C.S.I.R.O.

COMPUTING RESEARCH SECTION

NEWSLETTER NO. 14 - 1.7.66

I. GENERAL

Publications Issued this Month

NL Newsletter No. 14

M2 Manual Supplement No. 24. 64 - Character Set with 3200 Algol.

The First Implementation of DAD

1. System Choice

As from the middle of July 1966*a first version of the DAD system will be introduced on the Canberra 3600 although use of SCOPE will not cease on the date of the introduction of DAD. Users will be required to state "NOT SCOPE" on their job request cards if they wish to run under control of DAD . Subsidiary staffs should select such jobs when assembling a job stack tape and write them onto a second tape, both tapes to be externally labelled to indicate the system to be used.

The following points are to be noted and should be read with reference to the "DAD Programmers' Manual", (Memo No. 5).

2. Control Statements

Control cards for DAD should be used for jobs transmitted to the 3600 but it may happen that DAD will not be operational at any particular time so that SCOPE will have to be used. In the main compatibility exists between SCOPE control statements and DAD control statements. The following points are to be noted:

(a) All input tapes must be declared specifically as MT, and all input tapes also as RØ. SCOPE will be altered to accept these declarations. All tapes must be declared.

(b) Hardware declarations in SCOPE e.g. LP1, LP2 and PL1 and PL2 will be accepted by DAD in which case they will have the standard document limit supplied automatically. PL1, PL2 are accepted and are equivalent to PL and PB respectively.

* This date does not apply to the subsidiaries. The change over for the subsidiaries will be notified later.

(c) The hardware declaration for an unlabelled tape may also contain a tape physical unit number but will be ignored and a unit will be allocated by DAD. Unlabelled tapes should not be used.

Statements not directly acceptable by SCOPE are peculiar to DAD such as mode declarations, e.g. 4 part paper and *DOC etc.

Jobs will be of the following types:

(1) Those local to Canberra, in which DAD control statements may be made on cards and on which the $\frac{7}{9}$ or * may be used.

(2) Those from subsidiaries placed onto a tape; these will be:

(i) jobs checked on a 3200 and offloaded to the 3600 and will be written in terms of SCOPE 32 or SCOPE 36 and will be accepted by DAD,

(ii) jobs specially intended for running by the 3600 and may contain specifically DAD control statements.

In these cases control statements should start with a $\frac{7}{9}$ punch and not *. In job stack tapes a $\frac{7}{9}$ SEQUENCE statement may replace a $\frac{7}{9}$ EOD, the tape loading program will convert SEQUENCE statements to equivalent EOD's.

The back-up system will be SCOPE and so far as possible SCOPE type jobs will be capable of running even if DAD is not operational.

3. Magnetic Tape Labels

Care must be taken by users in specifying magnetic tape labels. Tapes labelled by declaration with names exceeding 14 characters will have labels truncated to the first 14 characters by DAD and inserted, in the first implementation, into SCOPE 5 type labels. Tapes so generated by DAD may be accepted as input by SCOPE so long as these are called only by the correct 14 character label.

4. Facility Restrictions

In the first implementation of DAD some restrictions on the system as described in the programmers' manual will exist. Thus:

(1) Multiple runs under the one JOB or EXECUTE statement will not be allowed.

(2) Overlay will not be possible.

(3) The SNAP facility will not exist.

(4) Special requests EXECUTE, DELETE, PRINT, PUNCH and PLOT will not be available via cards or a magnetic tape job stack. They are available via the keyboard displays. The effect of these statements may be obtained by supplying a short 'dummy' job. Extensive plotting and punching will not be run under SCOPE.

(5) SV will apply only to the day of presentation of a document. Documents may be created and saved for use by a program which follows during the same day only; they will not be held over from day to day.

(6) Library routines and tape macro functions will be called by the entry point statements as follows:

```
FORTRAN or FTN
COMPASS

UNLOAD,u
REWIND,u
MARKEF,u
ERASE,u

SKIP,u,m)
BSPF,u,m)     repeated m times
BSPR,u,m)

POST,u,p  )
REPOST,u,p)   p = a program or subroutine name
```

The subroutines which may be called by FTN and COMPASS will comprise all those which were available under SCOPE.

5. Accounting

Accounting will be done on the basis of the central processor time occupied by a program run plus charges for input and output of documents used or created. Both plotting and card punching will be charged for and will be run under DAD. This is in contrast to the previous SCOPE system in which plotting and punching were not charged for.

Library and other Subroutines

Most users will be aware of the comprehensive list of library functions which can be used directly in the Fortran language. The full list is contained in the 3400/3600 Fortran Reference Manual (Publ. No. 60132900) or 3600 Computer System Library Functions (Publ. No. 60056400). Besides these the library tape also contains routines such as MATRXPAK and others written by the section staff.

The main library of subroutines (and programs) is not held on the library tape but is in the form of separate source decks of cards filed in the data preparation room at Canberra.

The library contains about 100 routines which in general come from one of two sources. Firstly there is a large number of routines which were written by the C.R.S. staff. These include for example, efficient calculation of standard functions such as Bessel, Hermite etc. The second main source of routines is from other large computer centres which have Control Data equipment. These centres have a joint interchange of routines via an organisation called CO-OP. There is a monthly publication called CO-OP News which lists the present contents of the CO-OP library and gives details of new entries. It also publishes correspondence between CO-OP and the members. Periodically the library contents are defined in more detail and a CO-OP Catalogue is issued. The latest issue of this was in April, 1966.

There is a similar organisation called SWAP for the computer centres using small and medium sized Control Data equipment. C.R.S. also contributes to this and in fact a large number of routines originated by the staff at the subsidiary centres is incorporated in the SWAP library.

It should be noted that not all the routines in the CO-OP library are available at Canberra. Some are in an earlier COMPASS which is not compatible and many are too specialised.

Besides the card decks the user can consult the subroutine write-up for details of application. The general policy regarding the distribution of write-ups and source decks is as follows. Users of the C.S.I.R.O. network have free access to the library. Requests for write ups and/or card decks must be made via Miscellaneous Publication No. 8. which should be sent in the first place to The Subroutine Librarian, C.R.S., C.S.I.R.O., P.O. Box 109, Canberra. Notice of new routines appears in the Newsletter and no other form of communication between the Librarian and user will be established. There is no automatic despatch of new subroutine write-ups, nor is it our policy to despatch complete sets of subroutine write-ups.

Queries regarding any routine should be addressed to the subsidiary centre manager or the Operations Manager, Canberra. Users at the subsidiary centres will find that write-ups and card decks for all 3200 and for some of the 3600 routines are available at their own centre.

Library Subroutines List

USER IDENTIFICATION			TITLE	AUTHOR	CENTRE
A	CSIR	TYPEBYTE	Typebyte arithmetic package.	D.J. Langridge	C *
B 3.	CSIR	ACOSH	Inverse hyperbolic cosine function.	J.J. Russell	M
		ASINH	Inverse hyperbolic sine function.	"	M
		ATANH	Inverse hyperbolic tangent function.	"	M
		COSH	Hyperbolic cosine function.	"	M
		SINH	Hyperbolic sine function.	"	M
		DLOG	Double precision logarithm.	J.K. Mackenzie	M
C 1.	CSIR	CHEBY	Chebyshev polynomial generator.	J.J. Russell	M
		HERMITE	Hermite polynomial generator.	"	M
		LAGUERRE	Laguerre polynomial generator.	"	M
		LEGEND	Legendre polynomial generator.	"	M
		PADD	Polynomial addition and subtraction.	P.J. Howell	M
		PDIV	Polynomial division.	"	M
		PMULT	Polynomial multiplication.	"	M
C 2.	CSIR	ROOT	To solve F(X) = 0 for X.	A.C. Beresford	A
		CUBIC	To solve a cubic equation with real coefficients.	C.H. Johnson & E. Paine	M
		POLYMUL	Roots of polynomial equations.	E.H. Kinney	A
	UTEX	POLYMUL	Roots of polynomial equations by Mullers method.		
	CSIR	VIETA	Explicit solution of the general cubic.	A.M. Simpson	A
C 3.	CSIR	BESNJYIK	Bessel Functions.	J.J. Russell	M
		BESSEL	Bessel Functions.	"	M
		BESSNJY	Bessel Functions.	"	M
		BESSOIJY	Bessel Function.	"	M
		ERF	Error function and normal distribution function.	"	M
		ERF36	Error function and normal distribution function.	D.C. Knight	A *
		ZEROBESS	Bessel function.	J.J. Russell	M
		EXPINT	Exponential integral.	"	M
		GAMMA	Gamma function.	P.J. Howell	M
	NBSB	BEAUTY	Generalized hypergeometic functions.		
		STEPF	Fourier step.		
	UCSD	BES	Bessel function.		
		BFFGH	Spherical bessel function.		
		GAMMA	Gamma function for complex argument.		
		NPOA	Normal probability.		
		RCPGAMI	Reciprocal gamma function for complex argument.		
		RCPGAMR	Evaluation of reciprocal gamma function real argument.		
		SPHEBE	Spherical bessel function.		
	UTEX	MAXMIN	A maximum or a minimum of certain arbitrary function.		
		BESSEL	General of bessel functions.		
D 1	CSIR	DBLSIM	Double integration by Simpson's Rule.	J.J. Russell	M
		SIMP	Integration by Simpson's Rule.	"	M
		LINEPROF	Fourier unfolding of X-Ray powder lines.	T. Kato & E.W. Radoslovich & P. Ciddor	A S

Library Subroutines List (cont.)

	NBSB	TRAPZ	Trapezodial rule integration Fortran.		
	UCSD	SIMCON	Quadrature by Simpson's Rule.		
		SIMDUB	Double integration by Simpson's Rule.		
		SIMRUN	Tabular integral of a tabular function by Simpson's Rule.		
D 2.	CSIR	AUTODEQ	Controlled Solution of ordinary differential equations.	R.H. Hudson	C *
E 1.	CSIR	INTLAG	Interpolation and extrapolation using a lagrangian polynomial.	P.J. Howell	M
		RINT 5	5th degree Bessel function.	J.J. Russell	M
E 2.	CSIR	FIT	Curve fitting by orthogonal polynomials.	A.C. Beresford	A
		CHEBFIT	Chebyshev mini-max fit.	J.K. Mackenzie	M
		FOURIER	Fourier analysis and synthesis.	J.W. Spencer, R.W. Muncey & J.J. Russell	M
		CHEBPOL	Chebyshev polynomial expansion.	J.K. Mackenzie	M
		LSQPOLY	Least squares polynomial.	P.J. Leonard	M
E 3.	CSIR	DIVDIFF	Divided difference table.	J.K. Mackenzie	M
F 1.	CSIR	CHOLESKI	Choleski decomposition.	S.N. Stuart	M
		MTRXPACK	Matrixpack.	R.H. Hudson	C
		SYMINV	Symmetric matrix inversion with accompanying solution of linear equations.	D.C. Knight	A
		IMXINV	Integer matrix inversion.	"	A
		ABSINV	Absolute matrix inversion.	"	A
		CMTINV	Inverse of a complex matrix.	"	A
		MATMPA/B/C	Matrix multiplications.	"	A
		SYMMPY	Symmetric matrix multiply.	"	A
		MATINV	Matrix inversion with accompanying solution of linear equations.	"	A
		TRIDEC	Inverse of a real matrix and solution of simultaneous linear equations by the method of triangular decomposition (choleski decomposition).	"	A
		TRMINV	Triangular matrix inversion.	"	A
		BIGMINV	Large matrix inversion using magnetic tapes and partitioning.	"	A
	NBSB	MATINV	Matrix inversion with accompanying solution of linear equation.		
	UCSD	DPMATS	Double precision matrix inversion.		
		HPMINV	High precision matrix inversion.		
F 2.	CSIR	SIMLEQ	Simultaneous linear equation solution.	"	A
F 3.	CSIR	DETERM	Determinant of real matrix.	"	A
F 4.	SAND	HOUSE SR	Eigenvalues and eigenvectors of real symmetic matrices.		
	CSIR	EVAL	Eigenvalues of a real symmetic matrix. Householder's method.	D.R. Ross	A
		EVEC	Eigenvectors of a real symmetic matrix.	D.R. Ross	A
	UTEX	MATSUB	Eigenvalues and eigenvectors of complex non-herm.		

Library Subroutines List (cont.)

		MATVEC	Eigenvalues and eigenvectors of complex non-herm.		
	NBSB	EIGENVAL	Eigenvalues and eigenvectors of real symmetic matrices.		
	CSIR	JACOBI	Eigen solution of symmetic matrix.	J. Tindale & S.N. Stuart	M
G 1.	UTEX	COMPILE	Frequency distribution and descriptive statistics.		
		PARAMET	Basic descriptive statistics.		
G 2.	NBSB	AUTOCOR	Auto-correlation analysis.		
		MANYCOR	Correlation analysis.		
		TVAMRCA	Multiple regression, comprehensive.		
	UCSD	BIMD	Multiple regression and correlation analysis.		
	UTEX	ABSTRAC	Complete factor analysis and factor-score computation.		
		AUTOCROS	Auto- and cross-lag intercorrelation.		
		CORMAT	Basic stat, intercor, tetra esti and elementary link anal.		
		CORRD	Pearson product-moment correlation coefficients.		
		FACT	Intercor, prin axis factor anal. and normal variation rotation.		
		REGRANAL	Multiple correlation and regression analysis.		
G 4.	UTEX	SCANOVA	Single classification analysis of variance.		
G 5.	NBSB	RANDOM	Random number generator.		
	SAND	SBELL2	Normal deviate table construction.		
	UTEX	RANOM	Positive fixed point random number generator.		
	CSIR	RNUM	Uniform random number generator, and approximations to arbitrarily distributed variates.	D.C. Knight	A **
G 6.	CSIR	FSAPS	Program fsaps (fourier series and/or power spectrum).	D.J. Clarke	A
	UCSD	TUKEY	Tukey spectrum, cross spectra and power spectra.		
G 7.	CSIR	FACTORAN	Program factoran (principal components analysis or complete factor analysis including orthogonal relation).	T. Brown	A *
H 1.	CODA	CDM3	Linear programming system 3.		
I 1.	CSIR	BINARY	3200 Fortran binary input/output subroutine.	D.C. Knight	A **
		VARYREAD	Varyread.	D.J. Langridge	C
		IOBINARY	3200 Fortran binary input/output.	D.C. Knight	A **
I 5.	CSIR	BLKIO	Blocked input/output for magnetic tape.	E.H. Kinney	A
		CRGATE	405/3248 card reader/controller gating routine.	D.C. Knight	A **

Library Subroutines List (cont.)

J 3.	CSIR	DOUT	Double precision decimal output.	J.K. Mackenzie	M **
K 1.	CODA	BCDEDIT	BCD card image tape edit.		
K 3.	CSIR	CRDIMGED	Card image editing program.	P.J. Claringbold	S *
		IOMAGT	Direct magnetic tape control routines for 3200 Scope.	D.C. Knight	A **
		MTDENS	3200 density setting routine for 603 magnetic tape units.	"	A **
L 1.	CODA	SYMEDIT	Symbolic edit.		
M 1.	CSIR	MERJSORT	Internal sort.	J.A.B. Palmer	C
		SEARCH	Array search for equality.	J.S. Armstrong	C *
M 1.	UCSD	ORDER	Ordering of points for scatter-plotting.		
		SORT	Sorting routine.		
M 2.	CSIR	UNTANGLE	Relabelling complex Fortran programs.	P.E. Ewens	C *
N 1.	UCSD	TRACE	Trace.		
		TIMER	Fortran program timer.		
Q 4.	CSIR	LIN	Contour plotting by linear interpolation.	J.A.B. Palmer	C
Q 4.	CSIR	PLOT	Generate 3600 on-line plots.	R.H. Hudson	C
		QUIKPLOT	Automatic function plotting on the printer.	D. Ross	A
		TEXT	Generate characters for the CALCOMP plotters.	R.H. Hudson & G.S. Masters.	C S
Q 5.	CSIR	TIMER	Timing of program sections.	J.K. Mackenzie	M *
R 2.	CODA	GCD	Greatest common divisor.		
		LCM	The least common multiple.		
		PHI	Eulers phi function.		
		SIGTAU	Number and sum of divisors of n.		
Z 1.	CODA	CDACOMP	Compass plus codap to compass translator.		
	NBSB	SHIFTR	Boolean shift function.		

Miscellaneous Subroutines

CSIR	AUTOPLOT	Automatic function plotting.	R.H. Hudson	C
	FREEREAD	A free format input routine for the CDC 3600.	D.J. Langridge	C
	PDUMP	To assist dumping in Fortran programs.		
	LOC			
	VNUM	These subroutines and functions are used by PDUMP.	D.J. Langridge	C
	FORMEL			
	SIDADD	Detect and count the number of ones in an array M(k).	B.J. Austin	C *
	VISIWRIT	Generate visible characters on 8-level paper tape.	T.S. Holden	C *
	MACROGENERATOR	A general purpose macrogenerator allowing nested macros.	P.H. Frost	C

* 3600 only. ** 3200 only.

Library Subroutines List (cont.)

Key to centre location of Author.

A	Adelaide
M	Melbourne
S	Sydney
C	Canberra

II. 3600

Compass Course

An enquiry for instruction in 3600 Compass programming to a level such that users could write small subroutines in the assembly language has been received. This course if held would not be a full Compass programming course which could take up to four weeks full time, but would be intended for users already versed in machine or assembly language for a different machine. Anyone interested please contact J.S. Armstrong, C.R.S. Canberra.

Special Purpose Languages and Routines

Users are reminded that the following publications are available for the Control Data 3600 computer.

1. Sort II — General Purpose Sorting Routines. **
   Publ. No. 60058500
2. CDM 4 — Linear Programming Package **
   Publ. No. 60132300
3. ILP/1 — Integer Linear Programming Package. *
   Publ. No. 60084900
4. SIMSCRIPT — Simulation Language
   Publ. No. 60134600
5. APT — Machine Tool Control
   Publ. No. 60131500
6. PERT — Program Evaluation and Review Technique
   Publ. No. 60059500

Card/Tapes Routines

** Available under SCOPE

* Available for both DAD and SCOPE.

III. 3200

SCOPE

The following modifications have been made to the 3200 SCOPE monitor system.

1. All $\frac{7}{9}$ control cards may have a period following the last parameter.

2. It is now possible to obtain a loading map without going into execution after compiling a program. This is achieved by the control card sequence:-

$^{7}_{9}$LOAD,56

$^{7}_{8}$

This sequence will also allow an overlay tape to be fully prepared, without execution.

3. The problems associated with a fail-to-feed on the 405 card reader have been eliminated. These particularly effected the card to tape operations in UTILITY, causing very large records to be written erroneously.

4. The positions in the Unit Status Table (UST) of the fail-to-feed and pre-read compare error status bits from the card reader have been swapped. This now results in the compare error being equated with a lost data condition from magnetic tape.

Late Items

Lectures, Seminars

Canberra

Dr. W.T. Williams of the C.R.S. will give a series of lectures on "Numerical Methods of Classification" at the Florey Lecture Theatre, John Curtin Medical School,

on	Monday 1st August	2.00 p.m.
	Wednesday 3rd August	10.45 a.m.
	Thursday 4th August	2.00 p.m.
	Friday 5th August	2.00 p.m.

Dr. B. Austin of the C.R.S. will give two seminars in Adelaide and Sydney, the subject will be "The DAD system and the Fortran user".

Adelaide	Wednesday 13th, 2.00 p.m.	July
Sydney	Thursday 28th, 10.45 a.m.	July

For both the seminar at Adelaide and the one at Sydney those people who wish to attend should contact the subsidiary manager as there will be limited accommodation and it will be necessary to distribute the DAD - Fortran Manual beforehand. It will be assumed that everyone attending the seminar will have read the manual.

Staff News

Users will be pleased to learn that J. Penny of the Section has recently been awarded the degree of Ph.D. by the University of Adelaide.