. Moore, The University of Western Australia Computing Centre, Nedlands, Western Australia

This subroutine has the following calling sequences: CALL FIT (XX,YY,K,A,SMR,L,M, DELTA). XX and YY are the observation arrays, K is the number of observations, A returns with Chebyshev coefficients, SMR returns with mean square residuals, L = order required, DELTA returns with the sum of squares of the residuals and M is the switch which is initially set to 1. If the fit of order L+1 is required, then if M is set to a value > 1 and L incremented. Less computation is required when the subprogram is reentered.

Source Language: FORTRAN IV

DECUS No. 6-18

DISUBS

M. J. Erickson, The University of Western Australia Computing Centre, Nedlands, Western Australia

DISUBS is a group of subroutines which allows easy access to the display and light pen from a FORTRAN IV program.

The following subroutines are available:

- INTAB (A,L)
- POINT (A,X,Y)
- LINE (A,X1,Y1,X2,Y2)
- VECONT (A,X1,Y1,X2,Y2)
- CHAR (A,B)
- SPOT (A,X,Y)

DECUS No. 6-18 (Continued)

FLOTE (A,Z)
GFLOTE(A,Z,K,L)
OFIX(A,K)
DISPLY (K,A,B,C,...)
LITEPN (L,X,Y)

To estimate the size required for an array in general, a point requires a full 36-bit word; a line whose length is equal to one-tenth of the screen width requires 18 bits; and each character requires 6 bits. The subroutines themselves require less than 1K.

Source Language: MACRO-6

DECUS No. 6-19

MXNOUT

D.W.G. Moore, The University of Western Australia Computing Centre, Nedlands, Western Australia

MXNOUT, a FORTRAN IV subroutine, will output an MXN matrix suitably partitioned for a 120-column printer.

Source Language: FORTRAN IV

DECUS No. 6-20

DTADDT

I. D. Pugsley, The University of Western Australia Computing Centre, Nedlands, Western Australia

DTADDT is a program, based on user-DDT, capable of examining or modifying any word or words on a DECtape. The primary use of DTADDT is for limited editing of dump files, but it may be used for modifying any part of a DECtape (files with any format), or transferring single blocks or small groups of blocks from one tape to another. Since all output to the user is on his Teletype, the program has a practical limitation on the number of words which may be examined or modified, which would be about 200 words. However, a DDT search may be extended over a very wide range.

Minimum Hardware: PDP-6 with one or two DECtapes, Teletype, 3K core

DECUS No. 6-21

Critical Path Scheduling

D.W.G. Moore, The University of Western Australia Computing Centre, Nedlands, Western Australia

This program, written in FORTRAN IV for the PDP-6, computes the earliest starts, latest starts, earliest finishes, latest finishes, total float and free float of jobs constrained

DECUS No. 6-21 (Continued)

by an arrow diagram network. Familiarity with arrow diagramming techniques is assumed.

Output from this program may be used as input to scheduling programs developed for limited resource problems.

Source Language: FORTRAN IV

Other Programs Needed: LSH, DATE (Subroutines)

DECUS No. 6-22

MEM2 and MEM4

R. H. Smith, The University of Western Australia Computing Centre, Nedlands, Western Australia

This program allows DECtape to be treated as a random access device. Storage on tape is in binary form. The FORTRAN calling program must have the statement - DIMENSION ARRAY (127).

Source Language: MACRO-6

Other Programs Needed: DISUBS (DECUS No. 6-18)

DECUS No. 6-23

TSUM, DERIV and CONPOL

Mr. Boundy, C. L. Jarvis, and D.W. G. Moore, The University of Western Australia, Nedlands, Western Australia

Chebyshev polynomial subroutines:

TSUM

This function evaluates -

$$A(1)/2 + A(2)*T(1) + \dots + A(N+1)*T(N)$$

DERIV

This subroutine calculates the derivative of the polynomial Chebyshev coefficients at a point, i.e. the first derivative of $A(1)/2 + A(2)*T(1) + \dots + A(N+1)*T(N) = C(1)/2 + C(2)*T(1) + \dots + C(N)*T(N-1)$. The C(I)'s overwrite the A(I)'s.

CONPOL

This subroutine converts -

$$A(1)/2 + A(2)*T(1) + \dots + A(N+1)*T(N) \text{ to } C(1) + C(2)*X + C(3)*X**2 + \dots + C(N+1)*X**N$$

(i.e. the equivalent polynomial)

In all cases, maximum order of polynomial is 25.

DECUS No. 6-24

CHISQ

N. S. Stenhouse, The University of Western Australia
Computing Centre, Nedlands, Western Australia

This program calculates chi-squared up to order 6×12 on users TTY. Yates corrections are applied for 2×2 matrix.

Source Language: FORTRAN IV

Other Programs Needed: STAR (Subroutine)

DECUS No. 6-25

IKCLOK

R. L. Macmillan, The University of Western Australia
Computing Centre, Nedlands, Western Australia

This is a demonstration program in which the date and time are converted from their number form into a clock face on the display. Display routines used are taken directly from DISUBS, (DECUS No. 6-18)

Minimum Hardware: Power line frequency must be 50 CPS.

Storage Requirement: 1K core

Source Language: MACRO-6

Other Programs Needed: DISUBS (DECUS No. 6-18)

DECUS No. 6-26

WIRE

Richard J. Plano, Rutgers - The State University, New Brunswick, New Jersey

WIRE is a program designed to help with the tedious and detailed bookkeeping involved in wiring digital circuits. It assumes the circuit is known with all module and pin assignments made. Given this information, it will optimize the wiring connections in the sense of making the wire lengths short, bussing where advantageous, and keeping wiring between rows to a minimum. It assumes 32 modules in a row with 15 possible connections on each (as for Digital Equipment Corporation Flip Chip modules neglecting pins A, B, C, which generally carry power and ground).

It can then produce a variety of output including a list of loops of connected points, a list of busses and grounds, a wiring list which contains the number of connections on each pin to which a connection is about to be made, and the length of wire needed for the connection. A detailed map can also be printed out showing both ends of each connection as well as busses, grounds, and module names.

DECUS No. 6-26 (Continued)

An updating or editing facility is also provided so that the map and loops can be kept up-to-date as the circuit is modified or debugged.

The program is written for a PDP-6 computer using the DEC multiprogramming system. It requires approximately $(6 \div N) * 1000$ decimal words of core, where N is the number of rows of modules. The storage is automatically expanded at run time. Running time for a 20-row circuit, including all print out and optimizing but no editing, is approximately 20 minutes.

Minimum Hardware: PDP-6, Teletype, DECtape and Line Printer

DECUS No. 6-27

Obsolete

DECUS No. 6/10-28

CMPSRC

Joan Lechnor, Applied Logic Corporation, Princeton, New Jersey

This program compares two (MACRO-6 or similar) source files and prints a list of differences in readable form. Insertions and deletions are handled. The program is run using DDT.

Storage Requirement: 5K and variable size buffer.

DECUS No. 6/10-29

LISP 1.5 for PDP-6/10

T. Eggers, Digital Equipment Corporation, Maynard, Massachusetts

LISP is a general-purpose programming language which utilizes a list-structure storage scheme for both program and data. It is primarily suited for manipulation of symbolic quantities, although it offers complete fixed and floating point arithmetic as well. LISP functions may be recursive.

LISP is used effectively for arithmetic simplification and for symbolic differentiation and integration. It has been used extensively for studies in artificial intelligence, man-machine communication, and solution of game-playing problems.

On PDP-10 systems, the LISP interpreter runs under control of the system Monitor. It includes device-independent input/output capability and the ability to process character-by-character input. The system also includes a large set of LISP functions as subroutines. All storage made available to LISP will be used for the data structure.

The documentation available is supplementary to the M.I.T. Press LISP 1.5 Manual.

DECUS No. 6/10-29 (Continued)

Minimum Hardware: 16K PDP-6 or 10 with DECTapes.

Source Language: MACRO-10

Storage Requirement: 9K or more

DECUS No. 6/10-30

COBOL

Submitted by: Applied Logic Corporation, Princeton, New Jersey

NOTE: There is a temporary hold on distribution until further notice. Contact the DECUS Program Librarian regarding availability.

DECUS No. 6-31

CARD

C. B. Horan, The University of Australia Computing Centre, Nedlands, Western Australia

CARD, a FORTRAN IV function, returns a false answer if either the device with the logical name LPT or the logical name CDR is a DECTape.

It's intended use was so that a program may request a file name when one of these assignments is made.

Source Language: MACRO-6

DECUS No. 6-32

DISDAT

C. B. Horan, The University of Western Australia Computing Centre, Nedlands, Western Australia

This program calls DISUBS (DECUS No. 6-18) to display data at current display position. Display parameters must be set by calling the program.

Source Language: MACRO

Other Programs Needed: DISUBS (DECUS No. 6-18)

DECUS No. 6-33

PLIST

R. L. Macmillan, The University of Western Australia Computing Centre, Nedlands, Western Australia

PLIST is a series of subroutines enabling the user to manipulate up to five push-down lists from a FORTRAN IV program.

DECUS No. 6-33 (Continued)

Arrays must be set up within the user's program in which the push-down lists reside. The size of these arrays can be approximated by using the following:

Each 'PUSH' onto the PDL uses 1 location, but for each 'PUSHJ' called, 17 locations are used.

Source Language: MACRO-6

DECUS No. 6-34

IBYTE

D. W. G. Moore, The University of Western Australia Computing Centre, Nedlands, Western Australia

Bytes manipulation routines for FORTRAN IV are routines to allow a FORTRAN IV user to take successive bytes from an array. Up to 5 arrays may be manipulated simultaneously.

Source Language: MACRO-6

DECUS No. 6-35

CUBIC*, CUBTTY and CHRTTY

A. Peters, The University of Western Australia Computing Centre, Nedlands, Western Australia

*Subroutine CUBIC from Monash University

The subroutine CUBIC evaluates the roots of a cubic equation by Cardans method.

CUBTTY is a Teletype routine which uses subroutine CUBIC to solve a cubic equation.

CHRTTY evaluates the characteristic equation of a 3 x 3 matrix and, using CUBIC, solves the equation and prints out the eigenvalues of the matrix.

Source Language: FORTRAN IV

DECUS No. 6-36

RANDOM

R. L. Macmillan, The University of Western Australia Computing Centre, Nedlands, Western Australia

This is a subroutine for generating real random numbers.

Source Language: MACRO-6

Storage Requirement: 28 words

DECUS No. 6-37

PACK, UNPACK, REPACK

D. W. Goodall, The University of Western Australia
Computing Centre, Nedlands, Western Australia

These three subroutines, written in MACRO-6 for use in FORTRAN IV programs, enables integer data from a one-dimensional array to be packed in bytes of any chosen size into the successive words in a specified section of a two-dimensional array, and for individual entries to be retrieved or replaced.

DECUS No. 6/10-38

LISP 1.6 for PDP-6/10

NOTE: There is a temporary hold on distribution until further notice. Contact the DECUS Program Librarian regarding distribution.

DECUS No. 6/10-38.1

ALVINE

Stanford University Artificial Intelligence Laboratory,
Stanford, California

Alvine, Allen's very inchoate editor, is an interim string search editor for LISP and the PDP-6. A very simple command language is used for processing character strings. One can insert and delete arbitrary strings and store these strings on various I/O devices.

DECUS No. 6/10-39

GIST

Don A. Witcraft, Digital Equipment Corporation, Maynard,
Massachusetts

GIST (General Interpretive String Translator) for the PDP-6/10 contains the 1964 version of TRAC*, variable precision JOSS** type arithmetic primitives, ASCII file primitives, and primitives to interface with the PDP-6 time-sharing system. Complete documentation is contained in the source file.

*TRAC is a registered trademark of the Rockford Research Institute.

**JOSS is a registered trademark of the RAND Corporation.

Minimum Hardware: PDP-6 or PDP-10

DECUS No. 6/10-40

SCOPE TECO

Richard N. Freedman, Massachusetts Institute of Technology
LNS, Cambridge, Massachusetts

This program is a modification to the standard DEC Program Library version of TECO, (DEC-10-ETEA-D). It is usable with the Type 30 Scope.

Minimum Hardware: PDP-6 or PDP-10 with
Type 30 Scope.

DECUS No. 6/10-41

Rapid Program Generation System

W. F. Weiher, Stanford University, Stanford, California
and R. P. Gruen, Digital Equipment Corporation, Palo
Alto, California

Several new commands have been added to the DEC PDP-6/10 Time Sharing System to facilitate rapid program generation. These commands (EXECUTE, DEBUG, COMPILE, LOAD, and CREF) allow the time-sharing user to specify the names of the programs which he wishes to use and then delegate to the Rapid Program Generation System the task of compiling, assembling, and loading these programs, as needed, without requiring the user to type CUSP commands. The implementation makes use of an RPG CUSP and some small files on the disk; only nine additional instructions have been added to the Time-Sharing Monitor.

Minimum Hardware: PDP-6 or PDP-10 with Disk

Source Language: MACRO, FAIL

DECUS No. 6/10-42

LST9: A Program to List PDP-9 DECtapes on a PDP-10
Line Printer

Larry Wade, Digital Equipment Corporation, Maynard,
Massachusetts

Given the command "ASSIGN dev LPT", this program will list the contents of a specified PDP-9 DECtape file on a PDP-10 line printer.

Minimum Hardware: PDP-6 or PDP-10 with DEC-
tape and Line Printer

Source Language: MACRO-10

DECUS No. 6/10-43

PDP-8 Simulator on the PDP-10

This program is available on DECtape in PDP-6 or PDP-10 format. No documentation or source listing accompanied the submitted program.

Note: PDP-6 format - 1 DECtape
PDP-10 format - 2 DECtapes

DECUS No. 6/10-44

LaPlace Transform Computer Program

R. Soli, Missile Systems Division, Raytheon Co., Bedford, Massachusetts

This program is intended to be an engineering tool; it is easy to use and plots the result. The program requires a reasonable knowledge of LaPlace or Fourier transforms as well as some ability in block diagram manipulation. A minimum of knowledge is required about FORTRAN IV; all that is needed is the ability to understand a FORTRAN statement such as:

$$G1 = (T1*S + 1.) / (T2*S + 1.)$$

The user describes the various portions of his system using system parameters and S to form transfer functions. Then a block diagram reduction is done to combine the various transfer functions such as:

$$G2 = G1 / (1. + G1)$$

The documentation contains figures demonstrating examples of uses of the program.

Minimum Hardware: PDP-10 with card reader and line printer

Source Language: FORTRAN IV

PDP-10
INDEX

PDP-10 INDEX

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10-1	UT6RD	D (1)	
10-2	SERG: An Interactive Program to Perform Simple Regression Analysis	D (1)	X
10-3	DTLOTS: Lots of Copies of a DECtape	D (1)	
10-4	ROCK: A Sort/Merge Program for the PDP-10	D (1)	
10-5	CONVRT	D (1)	
10-6	SCHOLAR-TEACH	D (2)	

Code

A - ASCII Source
B - Binary Object
D - DECtape

H - High Binary Loader
L - LINCtape
LL - Linking Loader

R - RIM
S - Symbolic (Source)
X - Listing Available with
Write-up
XX - Listing Available at a
Handling charge

Write-ups are available for all programs.

PDP-10
PROGRAM ABSTRACTS

PDP-10 PROGRAM ABSTRACTS

DECUS No. 10-1

UT6RD

R. Clements, Digital Equipment Corporation, Maynard, Massachusetts

UT6RD is a PDP-10 utility program intended to replace CONVRT in a limited set of cases.

Although it is not as general as CONVRT it is much faster for those cases it does handle. Its function is to read PDP-6 format DECtapes and put the program onto the disk from tape as individual files.

Minimum Hardware: PDP-10 with DECtape and Disk

DECUS No. 10-2

SERG: An Interactive Program to Perform Simple Regression Analysis

Ross T. Newkirk, Computing Centre, University of Western Ontario, London, Ontario, Canada

SERG uses the least squares method to fit a regression equation to a data set of up to 100 pairs of data entries. Input listings and editing features are provided. The output is as follows: sample size, input data typed in "normalized form" (optional), sums for each of the two variables, sums of squares for each of the two variables, cross product of the two variables, means for each of the two variables, variances for each of the two variables, correlation between the first and second variable, regression equation relating the second variable to the first, table of residuals (optional), and standard error of residuals.

Minimum Hardware: PDP-10 with Teletype

Source Language: FORTRAN IV

Restrictions: Any Teletype input is valid except ↑ Z which terminates the program. The program is entirely interactive and instructions for its use are typed as required.

DECUS No. 10-3

DTLOTS: Lots of Copies of a DECtape

Robert Clements, Digital Equipment Corporation, Maynard, Massachusetts

This program will rapidly copy and verify a DECtape onto a

number of new DECtapes by wasting a lot of disk space as a scratch file.

Minimum Hardware: PDP-10 with Disk, 2 or more DECtapes, and line printer (optional)

Other Programs Needed: 10/50 Monitor (DEC-10-MTC0)

Source Language: MACRO-10

Storage Requirement: 3K, or more for efficiency

DECUS No. 10-4

ROCK: A Sort/Merge Program for the PDP-10

Robert Clements, Digital Equipment Corporation, Maynard, Massachusetts

ROCK is a specific-purpose sort/merge program for ASCII text files of a particular nature. It uses the disk in the same way that a conventional sort/merge uses magnetic tapes. It is not a "sort/merge package", but can be modified for a number of useful tasks. The name comes from its initial task, that of sorting the author's rock-and-roll catalog.

Minimum Hardware: PDP-10 with Disk and KE-10 (Byte Instructions)

Other Programs Needed: Monitor (DEC-10-MKB0)

Source Language: MACRO-10

Storage Requirement: 4K minimum to 10K maximum, plus disk scratch files

DECUS No. 10-5

CONVRT

P. Land and D. Nixon

Submitted by: N. Pappas, Digital Equipment Corporation, Maynard, Massachusetts

CONVRT takes PDP-6 format DECtapes as input and produces PDP-10 format DECtapes as output and vice versa.

Minimum Hardware: PDP-10

Source Language: MACRO-10

Storage Requirement: 3K

Restriction: Available only on PDP-10 format DECtape

DECUS No. 10-6

SCHOLAR-TEACH

The Boeing Company, Aerospace Group, Missile and Information System Division, Seattle, Washington

SCHOLAR-TEACH is a generalized system for computer-assisted instruction. The system is designed to provide for both the easy on-line construction of lessons on a variety of subjects, and the actual presentation of the completed lessons to students at communications terminals remote from the computer.

Other Programs Needed: PDP-10 System Monitor
(DEC-10-MKBØ)

Source Language: MACRO-10

**PDP-7 and 7/9
INDEX**

PDP-7 and 7/9 INDEX

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7/9-4c	PTSCOPE, PTPEN, PTPLOT, CALIBRATE, and LISTEN	A,R	X
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7-22	LEGFIT	A	X

Code

A - ASCII Source
 B - Binary Object
 D - DEctape

H - High Binary Loader
 L - LINCtape
 LL - Linking Loader

R - RIM
 S - Symbolic (Source)
 X - Listing with write-up
 XX - Listing available at a handling charge

Write-ups are available for all programs.

NOTE: PDP-9 Users using programs marked 7/9 should use the Basic Software with these programs.

<u>DECUS NO.</u>	<u>TITLE</u>	<u>TAPES AVAILABLE</u>	<u>LISTING</u>
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7-48	Magnetic Tape Device Handlers for the PDP-7 Advanced Software System	D (1)	
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**PDP-7 and 7/9
PROGRAM ABSTRACTS**

PDP-7 and 7/9 PROGRAM ABSTRACTS

DECUS No. 7-1

Obsolete

DECUS No. 7-2a

FAST 7 START

Philip Bevington, Stanford University, Stanford, California

FAST 7 (Fast Acquisition of System Tapes) is a monitor for retrieving frequently used programs from DECTape. It includes five programs:

1. FAST Loader
2. FAST Writer
3. FAST Reader
4. FAST Low Writer
5. FAST Low Reader

DECUS No. 7-3

CUS - Console Utility System

Allen Rousseau, C. W. Adams Associates

CUS is an octal debugging and utility system consisting of the following routines:

1. Octal Correcting Routines
2. Word Search Routines
3. Octal Dump
4. Compare Tape Equal Routine
5. Jump Options
6. Transfer Routine
7. Fill Routine

DECUS No. 7/9-4c

PTSCOPE, PTPEN, PTPLOT, CALIBRATE, and LISTEN

Philip Bevington, Stanford University, Stanford, California

PTSCOPE, PTPEN, PTPLOT, CALIBRATE and LISTEN are FORTRAN subroutines which provide oscilloscope displays and X-Y plots of single-parametric spectra using the Type 34 Display.

DECUS No. 7-5

KINEMATICS

Philip Bevington, Stanford University, Stanford, California

KINEMATICS is a FORTRAN subroutine for use with nuclear

DECUS No. 7-5 (Continued)

reactions to transform energies, angles, and cross sections non-relativistically between the laboratory system and the center-of-mass system.

DECUS No. 7-6

CGC Function

Philip Bevington, Stanford University, Stanford, California

The CGC (Clebsch Gordon Coefficient) subprogram is designed to be used with FORTRAN programs running under the Operating Time System on the PDP-7. It calculates angular momentum vector coupling coefficients with the phase conventions of Condon and Shortley.

DECUS No. 7-7

INPUT ND 180, INFLT ND 180, INPUT VICTOREEN, and INFLT VICTOREEN

Philip Bevington, Stanford University, Stanford, California

These FORTRAN subroutines read punched paper tapes of data from nuclear data multichannel pulse-height analyzers and store them in fixed or floating point arrays. They are in mixed FORTRAN and PDP-4/7 symbolic languages. They utilize EAE instructions.

DECUS No. 7/9-8a

FPTSCOPE, FPTPEN, and FPTPLOT

Philip Bevington, Stanford University, Stanford, California

These FORTRAN subroutines provide oscilloscope display and X-Y plots of single parameter spectra using the Type 34 Display. They are similar to DECUS No. 7/9-4c, but the display spectra are stored in floating point mode.

DECUS No. 7-9a

Scope Text Editor MK III for the PDP-7/340

R. E. Thomas and N. E. Wiseman, Cambridge University, England

A general-purpose, on-line text editing program for ASCII paper tapes. It is controlled by commands issued via the lightpen and keyboard. Monitoring of the text is provided by the CRT which serves as a "window" into a selected area of the text.

DECUS No. 7-10

DECPUN: Decimal Integer Punch Routine

Luther C. Abel, Rensselaer Polytechnic Institute, Troy, New York

DECPUN permits raw data, as acquired by a PDP-7 in an on-line installation, to be punched out. It treats all numbers as positive; allowing for the full 2¹⁸ machine capacity.

DECUS No. 7-11

POSPNT: Positive Decimal Integer Print Routine

Luther C. Abel, Rensselaer Polytechnic Institute, Troy, New York

It is similar to DECPNT, except all numbers are treated as positive. It is available in two versions: POSPNT I in which initial 0's are printed, and POSPNT II which suppresses initial 0's. Both versions call TDGIT from the Teletype Output Package (DEC-7-10-0); POSPNT II also calls TSP.

DECUS No. 7-12

Punch Output Package

Luther C. Abel, Rensselaer Polytechnic Institute, Troy, New York

This is an output package for punching IBM compatible 7-line paper tape code, as used with the IBM 1620 or the IBM Model 26 tapecard converter and punch. Routines included are: PDIGIT to punch one BCD digit on tape (called with digit in AC, adds correct parity, etc.), PUNSP to punch a space (842) character, PUNEOL to punch an end-off-line (column 8) punch, PUNLDR to punch a leader on the tape (128 lines of all 7 columns). A routine OPUN must be supplied to punch each character as generated by the package.

DECUS No. 7-13

340 Display Programming Manual

Stanford C. Adler, Bronx, New York

This manual provides a single reference containing information required to program the 340 Display. It summarizes information contained in other DEC publications, and assumes that the user is familiar with the PDP-7.

DECUS No. 7-14

ISENSE

Philip Bevington, Stanford University, Stanford, California

ISENSE, a FORTRAN function, permits the use of AC switches on the PDP-4/7 or the SCANS Idiot box spectrum-stripping switches as sense switches. It also uses the Idiot box display scale switch with scope display, or plots programs as a PTSCOPE (DECUS No. 7/9-4c).

DECUS No. 7-15

FORTTRAN Patch for EAE Arithmetic

Philip Bevington, Stanford University, Stanford, California

This subroutine is a modification to the FSWMIO FORTRAN for the PDP-4/7. It uses the EAE arithmetic to increase the speed of computation by a factor of 2.5 for two-word mode.

DECUS No. 7-16

Single-Level Breit Wigner Fit

P. Paul, Stanford University, Stanford, California

This FORTRAN program calculates the energy dependence and size of the total cross section of a single isolated resonance in the R-matrix formalism of nuclear theory. Included are subroutines for calculating Coulomb wave functions and phase shifts.

DECUS No. 7-17

CREASE

Philip R. Bevington, Stanford University, Stanford, California

CREASE transfers source programs and data from punched cards to paper tape.

DECUS No. 7-18

Paper Tape Verifier (with EAE)

Phyllis Niccolai, Carnegie Institute of Technology, Saxonburg, Pennsylvania

Paper Tape Verifier verifies each line of a master tape against its corresponding line on a duplicated paper tape. The master tape is read into the computer and stored two lines per word in memory. Two lines of the duplicated paper tape are then read and compared with their corresponding lines on the master tape in memory. In the event of an error, the contents of the two lines from the duplicated paper tape are typed in octal and, immediately below, the contents of the same two lines on the master tape are also typed in octal.

Minimum Hardware: 8K PDP-7 with EAE

DECUS No. 7-19

DUMP ND 180 and FDUMP ND 180

Philip Bevington, Stanford University, Stanford, California

This subroutine transfers data from the memory of a Nuclear Data 180 (or 181) Multichannel Pulse-Height Analyzer and deposits the spectrum in a special matrix in fixed-point mode.

DECUS No. 7-20

DECtape Copy Routine

James D. Pitts, Digital Equipment Corporation, Maynard, Massachusetts

This program reproduces the data information from one DEC-tape reel (master) to another (copy) and verifies the information. A tape on which timing and mark tracks are written should be used.

Other Programs Needed: PDP-4/7 DECtape Subroutine (Digital 4/7-22-10).

DECUS No. 7-21

Reaction Kinematics

Philip Bevington, Stanford University, Stanford, California

This FORTRAN program is used with nuclear reactions to tabulate the transformations of energies, angles, and cross sections nonrelativistically between an operator at the console of a computer and the subroutine KINEMATICS (DECUS No. 7-5) to specify the input parameters and output format.

DECUS No. 7-22

LEGFIT

Dale Heikkinen, Stanford University, Stanford, California

LEGFIT, a FORTRAN program, performs a least-squares fit to data with a Legendre polynomial expansion of the form:

$$Y(\theta_i) = \sum_{L=0}^N A_L P_L(\cos\theta_i).$$

The expansion can contain both even and odd terms or just even terms, depending on the user's option. The program uses the subroutine MATINV for matrix inversion.

DECUS No. 7-23

OUTFLT

Philip Bevington, Stanford University, Stanford, California

This FORTRAN subroutine punches arrays of floating point numerical data with an output format identical with that from Nuclear Data 180 Multichannel Pulse-Height Analyzer (in ASCII code).

DECUS No. 7-24

ENLOSS

Dale Heikkinen, Stanford University, Stanford, California

ENLOSS calculates the Kinematics of nuclear reactions with provision for a determination of the energy loss of the outgoing light particle due to passage through foils.

DECUS No. 7/9-25

PDP-7/9 DICE Playing Game

James D. Pitts, Digital Equipment Corporation, Maynard, Massachusetts

This program enables a user to play the game DICE, using the computer and ASR-33. It will work on a PDP-9 using the Basic Software.

DECUS No. 7-26

Obsolete

DECUS No. 7-27

Paper Tape Verifier (without EAE)

A. C. Kilgour, University of Edinburgh, Scotland

This program is an amended version of DECUS No. 7-18, in which all EAE instructions have been replaced by calls to subroutines. The specification is the same as for DECUS 7-18 except that storage is increased to 411₈ and EAE is not required.

DECUS No. 7-28

.IODEC Revision

Phyllis F. Niccolai, Carnegie Institute of Technology, Saxonburg, Pennsylvania

This revision of the PDP-7 library program .IODEC reduces the memory requirement of the relocatable library program

DECUS No. 7-28 (Continued)

from 1007₁₀ words to 538₁₀ words. Only binary transfers of data are permitted and operation codes 4 - 8 are replaced with a fast search option.

Minimum Hardware: 8K PDP-7, EAE, KSR-33 Teletype, and 2 DECTapes

Other Programs Needed: FORTRAN Main Program, FORTRAN OTS and Subroutines; as called by main program

DECUS No. 7-29

Non-FORTRAN DECTape System

K. W. Bixby, Philco-Ford Corporation, Newport Beach, California

This DECTape System was designed to provide a relatively easy means for running and storing of machine language programs on and off DECTape. The system is loaded from DECTape via a bootstrap that is on paper tape in HRI mode. Programs are called in through the system's keyboard monitor section. The system has the ability to insert new programs, change existing programs, copy the entire DECTape with another one, and generate just the system itself onto a new DECTape.

Minimum Hardware: 8K PDP-7, Dual DECTape Transport Type 555 and DECTape Control Type 550

Storage Requirement: Occupies 15600₈ - 17770₈ and DECTape loader occupies 7603₈ → 7761₈

DECUS No. 7/9-30

GRASP: Gaussian Reduction and Analysis of Spectrum Peaks

Albert Anderson, Stanford University, Stanford, California

GRASP is a FORTRAN program to make least-squares fits to peaks in pulse-height spectra with a Gaussian shape plus a quadratic background.

This program can be used on the PDP-9 using Basic Software.

Minimum Hardware: 8K PDP-7/9, EAE, Type 34 Display, and Type 370 Light Pen

Other Programs Needed: DECUS Nos. 7-4a, 7-7, and 7-14

Storage Requirement: Entire Memory

DECUS No. 7-31

Display N Letter Word

Allan M Cohen, New York University, New York City, New York

This program will display any word with the letters arranged in any desired sequence. Because of this capability, the program is useful for investigating perceptual processing in man. It is available for 5-, 10-, and 20- letter random displays.

Minimum Hardware: PDP-7, Type 340 Precision Display and Type 342 Symbol Generator driving a Fairchild CRT equipped with a P-24 phosphor. However, the program is adaptable to any fast phosphor, computer-controlled display.

DECUS No. 7-32

Obsolete

DECUS No. 7-33

SLPI: Simple List Processing Package

Neil E. Wiseman, University Mathematical Laboratory, Cambridge, England

This package consists of routines for the administration of unidirectional list structures. The subroutines allow you to: Initialize Package, Initialize a List, Move Forward, Push Down, Pop Up, Enter Subroutine, Exit Subroutine. The list structures are stored in a slightly unorthodox manner intended to conserve core space. An automatic "garbage collector" is provided and certain space jams may be monitored to be cleared by user-supplied subroutines.

Storage Requirement: Approximately 290₁₀ registers

DECUS No. 7/9-34

BESSEL

Albert Anderson, Stanford University, Stanford, California

BESSEL is a FORTRAN II subprogram to calculate spherical BESSEL and spherical Neumann functions accurate to five significant figures.

This program can be used on the PDP-9 with Basic Software.

Storage Requirement: 425₈ locations

Restrictions: Written in two-word mode

DECUS No. 7/9-35

Coulomb Excitation

J. L. Black, Stanford University, Stanford, California

This FORTRAN II program calculates Coulomb excitation cross sections for heavy-ion beams. The Coulomb excitation angular correlation attenuation coefficients a_2 and a_4 are also calculated.

This program can be used on the PDP-9 with Basic Software.

Minimum Hardware: 8K memory

Storage Requirement: Entire Memory

DECUS No. 7/9-36

Finite Geometry Attenuation Coefficients

J. L. Black, Stanford University, Stanford, California

This is a FORTRAN II program for calculating angular correlation attenuation coefficients and efficiencies for Na I (T_L) or Li(Ge) detectors.

This program can be used on the PDP-9 with Basic Software.

Minimum Hardware: 8K Memory

Storage Requirement: Entire Memory

DECUS No. 7/9-37

DIRECS and LUBITZ

Albert Anderson, Stanford University, Stanford, California

Direct REaction Cross Section, a FORTRAN II program, calculates PWBA (Plane Wave Born Approximation) predictions of distributions for reaction products from direct nuclear reactions such as stripping and pick-up. It utilizes a FORTRAN subroutine (LUBITZ) which calculates the parameters found in Lubitz's table as described in MacFarlane and French, Rev. Mod. Phys. 32, 567 (1960).

LUBITZ is a FORTRAN subroutine to calculate the function \mathcal{Q}_{ℓ} -TAB (tabulated by C. R. Lubitz) which determines the PWBA angular distribution of nuclear reaction products in stripping or pick-up reactions involving the transfer of one nucleon. The subroutine generates spherical Bessel functions by two different methods for speed and accuracy.

This program can be used on the PDP-9 with Basic Software.

Minimum Hardware: 8K memory

Other Programs Needed: DIRECS requires FPTSCOPE, LISTEN, FPTPEN, FPTPLOT, CALIBRATE (DECUS No. 7/9-8a)

Storage Requirement: 1536_g for LUBITZ

Execution Time: 150 msec/angle for LUBITZ

Restrictions: Some of the subroutines listed above assume the availability of EAE for proper operation.

DECUS No. 7/9-38

Gamma Ray Peeling Program

Friedrich Riess, Stanford University, Stanford, California

This FORTRAN II program makes a least square fit to a peak in a gamma-ray pulse-height spectrum with a line shape interpolated from three standard line shapes, combined with folding in a Gaussian, Lorentzian or rectangular function.

This program can be used on the PDP-9 with Basic Software.

Minimum Hardware: 8K memory

Other Programs Needed: PTSCOPE, LISTEN, PTPLOT, CALIBRATE, (DECUS No. 7/9-4a) INPUT ND 180 (DECUS No. 7-7)

Storage Requirement: Entire Memory

Restrictions: Some of the subroutines listed above assume the availability of EAE for proper operation.

DECUS No. 7-39

Store Display Program

Nigel A. Rose, Computer-Aided Design Project, University of Edinburgh, Scotland

This program allows one to examine the contents of specified addresses in the core store, using the Type 340 Display. The contents are displayed in both mnemonic and octal form.

Minimum Hardware: PDP-7 with Model 33/35 Teletype, Type 340 Display with Type 347 Subroutine Option.

DECUS No. 7-40

DUEL

M. S. Peterson and J. C. Viner, University Mathematical Laboratory, Cambridge University, England

"DUEL" is a game, played by two people, using the PDP-7 and 340 Display. Each person operates five switches which control the movement and gun firing of his own "space ship" on the display screen. The object is to destroy the enemy ship by the firing of bullets.

Minimum Hardware: PDP-7 with 340 Display

DECUS No. 7-41

FLAP: A Two-Pass Assembly Program for the PDP-7

P. Fleck, M.I.T., Lincoln Laboratory, Lexington, Massachusetts

This assembler accepts a source program prepared in ASCII code on paper tape, or in Hollerith code on punched cards, or in packed Hollerith code on magnetic tape. This source program is read in two passes and produces an assembly listing and a binary object paper tape in absolute, RIM or relocatable format. If 16K memory is used, the binary program is assembled in core memory ready to run.

The FLAP assembler can also be used as a card or paper tape (ASCII) or mag tape (FLAP format) lister. Since the assembler is not used, any format can be used on the input, with the qualification that for paper tape anything after the 80th character after each carriage return will be listed on a new line, and only the symbols for which characters exist in Hollerith will be listed.

Minimum Hardware: PDP-7 with EAE

DECUS No. 7-42

The ML/I Macro Processor

P. J. Brown, University Mathematical Laboratory, Cambridge, England

ML/I is a general macro processor. It is general in the sense that it can be used to process any kind of text. The text may be in any programming language or natural language, or it may be numerical data. The most important use of ML/I is to provide the user with a simple means of adding extra statements (or other syntactic forms) to an existing programming language in order to make the language more suitable for his own field of application. This process of extension may be carried to the level where the extended language could be regarded as a new language in its own right. Other uses of ML/I are program parameterization (e.g. a parameter might determine whether debugging statements are to be included in a program) and various applications in text editing or correction and data format conversion. ML/I is also suitable for use as the final pass of a compiler.

Minimum Hardware: Basic PDP-7
Source Language: MACRO-7
Storage Requirement: 8K

DECUS No. 7-43

A PDP-7 Music System

Ronald F. Brender, Logic of Computers Group, The University of Michigan, Ann Arbor, Michigan

This system consists of a pair of programs which produces four part music on the PDP-7. One program "performs" the music, while the other translates from symbolic musical text to the form required by the music player program. Four independent simultaneous parts in the frequency range 1 to 2000 Hz are produced.

DECUS No. 7-43 (Continued)

Complete instructions and examples include a concert of seven pieces from Bach to the Lovin' Spoonfuls. These programs are easily adapted to PDP-4 or PDP-9.

Minimum Hardware: PDP-7 with EAE

DECUS No. 7-44

An Interrupt Compatible DDT

Ronald F. Brender, Logic of Computers Group, The University of Michigan, Ann Arbor, Michigan

A modified DDT is provided which facilitates the debugging of programs using the interrupt hardware of the PDP-7. Interrupt and teleprinter flag status are saved, optionally restored at breakpoints, and can be specified when starting execution. Several additional commands are provided to control these features.

Minimum Hardware: 4K PDP-7

Storage Requirement: Approximately 1500 words plus user symbol table - about the same as Basic DDT

DECUS No. 7-45

FORTTRAN Plotter Library

Taketora Yamagata and Kazuhiro Hoshi, Institute for Nuclear Study, University of Tokyo, Tokyo, Japan

This program is a library system for an incremental Graphic Plotter and a PDP-7, and is used as part of the FORTRAN II I/O library. The program calling formats are similar to those for the IBM Graphic Plotter Routines enabling those acquainted with the IBM Graphic Plotter System to use the present system with ease.

The library consists of ten subroutines produced in a PDP-7 FORTRAN II library format. Input data which represent coordinates or lengths should be given as floating point numbers in units of millimeters; and that which represent angles, as floating point numbers in units of degrees.

The subroutines are:

PLOT	PLOTS	FACTOR	OFFSET	WHERE
NUMBER	LETTER	SCALE	AXIS	LINE

Minimum Hardware: 8K PDP-7 with Incremental Plotter and Control Type 350
Storage Requirement: 3532, including SINP, COSP Routines

Restrictions: Limited to three-word mode.
Other Programs Needed: PDP-7 FORTRAN II System

DECUS No. 7-46

Symbolic Tape Editor with Text Display

Bernhard Skaali, Oslo University, Oslo, Norway

This program enables the operator to inspect seven lines of text on the scope. It is a modification of the DECTape Editor with limited changes. The most significant being the C (change) command: the new text is inserted before the old one is deleted. The format of the lines displayed is that of a program listing, with an operator option to display the lines in three different ways.

Storage Requirement: 7502₈ locations

DECUS No. 7-47

Macro Dfinitions for the ML/I Macro Processor

Ronald F. Brender, Logic of Computers Group, The University of Michigan, Ann Arbor, Michigan

A set of macro definitions is provided for use with ML/I. It provides for extended reference instruction (e.g. single subscripting as in LAC A(B)), conditional transfers of the ALGOL type (e.g. IFAEB THEN... ELSEIF... ELSE...), loops with a logical terminating condition (e.g. THRU LABEL FOR X = (1) STEP (1) UNTIL X G MAX), and simple expressions using only + and - (e.g. SET DELTA = X + A(B) - (1)). The resulting source program is assembled with the DEC Assembler.

This package makes extensive use of the many sophisticated features of ML/I. Minimum Hardware: 8K PDP-7
Other Programs Needed: ML/I Macro Processor

DECUS No. 7-48

Magnetic Tape Device Handlers for the PDP-7 ADVANCED Software System

John W. Cox, Francis W. Keller and Daniel A. Brody, University of Tennessee, Memphis, Tennessee

This program is set of magnetic tape device handlers designed and written for a PDP-7 with an EAE, a 57A controller and from one to eight 545 tape transports. These routines were specifically written to be used with a FORTRAN IV users' program and do not provide for all of the data modes and functions normally available to a MACRO user's programs. They are, however, structured in a modular fashion to allow as much flexibility as possible.

Each device handler contains only the necessary logic for checking and converting data for I/O transfers since a common routine (MT.XCT) is used to perform all device level communications and to control all I/O data transfers. Error messages and error recovery procedures are also controlled by MT.XCT.

By having each device handler call MT.XCT to perform all hardware communication, any desired combination of device

DECUS No. 7-48 (Continued)

handlers can be used in the same program. If two device handlers are desired on the same tape transport, they must be assigned to different .DAT slots. Care should be taken to ensure the proper assignment of device handlers prior to loading the program since the particular device handler assigned determines, to some extent, the mode of data on the tape.

Minimum Hardware: 8K, EAE, 57A Magnetic Tape Controller and a skip-on-job-done flag IOT (706401), (a hardware modification).

Other Programs Needed: ADVANCED Software System

DECUS No. 7-49

ONER Mark III - Single Parameter Pulse Height Analysis Program

B. J. Allen, G. P. Upex and G. D. Trimble, Australia Atomic Energy Commission Establishment, Lucas Heights, Australia

This program is a significantly modified version of Digital's Single Parameter Analysis program. It is described in the Australian Atomic Energy Report, "Analysis of Ge(Li) Gamma Ray Spectra with an On-Line Computer", provided with the program. It has been extended to include a number of new features. It is written in symbolic language and is divided in a number of parts.

Source Language: FORTRAN

Minimum Hardware: 8K PDP-7, standard oscilloscope, fast reader and punch, dual analog-to-digital converter, KSR-33 Teletype.

DECUS No. 7-50

Plotter and Display Output Routines for the PDP-7 ADVANCED Software System

John W. Cox, Francis W. Keller, Melvin D. Woolsey, and Daniel A. Brody, Division of Clinical Physiology, University of Tennessee Medical Units, Memphis, Tennessee

This program is a set of plotter and display output routines for the PDP-7 ADVANCED Software System. These routines are written for a system configuration consisting of an EAE, CalComp Plotter Model 563 or 565 and/or Tektronix display Model RM503. They provide simple fixed graphic and alphanumeric output in FORTRAN IV and MACRO users' programs.

NOTE: PDP-9 Version available as DECUS No. 9-13

DECUS No. 7/9-51

A Fast Small Subroutine to Zero Arrays in PDP-7/9 FORTRAN

Garry A. Flint, Langley Porter Neuropsychiatric Institute, San Francisco, California

The DO loop code generated in PDP-7/9 ADVANCED Software FORTRAN IV is expensive in both execution time and core space when used to zero arrays. Subroutine ZERO occupies only 35 machine words and zeros 1, 2 and 3 dimensional vectors as least 7 and in extreme cases more than 68 times faster than with FORTRAN code. When using more than two DO loops to zero arrays of any size, subroutine ZERO is also very economical in terms of space savings.

Source Language: FORTRAN

DECUS No. 7-52

Analog-to-Digital Conversion Subroutine Package for the PDP-7 ADVANCED Software System

John W. Cox, Francis W. Keller and Daniel A. Brody, Division of Clinical Physiology, University of Tennessee Medical Units, Memphis, Tennessee

This collection of subroutines written for the PDP-7 provides the FORTRAN and MACRO programmer with real-time, analog-to-digital conversion capabilities. These routines utilize a "wrap-around" ADC buffer and assign a unique sequence number to each sample of data converted. The status of any sample (i.e., overwritten, present, or not converted yet) and its location can then be determined from the sequence number. Two-word integer sequence numbers are used to maintain adequate sequence number uniqueness.

Utility routines are provided for working storage and ADC buffer array manipulation. Routines are also included for two-word integer arithmetic, calibration of the sample clock and display of selected ADC channels.

Minimum Hardware: PDP-7 with EAE, 138E/139E ADC, and sample clock

Other Programs Needed: ADVANCED Software System (DEC-7A-GWPA-D)

Source Language: Written in MACRO-7, for use in FORTRAN and macro users programs.

DECUS No. 7/9-53

Programs for Masking and Processing Nonstandard Paper Tape Input to PDP-7/9 FORTRAN

Garry A. Flint, Langely Porter Neuropsychiatric Institute, San Francisco, California

Many data collection devices produce paper tape output with a format unacceptable to the standard FORTRAN READ

instruction. Program TREAD, and bit manipulation functions IAN, IOR, NDTO, and LCS, allow paper tapes of any format to be processed in PDP-7/9 FORTRAN. The functions also enable the user to pack or unpack strings of bits in any format.

Source Language: FORTRAN

DECUS No. 7/9-54

Character Generator Display File Routines

Daniel R. Frantz, Logic of Computers Group, The University of Michigan, Ann Arbor, Michigan

The character generator allows the user to display character data on the face of a 337/339 Display (with VC38 Character Generator hardware) by treating the display as a sink for ASCII characters in a format compatible with other ASCII oriented devices.

Minimum Hardware: PDP-7/9 with 337/339 Display and VC38 Character Generator

Other Programs Needed: LOCOSS (DECUS No. 7/9-55)

Source Language: MACRO-7

Storage Requirement: 16000₈-17600₈

DECUS No. 7/9-55

LOCOSS: Logic of Computer Operating System for the PDP-Seven (7)

Daniel R. Frantz, Logic of Computers Group, The University of Michigan, Ann Arbor, Michigan

LOCOSS was developed to provide a suitable time-run environment in which to run applications programs. Multi-programming capabilities are an essential part of the system and allow a flexible organization. Provision is made for alternate methods of establishing a separate (parallel) line of execution and for invoking a subtask. EVENTS provide a flexible means of inter-task communication. A keyboard Command Interpreter provides a number of real-time control services and simple debugging aids. Input/output is buffered, overlapped, and essentially device-independent, allowing users to write programs with references to generalized "sources" and "sinks". Additional subroutines are available for such user needs as reading and writing octal or decimal numbers, printing text lists, and setting an interval timer.

Minimum Hardware: PDP-7/9 with EAE

Source Language: MACRO-7

Storage Requirement: 0-4000₈

DECUS No. 7/9-56

LOG Editor: Symbolic Text Editor for 337/339

Ronald F. Brender, Logic of Computers Group, The University of Michigan, Ann Arbor, Michigan

A Symbolic Text Editor is provided which is similar in concept to the DEC editor. However, it provides many additional commands, including string search and substitution commands, uses device independent I/O via LOCOSS, and is quite modular so that additional commands or I/O devices may be readily added to the system. It may be run from a standard PDP-7 or PDP-9; its performance is enhanced if used with a 337 or 339 with character generator.

Minimum Hardware: Version 1: 8K PDP-7/9 with EAE
 Version 2: 8K 337/339 with EAE
 and VC38 Character Generator

Other Programs Needed: Version 1: LOCOSS, (DECUS
 No. 7/9-55)
 Version 2: LOCOSS, (DECUS
 No. 7/9-55) and Character
 Generator Display (DECUS No.
 7/9-54)

Source Language: MACRO-7

Storage Requirement: Up to 8K

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L - LINCtape

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R - RIM

S - Symbolic (Source)

X - Listing with write-up

XX - Listing available at a handling charge

Write-ups are available for all programs.

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PDP-9
PROGRAM ABSTRACTS

PDP-9 PROGRAM ABSTRACTS

DECUS No. 9-1

PDP-9 DECTape Copy Routine

James D. Pitts, Digital Equipment Corporation, Maynard, Massachusetts

This program will reproduce data information from one reel (master) to a second (copy) and verify information using verified DECTape on the PDP-9.

The complete tape of 576 blocks may be copied or any number of blocks can be reproduced as designated by the operator through the AC SWS. Data can be copied in multiples of one block only. The blocks indicated in the AC SWS will be copied from the master reel to the corresponding blocks of the copy reel.

DECUS No. 9-2

3D DRAW for 339 Display

Barry Wessler, Digital Equipment Corporation, Maynard, Massachusetts

This program is a demonstration of the capabilities of the 339 system. It allows the user to sketch three-dimensional objects on the scope and rotate them in real time.

Minimum Hardware: PDP-9 with 339 Display

DECUS No. 9-3

Double Precision Integer Package (PDP-9 ADVANCED Software System)

Submitted by: J. Pitts, Digital Equipment Corporation, Maynard, Massachusetts

This set of subroutines provides the user with the ability to perform double precision signed integer addition, subtraction, multiplication, and division. A 36-bit input can be expanded to a result of 72 bits by every operation except division.

This package is the same Double Precision Integer Package found in the PDP-9 Basic Software System. It has been converted to MACRO-9 source for use in a relocatable, ADVANCED Software environment.

DECUS No. 9-4

INTEGE: Integer Arithmetic with EAE

A. B. Trevor, University of Arizona, Tucson, Arizona

This program is an improved version of DEC's INTEGE for the PDP-9/EAE.

DECUS No. 9-5

DECTape File-Reading Basic Assembler

C. A. Miller, University of Manitoba, Winnipeg, Manitoba, Canada

The PDP-9 Basic Assembler has been modified to read ADVANCED Software DECTape files so that Basic assembler language source programs may be edited using the ADVANCED Software System program EDIT 9 and assembled without using paper tape input-output for source programs.

Minimum Hardware: PDP-9 with DECTape

DECUS No. 9-6

Scatter-Gather Magnetic Tape Routines

Donald D. Hodgins, Inforonics, Inc., Cambridge, Massachusetts

Performs (scatter)reading and (gather) writing for magnetic tapes (also read-compare, rewind, EOF, and spacing operations). Optional error handling package is also included. This is suitable for most programs but can be altered easily when necessary. The program is written in Basic assembly language and compiled with user programs. It operates with TC59 Control and TU20 7-Channel Tape Transport.

Minimum Hardware: PDP-9 with EAE and one magnetic tape drive

Storage Requirement: 572₈ core locations (including optional error package)

Restrictions: Program shuts off interrupt but restores status upon exit.

DECUS No. 9-7

Magnetic Tape Duplication Program

Donald D. Hodgins, Inforonics, Inc., Cambridge, Massachusetts

This program copies one or more magnetic tapes onto another magnetic tape and provides the option of dropping or reproducing bad records. Both density and parity may be changed during copying, but parity change is very dangerous if 00₈ or 12₈ characters are involved. It also provides manual control of tapes from console, (i.e. spacing, rewinding, etc.).

Minimum Hardware: PDP-9 with EAE and two magnetic tape drives

DECUS No. 9-7 (Continued)

Storage Requirement: Under 1350₈, rest of core used for buffer space

Restrictions: Handles records of up to 6144₁₀ words (this can be changed)

DECUS No. 9-8

TTJ. - 6-Bit Teletype I/O Handler

H. J. Bridges and K. R. Morin, St. Paul's Hospital, Vancouver, British Columbia, Canada

This handler packs and unpacks three 6-bit Teletype codes per 18-bit computer word.

Other Programs Needed: Keyboard Monitor System

Source Language: MACRO-9

Storage Requirement: 487₁₀ locations

Restrictions: This handler must be stored in memory bank 0. The interrupt entries must be modified for use with API.

DECUS No. 9-9

MAC89

Robert Mcguire, Digital Equipment Corporation, Maynard, Massachusetts

This is a powerful assembler for the user who has both a PDP-8 and a PDP-9. The program assembles on the PDP-9, PDP-8 program source tapes and outputs standard binary format tapes acceptable to the PDP-8 binary loader.

Minimum Hardware: PDP-9 with 8K core memory, High-Speed reader and punch with KSR-33

Source Language: MACRO-9

Storage Requirement: 8K core memory

DECUS No. 9-10

TIME

Ron Rothstein, Institute of Computer Science, University of London, Gordon Square, London, England

TIME is a MACRO-9 subroutine which initializes and increments the clock at 20 ms intervals and may be called from either a FORTRAN or MACRO-9 program. Since MACRO-9 programs may use the ".TIMER N, A" command this subroutine is of greater benefit to the FORTRAN programmer. The subroutine has been added to the PDP-9 System

Library on all existing system tapes.

Minimum Hardware: PDP-9 with clock

Other Programs Needed: FORTRAN Library Subroutines (DEC-9B-AFT6)

Source Language: MACRO-9

Storage Requirement: 73 Decimal Words

DECUS No. 9-11

ML/1-9

Dr. Daniel R. Killoran, M.I.T. Instrumentation Laboratory, Cambridge, Massachusetts

ML/1-9 is a PDP-9 implementation of ML/1 (DECUS No. 7-42) functioning identically with the only exception being that EOT (Control D) is used instead of formfeed to terminate an operation.

Minimum Hardware: PDP-9 with 8K, High-Speed Reader and Punch

Storage Requirement: 8K

Restrictions: Not for use with the ADVANCED Software System.

DECUS No. 9-12

READ-IN Mode Puncher

James D. Pitts, Digital Equipment Corporation, Maynard, Massachusetts

The HRI Mode Puncher will punch out a tape in Hardware READ-IN Mode format for use with the READ-IN switch on the PDP-9 Console.

Minimum Hardware: 8K PDP-9

DECUS No. 9-13

Plotter and Display Output Routines for the PDP-9 ADVANCED Software System

J. Wyatt, Digital Equipment Corporation, Maynard, Massachusetts

This program, a revision of DECUS No. 7-50, is a set of plotter and display output routines for the PDP-9 ADVANCED Software System. These routines are written for a system configuration consisting of an EAE, CalComp Plotter model 563 or 565, and/or Tektronix display model RM503. These routines provide simplified graphic and alphanumeric output in FORTRAN IV and Macro users' programs.

Minimum Hardware: PDP-9 with CalComp Plotter and Oscilloscope

DECUS No. 9-14

PROCON-9

Paul R. Condit, Digital Equipment Corporation, Maynard, Massachusetts

The PROCON-9 system is a set of programs designed to aid the programmer in the maintenance and alteration of existing programs, and to facilitate the preparation of new ones. In addition to commonly-used debugging routines such as core dumps, PROCON-9 also includes a selected group of self-contained device handlers which are often useful in debugging more comprehensive handlers.

PROCON-9 has been assembled at the high end of core bank 0 so as not to interfere with programs residing in low order core. Only autoindex registers 10 and 11 plus any necessary data channel control words are used in low order core of bank 0. PROCON-9 has the ability to move itself out of bank 0 into any other bank (and vice versa) so as to free any particular high core area.

Minimum Hardware: PDP-9 with Disk, Drum and DECTape

DECUS No. 9-15

FAST 9 START

Philip R. Bevington, Stanford University, Stanford, California

FAST 9 START (Fast Acquisition of System Tapes) is a Monitor written for the PDP-9 to retrieve frequently used programs from DECTape.

The FAST monitor includes five programs.

1. The FAST Loader
2. The FAST Writer
3. The FAST Reader
4. The FAST Low Writer
5. The FAST Low Reader

PDP-7 users should reference DECUS No. 7-2a.

Storage Requirement: 17600-17761

NOTE: This program will work only under Basic Software.

DECUS No. 9-16

Real-Time Clock Handler - Four Level Queue

Christopher Cross, Carnegie Mellon University, Pittsburgh, Pennsylvania

The Real-Time Clock Handler consists of four linkage routines to provide for a four-deep interval request queue for the real-time clock. These include:

1. TIME which provides an elapsed time clock callable via a FORTRAN IV program.

2. LTSH which enables the user to cause an interrupt to occur after the specified time interval.
3. LTCH which enables the user to cause variable frequency real-time interrupts whose period is independent of interrupt processing time.
4. DTIM enables the user to disable the clock.

Minimum Hardware: PDP-9 with 2 DECTapes

Other Programs Needed: PDP-9 ADVANCED Monitor System (DEC-9U-SRZC-UC)

Source Language: MACRO-9

Storage Requirement: TIME - 133g locations; LTSH - 50g locations; LTCH - 52g locations; DTIM - 31g locations, % Clock - 261g

DECUS No. 9-17

Drum Monitor for RM09 Drum

C. W. Richardson, Idaho Nuclear Corporation, Idaho Falls, Idaho

The Drum Monitor is a program designed to use DECTape in conjunction with a drum to operate the Keyboard Monitor and system programs efficiently. DECTape is used for permanent storage of the system and users' programs. The drum is used for temporary storage of programs currently being used and for high-speed transfers between the drum and memory. The user first initializes the drum with only those programs he intends to use. When the user has completed his operation the complete drum image can be stored permanently on DECTape, allowing the entire drum to be used for other purposes. Any system or user program can be individually added or deleted from the drum. Hence, the entire drum is available for each user and no portion of the drum must be dedicated or protected.

Minimum Hardware: 8K PDP-9 with RM09 (128K) Drum and 2 DECTapes

Other Programs Needed: DRD - Drum Handler; DTD - DECTape Handler; TTA - Teletype Handler

Source Language: MACRO-9

DECUS No. 9-18

A PDP-8 Simulator for the PDP-9

Daniel R. Frantz, Stephen F. Lundstrom
Submitted by: Daniel R. Frantz, Dianne C. Roberts and Ronald F. Brender, Logic of Computers Group, University of Michigan, Ann Arbor, Michigan

This program performs a register-by-register simulation of a PDP-8. IOT's are mapped into equivalent PDP-9 instructions and control the I/O action directly. Two versions are

DECUS No. 9-18 (Continued)

available for the PDP-9, one with and one without EAE, simulating PDP-8's with and without EAE, respectively. Switches and debugging aids are also provided via keyboard control.

Minimum Hardware: PDP-9 with or without EAE

Source Language: MACRO

Storage Requirement: 13000g

Execution Time: 50:1 simulation time ratio

DECUS No. 9-19

PIPHA, CALPIT - Particle Identification System

Robert J. Kidney and C. A. Miller, Cyclotron Laboratory, University of Manitoba, Winnipeg, Canada

PIPHA identifies charged particles incident on a two-detector telescope using stored Range-Energy tables and allows convenient off-line analysis of the spectra obtained. This program also has an overlay facility which enables the user to read a routine from DECTape and execute it by a single Teletype command. New overlay routines can be assembled separately and incorporated easily into the system. All I/O format is compatible with Digital's Multianalyzer Program No. 1 (DEC-9A-USAØ-D).

The Range-Energy tables are provided by CALPIT using any suitable algorithm.

Minimum Hardware: PDP-9 with EAE, 2 TU55 DECTape transports and NH02C Nuclear Data Interface Type 34H Display, Light Pen and CalComp Incremental Plotter

Source Language: PIPHA - MACRO; CALPIT - FORTRAN IV

DECUS No. 9-20

Conversational Mode Software for Control Systems Analysis

W. L. Renwick
Submitted by: Evelyn Dow, Digital Equipment Corporation, Maynard, Massachusetts

Conversational Mode Software for Control Systems Analysis contains the following five packages:

1. MATMAN - performs algebraic manipulations of matrices.
2. LCSYS - Simulates the linear continuous system $\dot{x}(t) = A \underline{x}(t) + B \underline{u}(t)$ with control $\underline{u}(t) = C \underline{x}(t)$.
3. LDSYS - simulates the discrete time equivalent of the continuous system $\underline{x}(t) = A \underline{x}(t) + B \underline{u}(t)$ with control

$u(t) = C \underline{x}(t)$.

4. DISYS - simulates the discrete system $\underline{x}_k + 1 = F \underline{x}_k + G \underline{u}_k$ with control $\underline{u}_k = C \underline{x}_k$.
5. RKMINT - integrates systems of linear or nonlinear differential equations. It is adapted to simulate the step and frequency response of a system specified by its LaPlace transfer function and to solve the matrix Riccati equation of optimal control theory.

Minimum Hardware: 8K PDP-9 for paper tape version
16K PDP-9 with 2 DECTapes for DECTape Version

Source Language: FORTRAN IV

Note: Please specify version (8K or 16K) when requesting this program.

DECUS No. 9-21

CLOSS

Geoffrey M. Hudson, University of Melbourne, Melbourne, Australia

CLOSS calculates energy losses of particles at least as heavy as protons passing through solids. It is intended for the energy range 0.1 MEV to 20 MEV. The program asks the operator for information and then calculates energy losses, and fluctuations following that particular theory.

Minimum Hardware: 8K PDP-9, Teletype, KM-9 facility for object tape.

Other Programs Needed: Keyboard Monitor System (DEC-9A-NGBA)

Source Language: FORTRAN IV

Storage Requirement: 8K

DECUS No. 9-22

DTCOPY

R. Jones, Digital Equipment Co., Ltd. Reading, England

DTCOPY runs within the Monitor System, copies a complete DECTape reel from Unit 6 to Unit 7, and checks for errors.

Minimum Hardware: 8K PDP-9 with TCØ2 and Two TU55 Units

Source Language: MACRO-9

Execution Time: 4 1/2 minutes

Restrictions: Monitor commands will not operate while copying.

DECUS No. 9-23

KALSD9

Geoffrey M. Hudson, University of Melbourne, Melbourne, Australia

This program is intended for those pleasure seekers who enjoy viewing psychedelic images formed on oscilloscope screens. It responds to Teletype commands by changing the pattern, or pattern sequence, some of which are up to two minutes long. It is also useful as a test program.

Minimum Hardware: PDP-9 with Type 34H Display

Source Language: MACRO-9

Storage Requirement: Less than 400₈ locations

Execution Time: Continuously running program

Restrictions: Uses .ABS Macro option and overwrites Monitor

DECUS No. 9-24

Matrix Package

F. G. Willetts, Department of Electrical Engineering, University of Aston, Birmingham, England

This package contains routines for copying (MXCOPY) adding (MXSUM), subtracting (MXDIFF), multiplying (MXPROD), transposing (MXTRAN), negating (MXNEG), scalar product (SCPROD), and inversion (INVMX) of matrices. These routines will deal with matrices of any size, however, the name of the matrix is required in the calling arguments. Inversion will deal only with "real" numbers. All other routines will deal with matrices which are "real", "double precision" or "integer".

Minimum Hardware: PDP-9

Source Language: MACRO-9

Restrictions: All matrices are assumed to be two-dimensional. Column matrices should be defined A(N, I) and row matrices as A(I, N).

DECUS No. 9-25

RCA Bootstrap

R. Newton, Research Council of Alberta, Edmonton, Alberta, Canada

This bootstrap replaces the ADVANCED Software System bootstrap for 8K systems with DECTape and allows it to be used as a basic DECTape handler. It also has a special provision for storing and retrieving "loaded" programs in core image from DECTape.

Minimum Hardware: PDP-9 with 8K and DECTapes

Source Language: MACRO-9

Storage Requirement: 96₁₀

Restrictions: For use on 8K system only.

DECUS No. 9-26

DTF. (DTG.): DECTape Handlers for FORTRAN Compiling

R. Newton, Research Council of Alberta, Edmonton, Alberta, Canada

These DECTape handlers are used for compiling FORTRAN programs. They are nonfile-oriented handlers and treat DECTape as paper tape and may be used at the same time as other DECTape handlers. The I/O functions are performed by the RCA Bootstrap (DECUS No. 9-25). Unlike DTF., DTG. performs no checksum operations.

Minimum Hardware: 8K PDP-9 with DECTapes and EAE

Other Programs Needed: RCA Bootstrap (DECUS No. 9-25)

Source Language: MACRO-9

Storage Requirement: 147₁₀ locations for DTF. and 105₁₀ locations for DTG.

Restrictions: It has only been used on 8K system, API questionable

DECUS No. 9-27

PRGLDR: Program Loader for RCA Bootstrap

R. Newton, Research Council of Alberta, Edmonton, Alberta, Canada

This subroutine generates the linkages necessary for the automatic storage and retrieval of core image programs using the RCA Bootstrap (DECUS No. 9-25). PRGLDR performs an equivalent function to the "CHAIN" subroutine.

Minimum Hardware: 8K PDP-9 with DECTapes and EAE

Other Programs Needed: RCA Bootstrap (DECUS No. 9-25)

Source Language: MACRO-9

Storage Requirement: 32₁₀ locations

Restriction: For use on 8K systems only, API questionable

DECUS No. 9-28

PACKER: A Text Handling Subroutine for PDP-9 ADVANCED Software System

C. J. Thompson, Atomic Energy of Canada, Ltd., Ottawa, Ontario, Canada

This subroutine will pack characters into, and unpack characters from the standard 5/7 ASCII packing scheme used by the PDP-9 ADVANCED Software System. In addition, it will perform single precision binary to decimal conversion, packing the output in 5/7 ASCII as left or right justified decimal numbers with an optional decimal point anywhere in the number. The subroutine uses EAE instructions and requires one auto index register #11.

Minimum Hardware: PDP-9 with EAE

Source Language: MACRO-9

Storage Requirement: 363₈ locations

Source Language: MACRO-9

Storage Requirement: 41₈ registers and TYPE

Execution Time: 600 milliseconds (ASR-33 printing speed)

DECUS No. 9-29

LPB.

Carel M. Stillebroer, Technical University Delft, Delft, Holland

This PDP-9 handler simulates an 84 characters per line, 55 lines per page lineprinter on a Tektronix 611 storage display unit, which is directly connected to a 34H Display control. It is not connected to program interrupt or API facility.

Minimum Hardware: Basic PDP-9 with 34H Display control and Tektronix 611 storage display

Source Language: MACRO-9

Storage Requirement: 574₈ locations

DECUS No. 9-30

OCTIP: Octal Integer Print Subroutine (Basic Software System)

J. M. Graetz, Digital Equipment Corporation, Maynard, Massachusetts

OCTIP will print an unsigned octal integer. If the link is set upon entering OCTIP, leading zeros are replaced with spaces; if not, leading zeros are printed. The number to be printed is in the accumulator upon entering the subroutine.

Minimum Hardware: PDP-9

Other Programs Needed: TYPE, an ASCII character printing subroutine (can be coded into OCTIP if desired).

**LINC and LINC-8
INDEX**

LINC and LINC-8 INDEX

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R - RIM
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 X - Listing available with write-up
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Write-ups are available for all programs.

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**LINC and LINC-8
PROGRAM ABSTRACTS**

LINC and LINC-8 PROGRAM ABSTRACTS

DECUS No. L-1.1

MSCPNT: Manuscript Compressed Print

Prof. P. Finkenzeller, University of Erlangen, Erlangen,
West Germany

MSCPNT prints LAP4 manuscript (packed or unpacked) via the Teletype. The program is written to be used under GUIDE. Sense switch options and parameter input format are the same as MSPRNT (DEC-L8-PTAA-D). This program is approximately 25 per cent faster than MSPRNT.

The manuscript consists of three sections.

1. Main Program, MSCPNT, which is 1622₈ lines long.
2. Q & A subroutine, Q+ASUB, which is 471₈ lines long.
3. Teletype driver, TTYSUB, which is 204₈ lines long.

Storage Requirement: Binary Program: 6 blocks of tape for storage under GUIDE. The program uses 8 quarters of memory at execution time.

DECUS No. L-2.1

"Clock 1" for LINC and "Clock 8" for LINC-8

Prof. P. Finkenzeller, University of Erlangen, Erlangen,
West Germany

"Clock 1" and "Clock 8" are demonstration programs for the LINC and LINC-8 respectively. The programs also check for the position of sense switch \emptyset . If the switch is down, the clock runs normal (keeping time); switch up and the clock will run fast (not keeping time).

DECUS No. L-3

Off-Line LABCOM* System

Submitted by: University of Wisconsin Hospital, Madison,
Wisconsin

This system was developed by the University of Wisconsin Hospital, Clinical Laboratories, to assist the staff in hospital clinical laboratories in performing routines calculations and to store laboratory data for administrative reports and quality control.

It also includes an experimental program for on-line monitoring by the computer of a single automatic laboratory analyzing device.

*Laboratory Aided By COMputer

This system is written for the classic LINC. For use on the LINC-8, slight modifications to Teletype programs are necessary. (See DECUS No. L-33)

Source Language: LAP4

Storage Requirement: 2048 words - programming is overlapped

Restrictions: Full capability requires four LINC-tape drives.

DECUS No. L-4.1

IN HISTO

Paul F. Sullivan, National Aeronautics and Space Administration, Cambridge, Massachusetts

IN HISTO provides for the calculation and display of the histogram of the intervals between positive-going trigger-level crossings of an input signal. The resolution, trigger level, delay after trigger, and number of crossings counted are under the operator's control.

Source Language: LAP6-3L

Storage Requirement: 9 Quarters

DECUS No. L-5

Tape Subroutine

Juergen Klauske, Physiological Institute of the Free University of Berlin, Berlin, Germany

This program can be used as a subroutine for reading, writing and checking one variable block size on LINC-8 tapes.

The subroutine does not use program interrupt. If the main program does use the interrupt, then the interrupt service routine must assign highest priority to the LINCtape.

Source Language: LAP4

DECUS No. L-6

TRIGGR

Hans Reiter, Physiological Institute of the Free University of Berlin, Berlin, Germany

This program is to be used as a trigger program. Input is via channel 10 and comparison with a trigger level is controlled by knob 0. It is also possible to arrange a delay by an octal

number submitted from the main program to the subroutine. During the time of delay, no trigger is possible. The input and the trigger level is displayed.

The minimum delay is 450 μ sec with an input of 1776, 3776, 5776, or 7776 in register 1F \neq 1.

The programs uses auto index registers 2, 3, and 6. The following tags are used. 1F, 2F, 4F, 1D, 4M, 5M. The execution time in each case is exactly 150 μ sec with the jump return to the main program, but without the jump to the subroutine. The program triggers only if the input signal crosses the trigger level in the positive sense.

Source Language: LAP4

Storage Requirement: 114₈

DECUS No. L-7

Modifications to PROGOFOP, Version 2

Submitted by: Richard Clayton, Digital Equipment Corporation, Maynard, Massachusetts

This modification to PROGOFOP, Version 2, allows for:

1. The simulation of the Classic LINC interrupt system, in conjunction with a one-second Program Interrupt Clock with which the system is provided.
2. The addition of I/O commands to allow PROGOFOP to answer the Soroban Keyboard.
3. The modification of the PROGOFOP execute and magtape commands to utilize the EXC command to request magtape operations from tape units 2 and 3.

DECUS No. L-8

DECtape Interface for LINC-8

Submitted by: Digital Equipment Corporation, Maynard, Massachusetts

Programming and documentation for a minimal hardware interface which allows the LINC-8 to read and write single blocks of PDP-8 format DECtape. It consists of eleven modules which are added to the LINC-8 memory section. Digital Equipment Corporation will make this interface available to LINC-8 customers, either as a factory installed option, a field installed option, or supply the drawings and programming for those who wish to implement this interface themselves.

Material available:

1. The block schematic diagram C-BS-7605206-0-1.
2. A description of the interface and its function.

3. A set of PDP-8 subroutines to use the modified LINC-8 Tape Control to read and write blocks of PDP-8 format DECtape.

4. A program which will copy a LINC format DECtape to a PDP-8 format DECtape or vice versa.

5. Binary and ASCII paper tapes, ASCII third-pass listings, and LINCtape containing the appropriate programming.

DECUS No. L-9a

LINC-CalComp Plot Subroutine Package (LAP5)

A. Maynard Engbretson, Washington University, St. Louis, Missouri

The following three subroutines are for use on the LINC-CalComp:

Character Plot Subroutine
Pen Control Subroutine
X-Y Motion Subroutine

To obtain revision version of this program see Programs Available from Authors.

DECUS No. L-10

LINC-8 Multianalyzer
(Adapted to the LINC-8 from the Pulse Height Analysis Program - J-5260)

Richard M. Merrill, Digital Equipment Corporation, Maynard, Massachusetts

The analysis facilities for high-speed data input and display have been adapted to the LINC-8 computer and several extra features have been added.

The basic program allows display of a complete three-dimensional data matrix as a 2D projection or as a contour display. Vertical or horizontal cross-sections of the data may also be displayed. The third basic mode, the Twinkle Display, shows dynamically the X and Y coordinates of only the current data points.

Additional features: (All numbers indicated below are octal.)

I. Display

- A. Histograms (including three-dimensional histograms) may be plotted as an option via sense switch zero.
- B. The data matrix is 100 x 53; the Twinkle Display is 100 x 100.
- C. For one-dimensional analysis, the X or Y coordinate may be changed via a control knob for selection of the data region. (Max: 53(Y) sets of 100(X) values of Z.)

II. Z-Coordinate

- A. The Z-coordinate may also be an analog signal instead of a count.
- B. X, Y, or Z coordinates may be taken from any of 16 built-in A-D converters. The value of Z for a given X, Y will be the last one taken.
- C. If the signal-to-noise ratio is small, then Z may be taken as a running average over 2^N samples; plus N is read from the left switches.

III. Miscellaneous

- A. A built-in variable timer is used and may be calibrated.
- B. Qualitative audio indications of $\pm X$ and $\pm Z$ are available.
- C. The LINC-8 Library System and data storage via DECTape may be used.

DECUS No. L-11

DATUM8

Richard W. Young
Submitted by: Dr. Walter H. Moran, Jr., West Virginia University, Morgantown, West Virginia

DATUM8 is a revision of an addition to DATAM by James Hance contained in the general library supplied with the LINC-8 computer. This program has retained all the features of DATAM. Some of the original routines have been changed in order to eliminate undesired features. In addition, DATUM8 has the ability to multiply, subtract, and display the data with two cursors. The data not included between the cursors can be suppressed allowing, for instance, integration between definite limits. The program has been re-coded to facilitate future modifications.

Minimum Hardware: LINC (2K) or LINC-8

Source Language: LAP6

Storage Requirement: 0-3777₈

DECUS No. L-12

READIT

T. D. Williams, University of Bristol, England

READIT is a program for measuring data stored on LINCtape. The program will read the data into store and then display it.

DECUS No. L-13

AVPROG

T. D. Williams, University of Bristol, England

AVPROG is a program for averaging analog signals.

DECUS No. L-14

MEAN

T. D. Williams, University of Bristol, England

MEAN is a program for calculating the mean and standard deviation of a set of numbers.

DECUS No. L-15.1

LEAP-1

Harold L. Pearson, West Virginia University, Morgantown, West Virginia

LEAP-1 is a LINC-8 modification for DECUS No. 5/8-64. It allows the LINC-8 user to edit, assemble and load PDP-8 programs with LINCtape.

DECUS No. L-16

RWTAPE

Harold L. Pearson, West Virginia University, Morgantown, West Virginia

RWTAPE is a general input-output subroutine for LINCtapes. The program replaces the DECTape routines in the PDP-8 DECTape Programming System (DECUS No. 5/8-64). It will read or write consecutive blocks on any LINC-8 tape unit.

Storage Requirement: 1 page of memory

DECUS No. L-17

LOAD - Extended Load Sequence for LINC-8

L. N. Law, Institute of Psychiatry, London, England

This program extends the load sequence so that the LINC Operating System, GUIDE, may be started without using any toggle switches other than the LOAD switch.

Restriction: LINC-8 only.

DECUS No. L-18

BUFFER - Fully Buffered Teletype I/O

L. N. Law, Institute of Psychiatry, London, England

BUFFER extends PROGOFOP to provide fully buffered operation for the ASR-33 Teletype. The input and output buffers each have storage for up to 100g Teletype characters and communicate with the ASR-33 via the computer interrupt. LINC instructions KST, KBD, KBDi, and TYP are executed by the Buffer Routines. In addition, OPR 12 reads ASCII or binary character values from the input buffer.

Restriction: LINC-8 only.

DECUS No. L-19

LABELS for LINC-8

L. N. Law, Institute of Psychiatry, London, England

This program punches patterns on paper tape to reproduce the character typed on the keyboard. A 4 x 6 matrix is used, based on the LINC display characters. All printing keys are valid, together with the space bar. All other control keys are ignored. The program uses L-18, BUFFER, for I/O and checks that it is operating on a LINC-8 with the BUFFER routines available on the Unit 0 tape.

Restriction: For use on LINC-8 only.

DECUS No. L-20

MONTOR - A Monitor for Automatic Sequential Operation of Programs on the LINC-8

R. W. Tuttle, K. Pavel, and C. F. Stroebel, Institute of Living Hospital, Hartford, Connecticut

MONTOR is a monitor operating system for the LINC-8 which permits sequential, automatic processing of GUIDE-filed programs. Any combination of data sampling, data reduction, process control, and data processing jobs can be intermixed on a daily or more frequent basis. Very minor alterations are required in GUIDE-filed programs to make them MONTOR compatible.

DECUS No. L-21

LINC-TRAN: FORTRAN Macros for the LINC-8

R. W. Tuttle, K. Pavel, and C. F. Stroebel, Institute of Living Hospital, Hartford, Connecticut

LINC-TRAN is a programming system which permits FORTRAN object programs and the FORTRAN Operating System to be called as part of a LINC-8 program. For example, data could be collected, primary processed, and stored in the LINC mode, floating point calculations performed in the

PDP-8 FORTRAN mode, with a return to the LINC mode for further processing or display of results. As a result, full use can be made of the unique capabilities and full power of the joint configuration (LINC and PDP-8) of the LINC-8 computer.

DECUS No. L-22

A New PDP-8 Display Instruction for LINC-8

R. W. Tuttle, K. Pavel, and C. F. Stroebel, Institute of Living Hospital, Hartford, Connecticut

This documentation describes hardware changes for a new PDP-8 IOT instruction so that the LINC-8 display unit may be controlled directly by the PDP-8.

DECUS No. L-23

Control to Designate Left or Right LINC-8 Tape Transport as Unit Zero

R. W. Tuttle, K. Pavel, and C. F. Stroebel, Institute of Living Hospital, Hartford, Connecticut

Since many programs for the LINC-8 are designed to run only on Tape Unit 0, it has been found convenient to add a "NORMAL-REVERSE CONFIGURATION" switch to the LINCtape transports. This switch allows the operator to choose NORMAL (left-hand Unit 0, right-hand Unit 1) or REVERSE (right-hand Unit 0, left-hand Unit 1) designation for the tape transports. All tape control functions are shifted by this one switch. One could also place this switch under program control by either using the relay register or constructing a new one-bit register. Circuit diagram available.

DECUS No. L-24

PLTKBD: Plot Keyboard

R. Cooper, Burden Neurological Institute, Bristol, England

PLTKBD, Plot Keyboard, is a LINC-8 program which plots the characters of the Teletype keyboard on a CalComp 365 Plotter. The program occupies four blocks and starts at 1 or 20. It uses the OPR instructions embedded in PROGOFOP (DEC-L8-SFAO-D). The size of the characters is set by the LSW. They can be rotated through 90° by SNS 0.

ALT MODE A draws a head stamp (useful in Electroencephalography).

ALT MODE B moves the drum down 1 inch so that the position of printing can be first set on the CalComp viewer crosswires.

ALT MODE C returns to GUIDE

The program is protected against illegal characters ALT MODF D, E, F, etc.

Other Programs Needed: PROGOFOP (DEC-L8-SFAO-D)

DECUS No. L-25

LINC Spectrum Program

James Bryan, National Institute of Mental Health, Bethesda, Maryland

This is a spectrum program using the new Cooley-Tukey Fast Fourier Transform Algorithm.

DECUS No. L-26

RELS8-1C (LINC-8 Only)

Submitted by: Dr. W. H. Calvin, University of Washington, Seattle, Washington

The original RELS8 has been modified in three ways:

1. To make the numbers typed correspond to the (inverted) labeling on the data terminal panel.
2. To vary the duration of relay closure via the SAM 0 knob.
3. To automatically repeat the relay closure at a rate determined by SAM 2 knob (enabled by SNS 0 up).

DECUS No. L-27

Q & A Subroutine (Modification for LAP6 Characters)

Submitted by: Dr. W. H. Calvin, University of Washington, Seattle, Washington

This Q & A Subroutine is the original Q & A Subroutine (DEC-L8-TAAA-D) modified to use the LAP6 character table.

DECUS No. L-28

TEXT TTY Subroutines

Dr. W. H. Calvin, University of Washington, Seattle, Washington

This subroutine types out a list of LINC characters generated by LAP6 quotation mark method, analogous to the way in which Q & A Subroutine displays them. Control is restored at the location following the end of the list, marked by a 77 half-word.

DECUS No. L-29

DEC-BI

Dr. W. H. Calvin, University of Washington, Seattle, Washington

The subroutine retrieves the half-words typed into the question marks during the Q & A Subroutine and converts them

from decimal to binary. It will do a decimal-to-binary conversion on one to four digits. There may be any number of question marks (1, 2, 3, or 4) and leading zeros need not be typed.

DECUS No. L-30

LAP6-1C (Modification to LAP6)

This is a modification procedure for modifying LAP6 to adapt it to:

1. LINC-8 Teletype and mnemonics SKP, PDP, TYP and EXC.
2. Fanfold paper in the Teletype.

The Teletype, mnemonic, and fanfold mods are independent of one another.

DECUS No. L-31

SNAP: Simplified Numerical Analysis Program for the LINC-8 (with and without EAE)

Harvard Medical School, Boston, Massachusetts

(See DECUS No. 8-122)

DECUS No. L-32

XMARK

Harold L. Pearson, West Virginia University, Morgantown, West Virginia

XMARK is a program which marks LINCtapes in a format which allows more efficient usage of the LINC-8 Library System and the LEAP-1 System (DECUS No. L-15.1) tapes. It marks the tape in 128 word blocks with 1792 (3400 octal) blocks per tape. The standard tape marking program (MARKL8) marks 256 word blocks with 512 (1000 octal) blocks per tape. XMARK significantly increases tape capacity and speed of operation for PDP-8 programs on the LINC-8.

Other Programs Needed: DECUS No. L-15.1

DECUS No. L-33

On-Line LABCOM System (Version IV)

Submitted by: University of Wisconsin Medical School, Madison, Wisconsin

The objective of the LABCOM (Laboratory Aided By Computer) system approach is to implement a computer-based laboratory information system in a series of meaningful steps, permitting the laboratory to secure a firm economic and operational foothold in each phase of implementation before taking the next step.

It is at the "bench level" of operation that the computer has the greatest opportunity to provide a direct service to the laboratory and thereby help to increase the quality and quantity of test results.

When operational, the on-line system provides a significant service by performing all calculations and increasing reliability through the computer implemented quality control procedures.

In the LABCOM system, a complete set of "USER CONTROL PROGRAMS" have been developed to permit the laboratory personnel to add new instruments or change essential variables in the on-line system without programming knowledge or assistance. Throughout, the emphasis has been to give the laboratory maximum control over the computer.

This manual describes the fourth version of the LABCOM system, the first major on-line system released for general use by the University of Wisconsin Clinical Laboratory Computing Division (See DECUS No. L-3).

DECUS No. L-34

LINC-DDT

I. D. Pugsley, University of Washington, Seattle, Washington

Standard DDT functions include examination and modification of contents of any address using octal or symbolic notation, insertion and deletion of symbols, word searches, address searches, and program execution with breakpoint. LINC-DDT operates on the binary output of LAP6 and is used normally in close conjunction with LAP6.

Other Programs Needed: LAP6 (DEC-L8-LTAF)

Source Language: LAP6

Storage Requirement: 8 tape blocks ~~4000~~₈ words including symbol table

DECUS No. L-35A

DF.INOUT

Dr. C. M. Malpus, University of Leeds, Leeds, England

DF.INOUT combines into a single memory quarter subroutines to input and output signed decimal numbers of any magnitude, offering great savings of core storage from IFORL8 and OFORL8. It transforms between FORTRAN F-Format and DBLFLT format. Input accuracy is limited only by the DBLFLT format; output is correct to six significant digits plus any additional integer or fractional zeros necessary to correctly place the decimal point. Calls to the routine are comparable to those to DBLFLT.

Other Programs Needed: DBLFLT (DEC-L8-SFAA-D)

Source Language: LAP6

Storage Requirement: ~~400~~ octal locations

Restrictions: Special call for numbers in DBLFLT Accumulator (FAC)

DECUS No. L-35B

I-O TAGS

Dr. C. M. Malpus, University of Leeds, Leeds, England

The I-O TAGS program contains definitions of the tags used in the DF.INOUT program (DECUS No. L-35A) including most of the functional ones of DBLFLT. It should be added to user's manuscripts when these are to be converted separately to DF.INOUT or when DF.INOUT and DBLFLT are called in binary form from LINCtape in the program.

Source Language: LAP6-3L

DECUS No. L-36

PRINTMSS

Dennis J. Nichols, University of Wisconsin, Madison, Wisconsin

PRINTMSS provides a convenient means of listing more than one LAP6 program without operator action between each program. The output device may be either a Teletype or a line printer.

Source Language: LAP6

Storage Requirement: 11₈ blocks in LAP6 file

DECUS No. L-37

BINLAP6

Conrad C. Bjerke, University of Wisconsin, Madison, Wisconsin

BINLAP6 disassembles a binary program stored on LINCtape to an equivalent LAP6 manuscript also on LINCtape. Locations which are referenced by the address fields of instructions are tagged. The user may specify that certain areas be converted to octal numbers or text rather than instructions.

Source Language: LAP6

Storage Requirement: 10₈ blocks on LINCtape

DECUS No. L-38

TAPEDUMP

Marilyn S. Lenahan, University of Wisconsin, Madison, Wisconsin

TAPEDUMP will print the contents of LINCtape with octal, unsigned or signed decimal, or octal and alphanumeric conversions. The output device may be either the LINC Teletype or a line printer.

Source Language: LAP6

DECUS L-39

SPCWAR

Anonymous
Modifications by: E. Duffin, University of Pennsylvania, Philadelphia, Pennsylvania

SPCWAR is a game program that permits two users to pilot individual spaceships that are displayed on the screen. Each pilot has control of a cannon that enables him to destroy his opponent's ship. Collisions destroy both vehicles.

Source Language: LAP6

Storage Requirement: Memory banks 1,2,3

DECUS No. L-40

AVERAGER

Dennis J. Nichols, University of Wisconsin, Madison, Wisconsin

The AVERAGER program provides a means of computing the average response of some signal-generating device to a series of excitations. Several options are available to the operator depending upon his specific needs.

The AVERAGER system provides a set of programs to average one channel while forming a post-stimulus histogram, average two channels, file data on tape, plot filed data, and measure latency and amplitude.

Source Language: LAP6

DECUS No. L-41

COMPARE LINCtape Blocks

Dennis J. Nichols, University of Wisconsin, Madison, Wisconsin

COMPARE will compare the contents of two sets of LINCtape blocks. Errors are either displayed on the LINC scope or printed on the Teletype.

Source Language: LAP6

DECUS No. L-42

Using the Teletype with the LINC-8

Glen W. Johnson, Institute of Oceanography, Dalhousie University, Halifax, Nova Scotia, Canada

This modification to PROGOFOP II defines LINC codes used by LAP6 when the character is formed on the Teletype. CASE is not needed; SHIFT is used more often. A minimal length (85₁₀ locations), fully relocatable subroutine is presented which converts any LINC code to ASCII and types it out. Several different message subroutines are suggested.

Source Language: LAP6

DECUS No. L-43

LAP6-1H Using High-Speed Punch for LINC-8

Glen W. Johnson, Institute of Oceanography, Dalhousie University, Halifax, Nova Scotia, Canada

LAP6-1H, a modification to LAP6-3L, uses the two OPR commands (defined as Ø and 1) to read or punch a character on the high-speed tape unit.

Minimum Hardware: LINC-8 with PCØ1 High-Speed Reader/Punch

Source Language: LAP6 and PAL III

Storage Requirement: Virtually all available space in PROGOFOP.

DECUS No. L-44

LINC DUMP

Glen W. Johnson, Institute of Oceanography, Dalhousie University, Halifax, Nova Scotia, Canada

LINC DUMP will allow the user to dump up to one memory bank at once without crossing a boundary. It will read data into memory and allow the operator to dump selected portions. Instructions are given for conversion to a subroutine.

Minimum Hardware: LINC-8 with High-Speed Punch

Other Programs Needed: Q & A and OPRØ defined in PROGOFOP to use high-speed punch (DEC-L8-PAA-D and DEC-L8-SFAO-D).

Source Language: LAP6

DECUS No. L-45

PLOT and PLOTTEST

Glen W. Johnson, Institute of Oceanography, Dalhousie University, Halifax, Nova Scotia, Canada

With PLOT, any quarter of upper memory may be plotted on an X-Y Plotter (contents vs. location) in either a continuous or point-by-point mode. Linear or logarithmic plotting can be done in any axis combinations. Captions may also be entered on the plot and data can be read/written on either unit. One quarter can be plotted against another quarter in the same memory bank. The desired plots can be displayed on the oscilloscope before plotting.

PLOTTEST is a program designed to demonstrate a calling sequence for PLOT and the system performance by generating a diagonal line for plotting. It is useful as a preliminary check.

Minimum Hardware: Standard LINC-8 with X-Y Plotter and remote pen control (needs lots of DC offset)

Other Programs Needed: Q & A (DEC-L8-PAA-D)

Source Language: LAP6

Restrictions: Normally data must be in the range 0- \uparrow 377₈

DECUS No. L-46

SERINDEX: Search LAP6 Index

Peter Gutterman, University of Wisconsin, Madison, Wisconsin

SERINDEX is a subroutine which searches for a given name in LAP6 Index.

Source Language: LAP6

DECUS No. L-47

OCTBIN: Octal-to-Binary Conversion

Dennis J. Nichols, University of Wisconsin, Madison, Wisconsin

The OCTBIN subroutines convert octal keyboard codes stored in memory to single-precision binary integers. Two routines are supplied: OCTBIN 1 and OCTBIN 2.

Source Language: LAP6

DECUS No. L-48

DECBIN: Decimal-to-Binary Conversion

Dennis J. Nichols, University of Wisconsin, Madison, Wisconsin

The DECBIN subroutines convert decimal keyboard codes stored in memory to binary integers. Four routines are supplied: DECBIN 1, DECBIN 2, DECBIN 3, and DECBIN 4.

Source Language: LAP6

DECUS No. L-49

BINOCT: Binary-to-Octal Conversion

Dennis J. Nichols, University of Wisconsin, Madison, Wisconsin

The BINOCT collection of conversion routines provide a standardized set of subroutines for various types of conversion from single-precision binary integers to octal keyboard codes. The resulting LINC keyboard codes are stored in consecutive half-words of memory. Two routines are supplied: BINOCT 1 and BINOCT 2.

Source Language: LAP6

DECUS No. L-50

BINDEC: Binary-to-Decimal Conversion

Dennis J. Nichols, University of Wisconsin, Madison, Wisconsin

The BINDEC collection of conversion routines provides a standardized set of subroutines for doing various types of conversion from binary integers to decimal keyboard codes. The resulting LINC keyboard codes are stored in consecutive half-words of memory. Eight routines are supplied: BINDEC 1 through BINDEC 9 with the exception of BINDEC 6.

Source Language: LAP6

DECUS No. L-51

TAGSWAP: Change Manuscript Tags

Michael Clark, University of Wisconsin, Madison, Wisconsin

TAGSWAP allows the changing of any or all symbols within a LAP6 manuscript. Options include sequencing symbols, replacing selected symbols only, printing lines referencing any specified symbol, and printing a table of all symbols used.

Source Language: LAP6

DECUS No. L-52

LINC-TAPE FORTRAN

Richard V. Wolf and Lawrence L. Feth, Eye and Ear Hospital of Pittsburgh, Pittsburgh, Pennsylvania

A minor modification of the TAPE-4 program and the addition of a short pseudo-op service routine enables execution of FORTRAN "READ" & "WRITE" statements on the LINC-8.

A change in the interpretation of the magtape statement list elements enables block transfers to begin at any address in core. This permits programmed substitution of machine language subroutines into the function area, as well as complete FORTRAN program swapping. Thus, FORTRAN programs that are unusually large can be programmed to run in segments.

TAPE-4 and the service routine resides in the standard DEC-tape core area allowing the user ~~2000~~₈ locations for programs and data. No change in the compiler is necessary.

Other Programs Needed: FORSYS (DEC-08-AFA3-PB)

Source Language: MACRO-8

DECUS No. L-53

FIND 1

Richard A. Harshman, Department of Linguistics, University of California, Los Angeles, California

FIND 1 allows the user to define categories or classes of data sets to be searched for in a large file. It then locates and retrieves relevant data from the files stored on magnetic tape. Files can be written in natural language (e.g. English) and entries need not be specially coded for subject headings or cross references. It is possible to search for data fitting into categories not anticipated when the file was created.

The files are created and stored as LAP6 manuscripts, and can be created, edited or updated by a typist or secretary who has no special knowledge of computers after only short training on the use of LAP6.

Source Language: LAP6

DECUS No. L-54

LES

Les Law, Institute of Psychiatry, London, England
Submitted by: Robin Harte

LES is a Library Executive System which provides filing and loading PDP-8 programs including FORTRAN programs. Once filed these programs may be manipulated by LAP6 meta commands which are also capable of deleting the program

DECUS No. L-54 (Continued)

from the file.

Source Language: LAP6

DECUS No. L-55

COMPAREM

I. D. Pugsley, Department of Physiology and Biophysics, University of Washington, Seattle, Washington

COMPAREM will compare the contents of two sets of LINC-tape blocks with errors displayed on the LINC scope. When an error is found, options allow the two files to become "out-of-step" if required, for example, to allow comparison of source manuscripts with insertions or deletions.

Source Language: LAP6

Storage Requirement: The manuscript occupies 32₈ blocks of tape; the binary occupies 3 blocks. During execution, COMPAREM uses 8 memory quarters.

DECUS No. L-56

FIDDLEX

I. D. Pugsley, Department of Physiology and Biophysics, University of Washington, Seattle, Washington

The program provides a convenient means of editing a LAP6 index. It is capable of inserting, deleting, modifying or rearranging entries.

Source Language: LAP6

Storage Requirement: The manuscript for FIDDLEX occupies 42₈ blocks on tape; the binary occupies 5 blocks. During execution the program occupies 8 memory quarters.

DECUS No. L-57

Obsolete

See DECUS No. L-39

DECUS No. L-58

LOGS

Paul F. Sullivan, National Aeronautics and Space Administration, Cambridge, Massachusetts

LOGS is a DBLFLT subroutine which calculates $\log_2 x$, $\log_{10} x$

or log_ex depending on the entry point.

Minimum Hardware: LINC-8
Other Programs Needed: DBLFLT (DEC-L8-SFAA-D)
Source Language: LAP6-3L

DECUS No. L-59

INDEX L4

Paul F. Sullivan, National Aeronautics and Space Administration, Cambridge, Massachusetts

INDEX L4 resides on a LAP6-3L tape on unit 0 and examines the index tables of the various manuscript files of a LAP4 tape on unit 1. It is designed for use with the program TRANSLT6 in converting LAP4 manuscripts into LAP6-3L manuscripts and requires the program DISPATCH to control interactions between LAP6-3L, INDEX L4, and TRANSLT6.

Minimum Hardware: LINC-8
Other Programs Needed: TRANSLT6, DISPATCH (DEC-L8-MAA0-UA)
Source Language: LAP6-3L

DECUS No. L-60

FORTTRAN with LINCtape

G. R. Hervey, The School of Medicine, University of Leeds, Leeds, England

The system adapts 4K PDP-8 FORTRAN to make use of the magnetic tape facility of the basic LINC-8 computer. FORTRAN programs can be called from the left-hand tape (unit 0) by statements in the FORTRAN program in the core; data can be stored and recalled by WRITE and READ statements, using the right-hand tape (unit 1).

The programs may be called in any order, and may be read in at less than full length in order to leave data in core. Data can be transferred to-and-from tape in blocks of any length, which may be chosen to correspond with program variables. Incorporation of the program-calling facility does not involve any sacrifice of core space for program or data; use of the data transfer facilities uses from half to one page of core.

The system includes a modified, improved version of SYMBOL PRINT; increases the maximum length of the statement number tables; and corrects some errors in the compiler.

Other Programs Needed: PDP-8 FORTRAN System (DEC-08-AFCO)
Source Language: PAL III

DECUS No. L-61

Alternative Binary Loader for LINC-8 Library

G. R. Hervey, The School of Medicine, University of Leeds, Leeds, England

The paper tape loader in the LINC-8 Library System (DEC-L8-SLAB of Feb. 1967) suffers from the defect that it puts zero in any location designated by an origin setting which is not followed by data; this is particularly liable to clear location 200, because PAL-III and MACRO-8 output an assumed origin setting of 200 at the start of all binary tapes. There is a further minor limitation in that location 0 cannot be loaded. These defects have been overcome, and useful advantages gained, by adapting the Modified Binary Loader MKIV of R. Ward, DECUS No. 5/8-48.

Other Programs Needed: LINC-8 Library System (DEC-L8-SLAB-D)
Storage Requirement: 80₁₀ locations

DECUS No. L-62

RTAPE/WTAPE

K. Metzger, Cooley Electronics Laboratory, University of Michigan, Ann Arbor, Michigan

RTAPE/WTAPE is a self-contained subroutine for reading and writing multiple blocks on LINCtape.

Source Language: MACRO-8
Storage Requirement: 200₈ locations

DECUS No. L-63

L6DISASS

C. M. Malpus, The School of Medicine, University of Leeds, Leeds, England

L6DISASS, a disassembler program, converts a binary program in the lower LAP6 binary working area into a LAP6 manuscript with symbolic and relative addressing, and adds this to the current LAP6 manuscript. By changing the value of tags in the L6DISASS manuscript it can be used with any present or foreseeable configuration of LAP6.

Source Language: LAP6-3L (DEC-L8-MAA0-D)
Storage Requirement: 400₈ locations
Execution Time: 10-50 seconds depending on source program length

DECUS No. L-64

A Pseudo Random Number Generator for the LINC-8

M. F. Lewis, W. M. Webber, J. E. Doyle, Federal Aviation Administration, Oklahoma City, Oklahoma

This program is the LINC-8 version of DECUS No. 5-25. It simulates on the LINC the 2's complement arithmetic of the PDP-5 routine, but returns with the equivalent LINC number in the accumulator.

Source Language: LAP6A
Storage Requirement: 20-247₈ locations
Execution Time: less than 0.5 msec.

DECUS No. L-65

LAP6TYPE

C. M. Malpus, The School of Medicine, University of Leeds, Leeds, England

This subroutine, LAP6TYPE, outputs strings of characters on the Teletype of a LINC-8. The characters are entered into the main program using the text facility of LAP6. The length of the character string is unlimited and is terminated by LINC-code 76 (CASE,G). The characters may reside in upper or lower memory.

Source Language: LAP6-3L
Storage Requirement: 155₈ locations (uses 4 index registers)

DECUS No. L-66

LAP6DISP

C. M. Malpus, The School of Medicine, University of Leeds, Leeds, England

This subroutine displays strings of characters on the scope display. The characters are entered into the main program using the text facility of LAP6, and may reside in upper or lower memory; the string is terminated by 76(CASE,G). Up to 15 lines of text, each containing up to 24 characters, may be entered. The display self-centers vertically.

Source Language: LAP6-3L
Storage Requirement: 67₁₀ locations (using 3 index registers)

DECUS No. L-67

TAPEIN

Edwin G. Duffin, University of Pennsylvania Hospital, Philadelphia, Pennsylvania

TAPEIN permits the user to read in a paper tape of a LAP6 generated manuscript via the ASR-33 reader. The manuscript is placed directly into the LAP6 manuscript area. The manuscript paper tape that is read by TAPEIN is generated by simply turning on the TTY punch before giving LAP6 the PM command.

Source Language: LAP6, MACRO-8
Storage Requirement: Memory banks 2 and 3

DECUS No. L-68

DBLFLT 2: A Multibank Configuration of DBLFLT

Paul F. Sullivan and Rayna B. Cole, National Aeronautics and Space Administration ERC, Cambridge, Massachusetts

DBLFLT 2 is a repackaging of the LINC-8 double precision floating point package DBLFLT (DEC-L8-SFAA-D) and is designed to permit the DBLFLT subroutines to be stored and executed in memory banks other than those occupied by the main program. The new package contains not only the basic arithmetic subroutines contained in DBLFLT but also the input and output subroutines IFORL8 and OFORL8 and subroutines for the more common mathematical functions. Programs designed to operate with DBLFLT in the standard location can be readily modified to operate with DBLFLT 2.

DECUS No. L-69

GRAPHAS

Karl Lowy and Sandra Furman, University of Rochester, Rochester, New York

GRAPHAS displays a coordinate system with individually variable scales for abscissa and ordinate.

If an extended memory is used, the program will display data contained in four consecutive blocks of tape according to the user's choice. The first two blocks containing the abscissae, the last two the ordinates of points to be individually displayed. Registers containing no entries are not displayed so that the solid zero line is absent when the graph is projected.

GRAPHAS retains all features of the original program, GRAPH (DEC-L8-LTAB), but was not written to include the plotting subroutine. Scale, figure and labels can be displayed simultaneously as well as individually, a feature helpful for the photographic procedure.

Minimum Hardware: LINC-8 with 4K, extended memory desirable
Source Language: LAP6

