

UNITED STATES
DEPARTMENT OF
COMMERCE
PUBLICATION



NBS TECHNICAL NOTE 734

OMNITAB II Segmentation Structure for the SCOPE Operating System

U.S.
DEPARTMENT
OF
COMMERCE

QC
00
5753
N. 734
1972
C. 2

NATIONAL BUREAU OF STANDARDS

The National Bureau of Standards¹ was established by an act of Congress March 3, 1901. The Bureau's overall goal is to strengthen and advance the Nation's science and technology and facilitate their effective application for public benefit. To this end, the Bureau conducts research and provides: (1) a basis for the Nation's physical measurement system, (2) scientific and technological services for industry and government, (3) a technical basis for equity in trade, and (4) technical services to promote public safety. The Bureau consists of the Institute for Basic Standards, the Institute for Materials Research, the Institute for Applied Technology, the Center for Computer Sciences and Technology, and the Office for Information Programs.

THE INSTITUTE FOR BASIC STANDARDS provides the central basis within the United States of a complete and consistent system of physical measurement; coordinates that system with measurement systems of other nations; and furnishes essential services leading to accurate and uniform physical measurements throughout the Nation's scientific community, industry, and commerce. The Institute consists of a Center for Radiation Research, an Office of Measurement Services and the following divisions:

Applied Mathematics—Electricity—Heat—Mechanics—Optical Physics—Linac Radiation²—Nuclear Radiation²—Applied Radiation²—Quantum Electronics³—Electromagnetics³—Time and Frequency³—Laboratory Astrophysics³—Cryogenics³.

THE INSTITUTE FOR MATERIALS RESEARCH conducts materials research leading to improved methods of measurement, standards, and data on the properties of well-characterized materials needed by industry, commerce, educational institutions, and Government; provides advisory and research services to other Government agencies; and develops, produces, and distributes standard reference materials. The Institute consists of the Office of Standard Reference Materials and the following divisions:

Analytical Chemistry—Polymers—Metallurgy—Inorganic Materials—Reactor Radiation—Physical Chemistry.

THE INSTITUTE FOR APPLIED TECHNOLOGY provides technical services to promote the use of available technology and to facilitate technological innovation in industry and Government; cooperates with public and private organizations leading to the development of technological standards (including mandatory safety standards), codes and methods of test; and provides technical advice and services to Government agencies upon request. The Institute also monitors NBS engineering standards activities and provides liaison between NBS and national and international engineering standards bodies. The Institute consists of the following divisions and offices:

Engineering Standards Services—Weights and Measures—Invention and Innovation—Product Evaluation Technology—Building Research—Electronic Technology—Technical Analysis—Measurement Engineering—Office of Fire Programs.

THE CENTER FOR COMPUTER SCIENCES AND TECHNOLOGY conducts research and provides technical services designed to aid Government agencies in improving cost effectiveness in the conduct of their programs through the selection, acquisition, and effective utilization of automatic data processing equipment; and serves as the principal focus within the executive branch for the development of Federal standards for automatic data processing equipment, techniques, and computer languages. The Center consists of the following offices and divisions:

Information Processing Standards—Computer Information—Computer Services—Systems Development—Information Processing Technology.

THE OFFICE FOR INFORMATION PROGRAMS promotes optimum dissemination and accessibility of scientific information generated within NBS and other agencies of the Federal Government; promotes the development of the National Standard Reference Data System and a system of information analysis centers dealing with the broader aspects of the National Measurement System; provides appropriate services to ensure that the NBS staff has optimum accessibility to the scientific information of the world, and directs the public information activities of the Bureau. The Office consists of the following organizational units:

Office of Standard Reference Data—Office of Technical Information and Publications—Library—Office of International Relations.

¹ Headquarters and Laboratories at Gaithersburg, Maryland, unless otherwise noted; mailing address Washington, D.C. 20234.

² Part of the Center for Radiation Research.

³ Located at Boulder, Colorado 80302.

OMNITAB II

Segmentation Structure for the SCOPE Operating System

S. T. Peavy and R. N. Varner

U.S. Institute for Basic Standards
National Bureau of Standards
Washington, D.C. 20234

t. Technical note no. 754



U.S. DEPARTMENT OF COMMERCE, Peter G. Peterson, Secretary
NATIONAL BUREAU OF STANDARDS, Lawrence M. Kushner, Acting Director,

Issued June 1972

National Bureau of Standards Technical Note 734

Nat. Bur. Stand. (U.S.), Tech. Note 734, 25 pages (June 1972)

CODEN: NBTNAE

OMNITAB II Segmentation Structure for the SCOPE Operating System

Sally T. Peavy and Ruth N. Varner

OMNITAB II is an interpretive system developed and maintained by the National Bureau of Standards to enable scientists to use a large computer easily, effectively and accurately for numerical, statistical and data analysis without prior computer experience. The system is as machine independent as possible, making implementation relatively easy. Since OMNITAB II has a large memory requirement, segmentation and overlay are virtually essential.

Overlay procedures are dependent upon the operating system of the computer. Changes are necessary to the OMNITAB II program when the overlay procedure requires specific overlay CALL statements to external procedures in other overlay links. This Technical Note describes a method of segmentation and overlay for a particular operating system (CDC-6000 series). The method can readily be adapted to other operating systems with modifications to the control statements.

Key words: ANSI FORTRAN, general-purpose computer program, implementation of OMNITAB II, links, OMNITAB II, overlay procedures, SCOPE operating system, segmentation.

OMNITAB II is an interpretive computing system which permits easy use of a computer without prior computing experience. The system was developed and is maintained by the National Bureau of Standards to enable scientists to use a computer easily, effectively and accurately for numerical, statistical and data analysis without the necessity of becoming professional programmers. OMNITAB was envisioned by Joseph Hilsenrath and developed by him and his co-workers. A complete description of the first version of OMNITAB was given in Hilsenrath et al. (1966). Hogben et al. (1970 and 1971) documents OMNITAB II version 5.0, the present version.

The OMNITAB II system was designed with the systems programmer in mind, as well as the user. All the subprograms in the system are written in the American National Standards Institute (ANSI) FORTRAN. Every effort has been made to produce a virtually machine independent program which could be easily transported and implemented on any large computer. However, a minimum number of modifications are necessary in the implementation of the OMNITAB II system, due to the variability of hardware and software features of computers. The modifications are limited to a small number of subprograms and are fully documented in Peavy, Varner and Bremer (1970).

The OMNITAB II version 5.0 system requires approximately 90K storage units of central memory, assuming each real (floating point) number and a machine instruction occupy one storage unit. The OMNITAB system consists of one main program, one-hundred-seventy-two procedure subprograms and four specification subprograms. To make the program operable on a smaller computer configuration, the OMNITAB II system has been segmented into twenty-one segments or groups. Certain of these segments may overlay each other (i.e., share the same storage units in central memory). This reduces the storage units required to approximately 49K, plus the storage units needed by the operating system library subprograms (i.e., SIN, LOG, I/O routines, etc., approximately 4K). The amount of storage needed may be further reduced by decreasing the size of the worksheet and scratch areas as described in Peavy, Varner and Bremer (1970). Segmentation and overlay may not be necessary for a computer with a large central memory if the OMNITAB II program is permitted to utilize the full memory.

Much thought has been put into the segmentation structure of the OMNITAB II program in order to minimize the swapping of segments in and out of the computer's central memory. Subprograms which read, scan and interpret the OMNITAB instructions are in the main segment which is in residence at all times during execution of the OMNITAB system. The error checking subroutines are also included in this segment as well as a few of the subprograms which execute the most often used instructions (GENERATE, INCREMENT, RESET, etc.) as determined from statistics gathered over a three month period. The other segments contain subprograms which execute related instructions, such as the statistical, input-output, matrix and array operations. In order to maintain a minimum number of subprograms in the main segment, it was sometimes necessary to duplicate a subroutine in another segment under a different subprogram name. This was avoided as much as possible.

The overlay procedure is very dependent upon the operating system of the computer. Since standards have not been defined in regards to overlay, the method of overlaying is at the discretion of the systems programmers or the software manufacturers. Some systems make great demands on the user or programmer, while others require a minimum amount of effort. From the authors' experience and knowledge of overlay procedures, there appear to be three main categories for third generation computers. In all three types the user must provide the following information to the operating system (1) how the subprograms are to be grouped, (2) which subprograms comprise the main segment and are in memory at all times, (3) which groups may overlay what other groups and (4) what other groups or segments are necessary with a particular group. Furthermore, some overlay procedures have restrictions of the use of the FORTRAN labeled and unlabeled COMMON statements, of which the user must be aware to take proper action.

One type of overlay procedure places no restrictions on the programmer when a problem is being programmed. During the programming stage of the problem no thought of overlay and segmentation structure are necessary. The programmer programs the problem as though the whole program will be able to reside in the computer at execution time. The operating system does not require the subprograms to be arranged in the order in which they are grouped when overlaid at execution time. Nor is it necessary to precede each subprogram with control cards for the operating system. The only prerequisite is that at execution time, the operating system must be provided with either a set of control statements or a routine outlining the segmentation and overlay structure. This is the overlay procedure that was used in implementing OMNITAB II version 5.0 for the NBS computer configuration. For complete details see Peavy, Varner and Bremer (1970).

The second form of overlay procedure also does not restrict the programmer when the problem is being programmed. However, before execution the program units must be arranged in order of the overlay setup. Furthermore system control cards must precede each of the grouped procedures or segments. If OMNITAB II version 5.0 is being implemented on a computer whose operating system allows this procedure for overlaying, the systems programmer should check Peavy, Varner and Bremer (1970) for details in deck setup.

The third form of overlay procedure requires the programmer to keep in mind that the program will have to be segmented and overlaid because of its size. He must plan the

overlay structure and links at the same time he is programming the problem. The writer must be able to judge the amount of storage units required by each subprogram in order to group them properly. If the programs are written in FORTRAN, CALL statements to bring in the proper overlay group must be added to the segment which references external procedures in another overlay link. These statements may be of the form CALL LINK (NAME), or CALL OVERLAY (a1, a2, a3, a4), where NAME is a name of a particular segment and a's are arguments to the subroutine OVERLAY. Furthermore at execution time, the program units must be organized in a specific manner. All the subprograms in a particular segment must be grouped together preceded by operating system control statement(s).

This paper describes the changes necessary to overlay the OMNITAB II program under a computer operating system where the overlay structure is of the third type. The material is divided into five parts: (I) changes necessary to specified subprograms; (II) addition of new program units; (III) the deck setup organization; (IV) flow chart of the overlay structure and; (V) changes necessary if the worksheet and scratch area sizes are changed. This information is on cards and appears in this publication as a computer listing.

Part I lists the changes that must be made to four subprograms BESSEL, OMNIT, ORTHO and XECUTE. The three letter subprogram identification and line numbers are shown on the extreme right, as in Peavy, Varner and Hogben (1970). The changes for each subprogram are divided into two parts. The first set of corrections are to replace the statements of the specified subprogram and the second set are additions to be inserted in the proper place. The additions should be made so that the numbers are in ascending order.

Part II consists of twenty new program units, one for each of the overlaying segments. The OMNITAB II program is segmented into twenty-one segments. The first segment (main segment) does not require any new program unit since it contains the main routine and is resident in memory throughout the execution of the OMNITAB II program. The first two lines of each program unit are control cards for one particular operating system (CDC-6000 - Scope system) for which the OMNITAB II system has been implemented. The first line OVERLAY (a1, a2, a3), indicates the start of a new segment. The argument a1 is the file name of the segment, a2 a numerical identifier or primary level number, and a3 the secondary level of the overlay within that particular file. The second card is a program identification for the program unit. Each program unit is written in FORTRAN and consists primarily of CALL statements which refer to subprograms in that particular segment.

The deck setup organization is described in part III. The segments may be stored on a magnetic tape file, disk file, drum file or card file. For convenience the twenty-one segments are labeled Group 1 through Group 21. The groups should be in the order listed (i.e. in ascending order), in order to minimize file searching. The setup for each group is documented in detail. Each group (except Group 1) must begin with one of the program units described in part II, followed by the OMNITAB II subprograms listed for that group. The order of the OMNITAB II subprograms within a particular group is insignificant.

Part IV is a flow diagram of the overlay structure. The approximate size of each segment is also indicated, assuming each real number (floating point) and machine instruction occupy one storage unit.

It was necessary to include some of the labeled common areas in the program units described in part II. If the size of the worksheet and scratch areas are to be increased or decreased, changes must be made in some of the program units as well as in the subprograms indicated in Peavy, Varner and Bremer (1970). Part V describes the changes pertinent to particular program units in part II.

Although the write-up is for a particular computer and computer operating system, the deck setup can be easily modified for other operating systems. In part I the CALL statements (CALL OVERLAY (a1, a2, a3, a4)) in the subprograms BESSEL, OMNIT, ORTHO and XECUTE must be changed to the proper CALL statements of the specific operating system used. It may be necessary to modify the program units in part II as subprograms rather than main programs. The first two control cards of each program unit must be exchanged for the proper

control statement(s) of the operating system. Also in some cases, control statement(s) may be required for part III.

The authors wish to thank Mr. B. Scott Miller of Control Data Corporation, for his assistance in programming and implementing the OMNITAB II program on the SCOPE operating system and in editing the manuscript. Special thanks goes to Shirley Bremer in preparing and editing the cards for listing.

References

AMERICAN STANDARD FORTRAN (1966). American National Standards Institute, New York.

CDC (1971). Control Data 6000 Series Computer System SCOPE 3.3 Reference Manual. Publication No. 60305200.

HILSENATH, J., ZIEGLER, G. G., MESSINA, C. G., WALSH, P. J. and HERBOLD, R. J. (1966). OMNITAB: A Computer Program For Statistical and Numerical Analysis. National Bureau of Standards Handbook 101, Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Reissued January 1968 with corrections.

HOGBEN, DAVID, PEAVY, S. T. and VARNER, R. N. (1970). OMNITAB II Magnetic Tape and Documentation Parcel. NBS Magnetic Tape 1, Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

HOGBEN, DAVID, PEAVY, S. T. and VARNER, R. N. (1971). OMNITAB II User's Reference Manual. NBS Technical Note 552, Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

LANZANO, BERNADINE C. (October, 1969). Loader Standardization for Overlay Programs. Communications of the ACM, Vol. 12, No. 10, pgs. 541-550.

PEAVY, S. T., VARNER, R. N., and BREMER, S. G. (1970). A Systems Programmer's Guide for Implementing OMNITAB II. NBS Technical Note 550, Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

PEAVY, S. T., VARNER, R. N. and HOGBEN, DAVID, (1970). Source Listing of OMNITAB II Program. NBS Special Publication 339, Superintendent of Documents, U.S. Government Printing Office Washington, D.C. 20402.

PART I

CHANGES NECESSARY TO SPECIFIC SUBPROGRAMS

SEGMENTING OMNITAB II FOR THE CDC-6000 SERIES UNDER THE SCOPE SYSTEM
THIS SEGMENTATION STRUCTURE IS FOR OMNITAB II VERSION 5.00

THE FOLLOWING SUBPROGRAMS MUST BE CHANGED: BESSEL, OMNIT, ORTHO AND XECUTE

THE CHANGES THAT ARE NECESSARY ARE LISTED FOR EACH OF THE SUBPROGRAMS
ALONG WITH THE APPROPRIATE LINE NOS IN COLS 73 THROUGH 79

A. CHANGES FOR SUBPROGRAM BESSEL

REPLACE THE APPROPRIATE CARDS (LINE NOS. IN COLS 73-79)
WITH THE FOLLOWING CARDS

	DOUBLE PRECISION X,Y,E,P,Q,S,T,Z,DXEX,XEX	BES 90
40	CALL OVERLAY(4HWORK,3,1,6HRECALL)	BES 870
90	CALL OVERLAY(4HWORK,3,1,6HRECALL)	BES1130
	IF(M.NE.2) GO TO 145	BES1580
145	IF(M.NE.1) GO TO 148	BES1660
	CALL OVERLAY(4HWORK,3,2,6HRECALL)	BES1670
	ICDC=2	BES2310
	ICDC=3	BES2410
330	DBEJX=Z	BES2540
335	IF(L2.NE.38) IF(L2-39)338,460,338	BES2560
	CALL OVERLAY(4HWORK,3,1,6HRECALL)	BES2570
338	DO 340 N=1,K	BES2580
	ICDC=4	BES2740
360	ICDC=5	BES2770
	ICDC=5	BES3020
	R(J)=DBEJX	BES3050
	CALL OVERLAY(4HWORK,3,2,6HRECALL)	BES3280
470	ICDC=1	BES3370
	AA(1)=DBEJX	BES3380

INSERT THE FOLLOWING CARDS IN THE APPROPRIATE PLACES
(LINE NOS. IN COLS 73-79)

C	CDC VERSION 5.00 BESSEL	BES 25
	COMMON/CDC/ICDC,ICDCK,ICDCN,DBEJX,BES2	BES 192
	DOUBLE PRECISION DBEJX,BES2	BES 194
	ICDC=1	BES 522
	ICDCK=N	BES 524
	ICDCN=M	BES 526
	R(J)=Y*DBEJX	BES 875
	X=Y*DBEJX	BES1135
	ICDC=1	BES1582
	CALL OVERLAY(4HWORK,3,2,6HRECALL)	BES1584
	ICDC=2	BES1665
148	Z=X*FDCOS(Y)	BES1675
	DBEJX=Z	BES2312
	CALL OVERLAY(4HWORK,3,1,6HRECALL)	BES2314
	R(J)=BES2	BES2316
	ICDCK=K	BES2412
	CALL OVERLAY(4HWORK,3,2,6HRECALL)	BES2414
	R(J)=BES2	BES2416
	IF(L2.NE.32) GO TO 335	BES2542
	ICDC=3	BES2544

CALL OVERLAY(4HWORK,3,1,6HRECALL)	BES2546
GO TO 338	BES2548
ICDC=4	BES2565
ICDCK=L	BES2742
CALL OVERLAY(4HWORK,3,2,6HRECALL)	BES2744
ICDCK=L	BES2772
CALL OVERLAY(4HWORK,3,2,6HRECALL)	BES2774
CALL OVERLAY(4HWORK,3,1,6HRECALL)	BES3024
ICDCK=K	BES3276
ICDCN=L	BES3277
ICDC=6	BES3279
ICDCK=0	BES3372
ICDCN=7	BES3374
CALL OVERLAY(4HWORK,3,1,6HRECALL)	BES3376
ICDCK=1	BES3382
CALL OVERLAY(4HWORK,3,1,6HRECALL)	BES3384
AA(2)=DBEJX	BES3386

B. CHANGES FOR SUBPROGRAM OMNIT

REPLACE THE APPROPRIATE CARDS (LINE NOS. IN COLS 73-79)
WITH THE FOLLOWING CARDS

CALL OVERLAY (5HOMNIT,1,0,6HRECALL)	OMN 460
CALL OVERLAY (5HOMNIT,1,0,6HRECALL)	OMN 810
65 ICDCK=LETSGO	OMN1030
ICDC=5	OMN1170
ICDC=1	OMN1273
ICDC=6	OMN1320
ICDC=8	OMN1840
ICDC=7	OMN3190
ICDC=9	OMN3400

INSERT THE FOLLOWING CARDS IN THE APPROPRIATE PLACES
(LINE NOS. IN COLS 73-79)

C	VERSION 5.00 CDC OVERLAY OMNIT	OMN 25
	COMMON/CDC/ ICDC,ICDCK,ICDCN,DBEJX,BES2	OMN 185
	DOUBLE PRECISION DBEJX,BES2	OMN 186
	ICDC=2	OMN 455
50	ICDC=3	OMN 805
	ICDC=4	OMN1033
	CALL OVERLAY(5HOMNIT,1,0,6HRECALL)	OMN1036
	LETSGO=ICDCK	OMN1038
	CALL OVERLAY(5HOMNIT,1,0,6HRECALL)	OMN1175
95	ICDCK=K	OMN1272
	CALL OVERLAY(5HOMNIT,1,0,6HRECALL)	OMN1274
	CALL OVERLAY(5HOMNIT,1,0,6HRECALL)	OMN1325
	CALL OVERLAY(5HOMNIT,1,0,6HRECALL)	OMN1845
	CALL OVERLAY(5HOMNIT,1,0,6HRECALL)	OMN3195
	ICDCK=J	OMN3404
	CALL OVERLAY(5HOMNIT,1,0,6HRECALL)	OMN3406
	J=ICDCK	OMN3408

C. CHANGES FOR SUBPROGRAM ORTHO

REPLACE THE APPROPRIATE CARDS (LINE NOS. IN COLS 73-79)
WITH THE FOLLOWING CARDS

CALL OVERLAY(6HSTATIS,1,4,6HRECALL)	ORT7110
-------------------------------------	---------

1590	CALL OVERLAY(6HSTATIS,1,5,6HRECALL)	ORT7160
1610	CALL OVERLAY(6HSTATIS,1,3,6HRECALL)	ORT7190
	CALL OVERLAY(6HSTATIS,1,1,6HRECALL)	ORT7210
1650	CALL OVERLAY(6HSTATIS,1,2,6HRECALL)	ORT7470
C		ORT7480

INSERT THE FOLLOWING CARDS IN THE APPROPRIATE PLACES
(LINE NOS. IN COLS 73-79)

C	VERSION 5.00 CDC OVERLAY ORTHO	ORT 21
	COMMON/CDCORT/N,M,MX,NX,ND2,ND3,ND19,B,SSQ,IX, IXA,ND7,MD1,IHC,	ORT 22
	1IHT,YSUM,SU,ND9,FM,NSU,M1,ND18,ND17,IND19S,IND18S,IND7S,SS,SSOLD	ORT 24

D. CHANGES FOR SUBPROGRAM XECUTE

REPLACE THE APPROPRIATE CARDS (LINE NOS. IN COLS 73-79)
WITH THE FOLLOWING CARDS

200	ICDC=13	XEC 270
300	ICDC=14	XEC 300
400	ICDC=11	XEC 330
600	ICDC=10	XEC 390
700	GO TO 400	XEC 420
C		XEC 440
800	GO TO 200	XEC 450
C		XEC 460
1303	ICDC=12	XEC 720
1305	CALL OVERLAY (5HOMNIT,2,0,6HRECALL)	XEC 770
1306	GO TO 1305	XEC 800
C		XEC 810
1313	ICDC=1	XEC 990
1314	CALL OVERLAY (5HOMNIT,2,0,6HRECALL)	XEC1020
1500	CALL OVERLAY (6HMATRIX,1,0,6HRECALL)	XEC1470
1600	CALL OVERLAY (6HMATRIX,2,0,6HRECALL)	XEC1500
1701	CALL OVERLAY (6HMATRIX,1,0,6HRECALL)	XEC1550
1702	CALL OVERLAY (6HMATRIX,1,0,6HRECALL)	XEC1580
1703	CALL OVERLAY (6HMATRIX,1,0,6HRECALL)	XEC1610
1704	CALL OVERLAY (6HMATRIX,1,0,6HRECALL)	XEC1640
1705	CALL OVERLAY (6HMATRIX,3,0,6HRECALL)	XEC1670
	CALL OVERLAY (6HMATRIX,1,0,6HRECALL)	XEC1720
1809	CALL OVERLAY (6HMATRIX,3,0,6HRECALL)	XEC1750
1900	CALL OVERLAY (4HWORK,1,0,6HRECALL)	XEC1780
2000	CALL OVERLAY (4HWORK,2,0,6HRECALL)	XEC1810
2101	CALL OVERLAY (4HWORK,1,0,6HRECALL)	XEC1870
2103	CALL OVERLAY (4HWORK,2,0,6HRECALL)	XEC1920
2105	CALL OVERLAY (4HWORK,2,0,6HRECALL)	XEC1970
2108	CALL OVERLAY (4HWORK,1,0,6HRECALL)	XEC2040
2110	CALL OVERLAY (4HWORK,2,0,6HRECALL)	XEC2090
2111	CALL OVERLAY (4HWORK,1,0,6HRECALL)	XEC2120
2112	CALL OVERLAY (4HWORK,1,0,6HRECALL)	XEC2150
2113	CALL OVERLAY (4HWORK,1,0,6HRECALL)	XEC2180
2118	CALL OVERLAY (5HOMNIT,2,0,6HRECALL)	XEC2330
2200	CALL OVERLAY (6HSTATIS,1,0,6HRECALL)	XEC2390
2301	CALL OVERLAY (4HWORK,2,0,6HRECALL)	XEC2450
2306	CALL OVERLAY (4HWORK,2,0,6HRECALL)	XEC2560
2310	CALL OVERLAY (4HWORK,2,0,6HRECALL)	XEC2650
2401	CALL OVERLAY (6HSTATIS,2,0,6HRECALL)	XEC2760
2403	CALL OVERLAY (6HSTATIS,3,0,6HRECALL)	XEC2810
2404	CALL OVERLAY (4HWORK,2,0,6HRECALL)	XEC2840
2405	CALL OVERLAY (6HSTATIS,2,0,6HRECALL)	XEC2870

2406	CALL OVERLAY(6HSTATIS,4,0,6HRECALL)	XEC2900
2407	GO TO 2406	XEC2930
C		XEC2940
2408	CALL OVERLAY(6HSTATIS,2,0,6HRECALL)	XEC2960
2409	GO TO 2408	XEC2990
C		XEC3000
2410	CALL OVERLAY(6HSTATIS,2,0,6HRECALL)	XEC3020
2411	CALL OVERLAY(6HSTATIS,3,0,6HRECALL)	XEC3050
2412	GO TO 2411	XEC3080
C		XEC3090
2413	CALL OVERLAY(6HMATRIX,3,0,6HRECALL)	XEC3110
2415	CALL OVERLAY(5HOMNIT,2,0,6HRECALL)	XEC3160
	CALL OVERLAY(4HWORK,1,0,6HRECALL)	XEC3200
2504	CALL OVERLAY(4HWORK,1,0,6HRECALL)	XEC3220
2600	CALL OVERLAY(6HMATRIX,1,0,6HRECALL)	XEC3250
2700	CALL OVERLAY(6HMATRIX,2,0,6HRECALL)	XEC3280
2800	CALL OVERLAY(4HWORK,1,0,6HRECALL)	XEC3310
2900	CALL OVERLAY(4HWORK,1,0,6HRECALL)	XEC3340
3000	CALL OVERLAY(4HWORK,3,0,6HRECALL)	XEC3370
3100	CALL OVERLAY(5HOMNIT,2,0,6HRECALL)	XEC3400
3200	CALL OVERLAY(4HWORK,2,0,6HRECALL)	XEC3430
4500	ICDC=15	XEC3720
5100	CALL OVERLAY(6HMATRIX,1,0,6HRECALL)	XEC3860
5200	CALL OVERLAY(6HMATRIX,1,0,6HRECALL)	XEC3890
5300	CALL OVERLAY(6HMATRIX,1,0,6HRECALL)	XEC3920
5402	CALL OVERLAY(4HWORK,4,0,6HRECALL)	XEC4000
5403	CALL OVERLAY(4HWORK,4,0,6HRECALL)	XEC4030
5404	CALL OVERLAY(4HWORK,4,0,6HRECALL)	XEC4060
5405	CALL OVERLAY(4HWORK,4,0,6HRECALL)	XEC4090
5406	CALL OVERLAY(4HWORK,4,0,6HRECALL)	XEC4120
5407	CALL OVERLAY(4HWORK,4,0,6HRECALL)	XEC4150

INSERT THE FOLLOWING CARDS IN THE APPROPRIATE PLACES
(LINE NOS. IN COLS 73-79)

C	VERSION 5.00 CDC OVERLAY XECUTE	XEC 25
	COMMON/CDC/ICDC,ICDCK,ICDCN,DBEJX,BES2	XEC 45
	DOUBLE PRECISION DBEJX,BES2	XEC 46
	CALL OVERLAY(5HOMNIT,1,0,6HRECALL)	XEC 275
	CALL OVERLAY (5HOMNIT,1,0,6HRECALL)	XEC 305
	CALL OVERLAY (5HOMNIT,1,0,6HRECALL)	XEC 335
	CALL OVERLAY (5HOMNIT,1,0,6HRECALL)	XEC 395
	CALL OVERLAY (5HOMNIT,1,0,6HRECALL)	XEC 725
	ICDCK=3	XEC 992
	CALL OVERLAY (5HOMNIT,1,0,6HRECALL)	XEC 994
	CALL OVERLAY(5HOMNIT,1,0,6HRECALL)	XEC3725

PART II

ADDITION OF NEW PROGRAM UNITS

THE FOLLOWING NEW PROGRAMS MUST ALSO BE INCLUDED. THESE PROGRAMS ARE LISTED BELOW.

	OVERLAY (OMNIT,1,0)	
	PROGRAM GRP2	
C	VERSION 5.00 CDC OVERLAY GROUP 2	GP2 20
	COMMON/CDC/ ICDC,ICDCK,ICDCN,DBEJX,BES2	GP2 50
	DOUBLE PRECISION DBEJX,BES2	GP2 55
	COMMON /BLOCKB/ NSTMT,NSTMTX,NSTMTH,NCOM,LCOM,IOVFL,COM(2000)	GP2 60
	GO TO (10,20,30,40,50,60,70,80,90,100,110,120,130,140,150),ICDC	GP2 75
10	CALL NOTEPR(ICDCK)	GP2 80
	GO TO 1000	GP2 90
20	CALL SETUP	GP2 100
30	CALL STMT(NSTMT)	GP2 110
	GO TO 1000	GP2 120
40	CALL XOMNIT(ICDCK)	GP2 130
	GO TO 1000	GP2 140
50	CALL XFORMAT	GP2 150
	GO TO 1000	GP2 160
60	CALL XHEAD	GP2 170
	GO TO 1000	GP2 180
70	CALL SETQ	GP2 190
	GO TO 1000	GP2 200
80	CALL TAPOP	GP2 210
	GO TO 1000	GP2 220
90	CALL STORE (ICDCK)	GP2 230
	GO TO 1000	GP2 240
100	CALL ABRIDG	GP2 250
	GO TO 1000	GP2 260
110	CALL APRINT	GP2 270
	GO TO 1000	GP2 280
120	CALL FIXFLO	GP2 290
	GO TO 1000	GP2 300
130	CALL PRINTX	GP2 310
	GO TO 1000	GP2 320
140	CALL PUNCH	GP2 330
	GO TO 1000	GP2 340
150	CALL TAPOP2	GP2 350
1000	RETURN	GP2 360
	END	GP2 370

	OVERLAY(OMNIT,2,0)	
	PROGRAM GRP3	
C	VERSION 5.00 CDC OVERLAY GROUP 3	GP3 20
	COMMON/BLOCKE/ NAME(4),L1,L2,ISRFLG	GP3 30
	IF(L1.EQ.31) GO TO 40	GP3 40
	IF(L1.EQ.24.AND.L2.EQ.15) GO TO 30	GP3 50
	IF(L1.EQ.21.AND.(L2.EQ.18.OR.L2.EQ.19)) GO TO 20	GP3 60
	IF(L2.EQ.14) GO TO 10	GP3 70
	CALL PLOT	GP3 80
	GO TO 50	GP3 90
10	CALL FNEIC	GP3 100
	GO TO 50	GP3 110
20	CALL FNEC	GP3 120
	GO TO 50	GP3 130
30	CALL FNKC	GP3 140

	GO TO 50	GP3 150
40	CALL THERMO	GP3 160
50	RETURN	GP3 170
	END	GP3 180
	OVERLAY(MATRIX,1,0)	
	PROGRAM GRP4	
C	VERSION 5.00 CDC OVERLAY GROUP 4	GP4 20
	COMMON/BLOCKE/ NAME(4),L1,L2,ISRFLG	GP4 30
	IF (L1-EQ.52) 10,90,100	GP4 40
10	IF (L1-EQ.51) GO TO 80	GP4 50
	IF (L1-EQ.26) GO TO 70	GP4 60
	IF (L1-EQ.18) GO TO 60	GP4 70
	IF (L1-EQ.17) GO TO (20,30,40,50),L2	GP4 80
	CALL MOP	GP4 90
	GO TO 120	GP4 100
20	CALL MMULT	GP4 110
	GO TO 120	GP4 120
30	CALL MRAISE	GP4 130
	GO TO 120	GP4 140
40	CALL MKRON	GP4 150
	GO TO 120	GP4 160
50	CALL MTRIAN	GP4 170
	GO TO 120	GP4 180
60	CALL MATRIX	GP4 190
	GO TO 120	GP4 200
70	CALL EXPCON	GP4 210
	GO TO 120	GP4 220
80	CALL MXTX	GP4 230
	GO TO 120	GP4 240
90	CALL MDAMAD	GP4 250
	GO TO 120	GP4 260
100	CALL ARYVEC	GP4 270
120	RETURN	GP4 280
	END	GP4 290
	OVERLAY(MATRIX,2,0)	
	PROGRAM GRP5	
C	VERSION 5.00 CDC OVERLAY GROUP 5	GP5 20
	COMMON/BLOCKE/ NAME(4),L1,L2,ISRFLG	GP5 30
	IF (L1-EQ.27) GO TO 10	GP5 40
	CALL INVERT	GP5 50
	GO TO 20	GP5 60
10	CALL MPROP	GP5 70
20	RETURN	GP5 80
	END	GP5 90
	OVERLAY(MATRIX,3,0)	
	PROGRAM GRP6	
C	VERSION 5.00 CDC OVERLAY GROUP 6	GP6 20
	COMMON/BLOCKE/ NAME(4),L1,L2,ISRFLG	GP6 30
	IF (L1-EQ.24) GO TO 20	GP6 40
	IF (L1-EQ.18) GO TO 10	GP6 50
	CALL MEIGEN	GP6 60
	GO TO 30	GP6 70
10	CALL COALES	GP6 80
	GO TO 30	GP6 90
20	CALL ONEWAY	GP6 100
30	RETURN	GP6 110
	END	GP6 120

	OVERLAY(STATIS,1,0)		
	PROGRAM GRP7		
C	VERSION 5.00 CDC OVERLAY GROUP 7	GP7	20
	CALL ORTHO	GP7	30
	RETURN	GP7	40
	END	GP7	50
	OVERLAY(STATIS,1,1)		
	PROGRAM GRP8		
C	VERSION 5.00 CDC OVERLAY GROUP 8	GP8	20
	COMMON/CDCORT/N,M,MX,NX,ND2,ND3,ND19,B,SSQ,IX, IXA,ND7,MD1,IHC,	GP8	30
1	IHT,YSUM,SU,ND9,FM,NSU,M1,ND18,ND17,IND19S,IND18S,IND7S,SS,SSOLD	GP8	31
	DIMENSION B(120),IHC(4),IHT(8),IIRGS(100)	GP8	40
	DOUBLE PRECISION YSUM	GP8	50
	COMMON/KFMT/KFMT(100)	GP8	60
	EQUIVALENCE (IIRGS,KFMT)	GP8	70
	CALL OANOVA(YSUM,SU,ND9,FM,M,N,ND7,SSQ,IHC,NSU,B)	GP8	80
	RETURN	GP8	90
	END	GP8	95
	OVERLAY(STATIS,1,2)		
	PROGRAM GPR9		
C	VERSION 5.00 CDC OVERLAY GROUP 9	GP9	20
	COMMON/CDCORT/N,M,MX,NX,ND2,ND3,ND19,B,SSQ,IX, IXA,ND7,MD1,IHC,	GP9	30
1	IHT,YSUM,SU,ND9,FM,NSU,M1,ND18,ND17,IND19S,IND18S,IND7S,SS,SSOLD	GP9	31
	DIMENSION B(120),IHC(4),IHT(8),IIRGS(100)	GP9	40
	DOUBLE PRECISION YSUM	GP9	50
	COMMON/KFMT/KFMT(100)	GP9	60
	EQUIVALENCE (IIRGS,KFMT)	GP9	70
	CALL OCOEFF(M1,N,ND18,ND17,IND19S,IND18S,IHC,B,IND7S,NSU,SS,SSOLD,	GP9	80
1	YSUM)	GP9	81
	RETURN	GP9	90
	END	GP9	95
	OVERLAY(STATIS,1,3)		
	PROGRAM GRP10		
C	VERSION 5.00 CDC OVERLAY GROUP 10	GP10	20
	COMMON/CDCORT/N,M,MX,NX,ND2,ND3,ND19,B,SSQ,IX, IXA,ND7,MD1,IHC,	GP10	30
1	IHT,YSUM,SU,ND9,FM,NSU,M1,ND18,ND17,IND19S,IND18S,IND7S,SS,SSOLD	GP10	31
	DIMENSION B(120),IHC(4),IHT(8),IIRGS(100)	GP10	40
	DOUBLE PRECISION YSUM	GP10	50
	COMMON/KFMT/KFMT(100)	GP10	60
	EQUIVALENCE (IIRGS,KFMT)	GP10	70
	CALL OCOVAR(M,ND7,MD1,IHC,B,IHT)	GP10	80
	RETURN	GP10	90
	END	GP10	95
	OVERLAY(STATIS,1,4)		
	PROGRAM GRP11		
C	VERSION 5.00 CDC OVERLAY GROUP 11	GP11	20
	COMMON/CDCORT/N,M,MX,NX,ND2,ND3,ND19,B,SSQ,IX, IXA,ND7,MD1,IHC,	GP11	30
1	IHT,YSUM,SU,ND9,FM,NSU,M1,ND18,ND17,IND19S,IND18S,IND7S,SS,SSOLD	GP11	31
	DIMENSION B(120),IHC(4),IHT(8),IIRGS(100)	GP11	40
	DOUBLE PRECISION YSUM	GP11	50
	COMMON/KFMT/KFMT(100)	GP11	60
	EQUIVALENCE (IIRGS,KFMT)	GP11	70
	CALL OPONE(N,M,MX,NX,ND2,ND3,ND19,B,SSQ,IX)	GP11	80
	RETURN	GP11	90
	END	GP11	95

	OVERLAY(STATIS,1,5)	
	PROGRAM GRP12	
C	VERSION 5.00 CDC OVERLAY GROUP 12	GP12 20
	COMMON/CDCORT/N,M,MX,NX,ND2,ND3,ND19,B,SSQ,IX, IXA,ND7,MD1,IHC,	GP12 30
1	IHT,YSUM,SU,ND9,FM,NSU,M1,ND18,ND17,IND19S,IND18S,IND7S,SS,SSOLD	GP12 31
	DIMENSION B(120),IHC(4),IHT(8),IIRGS(100)	GP12 40
	DOUBLE PRECISION YSUM	GP12 50
	COMMON/KFMT/KFMT(100)	GP12 60
	EQUIVALENCE (IIRGS,KFMT),(B,IB)	GP12 70
	CALL ORTPLT(ND19,ND2,N,SSQ,ND3,IB,IIRGS(IXA),IIRGS(2))	GP12 80
	RETURN	GP12 90
	END	GP12 95
	OVERLAY(STATIS,2,0)	
	PROGRAM GRP13	
C	VERSION 5.00 CDC OVERLAY GROUP 13	GP13 20
	COMMON/BLOCKE/ NAME(4),L1,L2,ISRFLG	GP13 30
	IF (L2.EQ.10) GO TO 30	GP13 40
	IF (L2.EQ.8.OR.L2.EQ.9) GO TO 20	GP13 50
	IF (L2.EQ.5) GO TO 10	GP13 60
	CALL STATIS	GP13 70
	GO TO 40	GP13 80
10	CALL FPROB	GP13 90
	GO TO 40	GP13100
20	CALL HISTGM	GP13120
	GO TO 40	GP13130
30	CALL FRDIST	GP13135
40	RETURN	GP13140
	END	GP13150
	OVERLAY(STATIS,3,0)	
	PROGRAM GRP14	
C	VERSION 5.00 CDC OVERLAY GROUP 14	GP14 20
	COMMON/BLOCKE/ NAME(4),L1,L2,ISRFLG	GP14 30
	IF (L2.EQ.11.OR.L2.EQ.12) GO TO 10	GP14 40
	CALL RANKS	GP14 50
	GO TO 20	GP14 60
10	CALL CORREL	GP14 70
20	RETURN	GP14 80
	END	GP14 90
	OVERLAY(STATIS,4,0)	
	PROGRAM GRP15	
C	VERSION 5.00 CDC OVERLAY GROUP 15	GP15 20
	COMMON/BLOCKE/ NAME(4),L1,L2,ISRFLG	GP15 30
	CALL TWOWAY(L2)	GP15 40
	RETURN	GP15 50
	END	GP15 60
	OVERLAY (WORK,1,0)	
	PROGRAM GRP16	
C	VERSION 5.00 CDC OVERLAY GROUP 16	GP16 20
	COMMON/BLOCKE/ NAME(4),L1,L2,ISRFLG	GP16 30
	IF(L1.EQ.29) GO TO 110	GP16 35
	IF (L1.EQ.28) GO TO 100	GP16 40
	IF(L1.EQ.25) IF(L2-3) 80,80,90	GP16 50
	IF (L1.EQ.19) GO TO 70	GP16 60
	IF(L2-2) 60,60,10	GP16 70
10	LL2=L2-7	GP16 80
	GO TO (20,20,120,30,40,50,20),LL2	GP16 90

20	CALL SORDER	GP16110
	GO TO 120	GP16120
30	CALL EXCHNG	GP16130
	GO TO 120	GP16140
40	CALL FLIP	GP16150
	GO TO 120	GP16160
50	CALL CHANGE	GP16170
	GO TO 120	GP16180
60	CALL PROROW	GP16190
	GO TO 120	GP16200
70	CALL ALLSUB	GP16210
	GO TO 120	GP16220
80	CALL SELECT	GP16230
	GO TO 120	GP16240
90	IF(L2.EQ.5) GO TO 80	GP16245
	CALL INTERP	GP16250
	GO TO 120	GP16260
100	CALL ITERAT	GP16270
	GO TO 120	GP16280
110	CALL CMSEPA	GP16290
120	RETURN	GP16300
	END	GP16310

OVERLAY(WORK,2,0)

PROGRAM GRP17

C	VERSION 5.00 CDC OVERLAY GROUP 17	GP17 20
	COMMON/BLOCKE/ NAME(4),L1,L2,ISRFLG	GP17 30
	IF (L1.EQ.32) GO TO 100	GP17 40
	IF (L1.EQ.24) GO TO 90	GP17 45
	IF (L1.EQ.23) IF (L2-6) 70,80,60	GP17 50
	IF (L1.EQ.21) IF (L2-3) 110,30,20	GP17 70
	IF(L1.EQ.20) GO TO 25	GP17 75
20	IF (L2-6) 40,40,50	GP17 80
25	CALL MSCROW	GP17 90
	GO TO 110	GP17100
30	CALL DEFINE	GP17110
	GO TO 110	GP17120
40	CALL EXTREM	GP17130
	GO TO 110	GP17140
50	CALL ERASE	GP17150
	GO TO 110	GP17160
60	CALL PDMOTE	GP17170
	GO TO 110	GP17180
70	CALL MISC2	GP17190
	GO TO 110	GP17200
80	CALL MOVE	GP17210
	GO TO 110	GP17220
90	CALL GQUAD	GP17230
	GO TO 110	GP17240
100	CALL COMPLX	GP17250
110	RETURN	GP17260
	END	GP17270

OVERLAY(WORK,3,0)

PROGRAM GRP18

C	VERSION 5.00 CDC OVERLAY GROUP 18	GP18 20
	CALL BESSEL	GP18 30
	RETURN	GP18 40
	END	GP18 50

	OVERLAY (WORK,3,1)	
	PROGRAM GRP19	
C	VERSION 5.00 CDC OVERLAY GROUP 19	GP19 20
	COMMON/ABEKI/X,Y,P,Q,S,T	GP19 30
	DOUBLE PRECISION X,Y,P,Q,S,T,DBEJ,DBEJX,BES2,BINTJO	GP19 40
	COMMON/CDC/ ICDC,ICDCK,ICDCN,DBEJX,BES2	GP19 50
	COMMON/SCRAT/NS,NS2,A(13500)	GP19 60
	DOUBLE PRECISION W(100)	GP19 70
	EQUIVALENCE(A(4001),W)	GP19 80
	GO TO (10,20,30,40,50),ICDC	GP19 90
10	DBEJX=DBEJ(X,ICDCK,ICDCN)	GP19100
	GO TO 60	GP19110
20	BES2=BINTJO(X,W,DBEJX)	GP19120
	GO TO 60	GP19130
30	CALL BEJN(0,W,DBEJX)	GP19140
	GO TO 60	GP19150
40	CALL BEJN(1,W,DBEJX)	GP19160
	GO TO 60	GP19170
50	CALL STRUVE(X,Y,DBEJX,W)	GP19180
60	RETURN	GP19190
	END	GP19200
	OVERLAY(WORK,3,2)	
	PROGRAM GRP20	
C	VERSION 5.00 CDC OVERLAY GROUP 20	GP20 20
	COMMON/ABEKI/X,Y,P,Q,S,T	GP20 30
	DOUBLE PRECISION X,Y,P,Q,S,T,DBEJX,BES2,COMELL	GP20 40
	COMMON/CDC/ ICDC,ICDCK,ICDCN,DBEJX,BES2	GP20 50
	COMMON/SCRAT/NS,NS2,A(13500)	GP20 60
	DOUBLE PRECISION AA(1000),B(1000)	GP20 70
	EQUIVALENCE (A(1),AA),(A(2001),B)	GP20 80
	GO TO (10,20,30,40,50,60),ICDC	GP20 90
10	CALL CBEK	GP20100
	GO TO 70	GP20110
20	CALL CBEI	GP20120
	GO TO 70	GP20130
30	BES2=COMELL(X,ICDCK)	GP20140
	GO TO 70	GP20150
40	CALL BEZONE(AA,B,1,ICDCK)	GP20160
	GO TO 70	GP20170
50	CALL BEZERO(AA,B,1,ICDCK)	GP20180
	GO TO 70	GP20190
60	CALL FOURIA(AA,B(1),B(2),ICDCK,ICDCN)	GP20200
70	RETURN	GP20210
	END	GP20220
	OVERLAY(WORK,4,0)	
	PROGRAM GRP21	
C	VERSION 5.00 CDC OVERLAY GROUP 21	GP21 20
	COMMON/BLOCKE/ NAME(4),L1,L2,ISRFLG	GP21 30
	L2A=L2-1	GP21 40
	GO TO (10,20,30,40,50,60),L2A	GP21 45
10	CALL DUMMYA	GP21 50
	GO TO 70	GP21 60
20	CALL DUMMYB	GP21 70
	GO TO 70	GP21 80
30	CALL DUMMYC	GP21 90
	GO TO 70	GP21100
40	CALL DUMMYD	GP21110
	GO TO 70	GP21120

50	CALL DUMMYE	GP21130
	GO TO 70	GP21140
60	CALL DUMMYF	GP21150
70	RETURN	GP21160
	END	GP21170

PART III

DECK SETUP ORGANIZATION

IN ORDER TO UTILIZE THE OVERLAY SCHEME DEVELOPED THE PROGRAMS LISTED ABOVE AND THE SUBPROGRAMS OF OMNITAB II MUST BE IN THE FOLLOWING ORDER:

I GROUP 1

MUST HAVE THE FOLLOWING THREE CARDS

OVERLAY(OMNIT,0,0)

PROGRAM OMNITAB (INPUT,OUTPUT,PUNCH,TAPE5=INPUT,TAPE6=OUTPUT,TAPE3
1=PUNCH,TAPE45)

FOLLOWED BY THE FOLLOWING SUBPROGRAMS:

OMNSYM, AARGS,ACCDIG,ADDRESS, AERR, ARITH, ASTER, BEGIN,CHKCOL,
CKIND,DIMENS, ERROR,EXPAND, FCOS, FDCOS, FDEXP, FDLOG,FDPCON,
FDSIN,FDSQRT, FEXP, FEXP2, FLOG,FLOG10, FSIN, FSQRT, FTANH,
FUNCT, GENER, HEADS, IFS,INFERR, INPUT, LIST,LOCATE,LOOKUP,
MTXCHK, MTXP, NNAME,NONBLA,OMCONV, OMNIT,OUTPUT, PACK, PAGE,
PHYCON,PREPAK, PROB, READQ, READX,REPINC, RESET,RFORMAT,RNDOWN,
SET, SORTSM, SPACE, SYMV,VARCON,VECTOR,XECUTE, XPND, XSTOP,
BLOCK,LBCONS,LOOKTB,PHYSIC

II GROUP 2

PROGRAM STARTING WITH CARD

OVERLAY(OMNIT,1,0)

THROUGH THE CARD

END

GP2 370

FOLLOWED BY THE FOLLOWING SUBPROGRAMS:

ABRIDG,APRINT,FIXFLO,NOTEPR,PRINTX, PUNCH,RPRINT, SETQ, SETUP
STMT, STORE, TAPOP,TAPOP2,XFORMAT, XHEAD,XOMNIT

III GROUP 3

PROGRAM STARTING WITH CARD

OVERLAY(OMNIT,2,0)

THROUGH THE CARD

END

GP3 180

FOLLOWED BY THE FOLLOWING SUBPROGRAMS:

DHRND,ERRINT, FNEC, FNEIC, FNKC, PLOT, RNJBK,THERMO

IV GROUP 4

PROGRAM STARTING WITH CARD

OVERLAY(MATRIX,1,0)

THROUGH THE CARD

END

GP4 290

FOLLOWED BY THE FOLLOWING SUBPROGRAMS:

ARYVEC,EXPCON,MATRIX,MDAMAD, MKRON, MMULT, MOP,MRAISE,MTRIAN,
MTX,STORMT,TRANSF

V GROUP 5

PROGRAM STARTING WITH CARD:

OVERLAY(MATRIX,2,0)

THROUGH THE CARD	
END	GP5 90
FOLLOWED BY THE FOLLOWING SUBPROGRAMS:	
DETRNK, INVCHK, INVERT, MPROP, ORTHRV, PROCHK, PVTRI, RCSUM, SKSYMV, SPINV	
VI GROUP 6	
PROGRAM STARTING WITH CARD	
OVERLAY(MATRIX,3,0)	
THROUGH THE CARD	
END	GP6 120
FOLLOWED BY THE FOLLOWING SUBPROGRAMS:	
COALES, FPPT, HDIAG, MEIGEN, ONEWAY, RANKO, TPCTPT	
VII GROUP 7	
PROGRAM STARTING WITH CARD	
OVERLAY(STATIS,1,0)	
THROUGH THE CARD	
END	GP7 50
FOLLOWED BY THE FOLLOWING SUBPROGRAM:	
ORTHO	
VIII GROUP 8	
PROGRAM STARTING WITH CARD	
OVERLAY(STATIS,1,1)	
THROUGH THE CARD	
END	GP8 95
FOLLOWED BY THE FOLLOWING SUBPROGRAM:	
OANOVA	
IX GROUP 9	
PROGRAM STARTING WITH CARD	
OVERLAY(STATIS,1,2)	
THROUGH THE CARD	
END	GP9 95
FOLLOWED BY THE FOLLOWING SUBPROGRAM:	
OCOEFF	
X GROUP 10	
PROGRAM STARTING WITH CARD	
OVERLAY(STATIS,1,3)	
THROUGH THE CARD	
END	GP10 95
FOLLOWED BY THE FOLLOWING SUBPROGRAM:	
OCOVAR	
XI GROUP 11	
PROGRAM STARTING WITH CARD	
OVERLAY(STATIS,1,4)	
THROUGH THE CARD	
END	GP11 95
FOLLOWED BY THE FOLLOWING SUBPROGRAM:	
OPONE	
XII GROUP 12	
PROGRAM STARTING WITH CARD	
OVERLAY(STATIS,1,5)	
THROUGH THE CARD	
END	GP12 95

FOLLOWED BY THE FOLLOWING SUBPROGRAM:
ORTPLT

XIII GROUP 13

PROGRAM STARTING WITH CARD
OVERLAY(STATIS,2,0)
THROUGH THE CARD
END

GP13150

FOLLOWED BY THE FOLLOWING SUBPROGRAMS:
FPROB,FRDIST,FREQCY,HISTGM,STATIS

XIV GROUP 14

PROGRAM STARTING WITH CARD
OVERLAY(STATIS,3,0)
THROUGH THE CARD
END

GP14 90

FOLLOWED BY THE FOLLOWING SUBPROGRAMS:
BJORCK,CORREL,CSPINV,INVCOR, MIST, RANKS RANKX

XV GROUP 15

PROGRAM STARTING WITH CARD
OVERLAY(STATIS,4,0)
THROUGH THE CARD
END

GP15 60

FOLLOWED BY THE FOLLOWING SUBPROGRAM:
TOWAY

XVI GROUP 16

PROGRAM STARTING WITH CARD
OVERLAY(WORK,1,0)
THROUGH THE CARD
END

GP16310

FOLLOWED BY THE FOLLOWING SUBPROGRAMS:
ALLSUB,CHANGE,CMPARA,CMSEPA,EXCHNG, FLIP,INTERP, INTRP,ITERAT,
PROROW,SELECT,SORDER

XVII GROUP 17

PROGRAM STARTING WITH CARD
OVERLAY(WORK,2,0)
THROUGH THE CARD
END

GP17270

FOLLOWED BY THE FOLLOWING SUBPROGRAMS:
COMPLX,DEFINE,ERASE,EXTREM, GQUAD, MISC2, MOVE,MSCROW,PDMOTE

XVIII GROUP 18

PROGRAM STARTING WITH CARD
OVERLAY(WORK,3,0)
THROUGH THE CARD
END

GP18 50

FOLLOWED BY THE FOLLOWING SUBPROGRAM:
BESSEL

XIX GROUP 19

PROGRAM STARTING WITH CARD
OVERLAY(WORK,3,1)
THROUGH THE CARD
END

GP19200

FOLLOWED BY THE FOLLOWING SUBPROGRAMS:
BEJN,BINTJO, DBEJ,STRUVE

XX GROUP 20
 PROGRAM STARTING WITH CARD
 OVERLAY(WORK,3,2)
 THROUGH THE CARD
 END
 FOLLOWED BY THE FOLLOWING SUBPROGRAMS:
 BEZERO,BEZONE, CBEI, CBK,COMELL,FOURIA

GP20220

XXI GROUP 21
 PROGRAM STARTING WITH CARD
 OVERLAY(WORK,4,0)
 THROUGH THE CARD
 END
 FOLLOWED BY THE FOLLOWING SUBPROGRAMS:
 DUMMYA,DUMMYB,DUMMYC,DUMMYD,DUMMYE,DUMMYF

GP21170

PART IV

FLOW CHART OF OVERLAY STRUCTURE

GROUP 1 IS RESIDENT IN MEMORY AT ALL TIMES,
 CONTAINS MOST OFTEN USED ROUTINES, SUBPROGRAMS
 NEEDED BY MORE THAN ONE OF THE OTHER GROUPS, AND
 ALL OF LABELED COMMON (EXCLUDING LABELED COMMON
 FOR BESSEL SUBPROGRAMS).

ONLY ONE OF THE OTHER GROUPS (GROUP 2 THROUGH
 GROUP 7, GROUP 13 THROUGH GROUP 18 AND GROUP 21)
 IS IN MEMORY AT A PARTICULAR TIME.

GROUPS 7 AND 18 EACH CONTAIN SUB-
 SEGMENTS. ONLY ONE OF THE SEGMENTS (GROUP 8
 THROUGH GROUP 12) WILL BE IN RESIDENCE WITH
 GROUP 7. EITHER GROUP 19 OR GROUP
 20 WILL BE LOADED WITH GROUP 18.

OUTLINE OF SEGMENTATION

GROUP 1

 * AARGS ACCDIG ADDRESS AERR ARITH *
 * ASTER BEGIN CHKCOL CKIND DIMENS *
 * ERROR EXPAND FCOS FDCOS FDEXP *
 * FDLOG FDPCON FDSIN FDSQRT FEXP *
 * FEXP2 FLOG FLOG10 FSIN FSQRT *
 * FTANH FUNCT GENER HEADS IFS *
 * INFERR INPUT LIST LOCATE LOOKUP *
 * MIXCHK MXTXP NNAME NONBLA *
 * OMCONV OMNIT OMNSYM OUTPUT PACK *
 * PAGE PHYCON PREPAK PROB READQ *
 * READX REPINC RESET RFORMT RNDOWN *
 * SET SORTSM SPACE SYMV VARCON *
 * VECTOR XECUTE XPND XSTOP *
 *
 * PLUS LIBRARY FUNCTIONS (SIN,ETC) *
 *
 *

```

*          ALL OF LABELED COMMON          *
*
* ABCDEF BLOCKA BLOCKB BLOCKC BLOCKD *
* BLOCKE BLOCKX BLOCKC CODE CODETP *
* CONLB2 CONSLB CONSTS DCONL2 DCONLB *
* FMAT  HEADER ICODE  ICODETP KFMT  *
* NOTE  PCONST PKSWT  QRS    SCRAT  *
* SPRV  TAPE                                     *
*
*
* THERE ARE 4 BLOCK DATA PROCEDURES. *
* THE COMMENT OR 2ND CARD HAS THE *
* LABEL NAME. THE 4 PROCEDURES ARE *
*
* BLOCK  LBCONS LOOKTB PHYSIC *
*
*****
*
*
*
*
*****
GROUP * 2  1 *      1 *      * 1 *      1 * 1  1  1  1 *
*      1 *      1 *      * 1 *      1 * 1  1  1  1 *
***** 1 *      1 *      * 1 *      1 * 1  1  1  1 *****
* ABRIDG * 1 *      1 *      * 1 *      1 * 1  1  1  1 * ARYVEC *
* APRINT * 1 *      1 *      * 1 *      1 * 1  1  1  1 * EXPCON *
* FIXFLO * 1 *      1 *      * 1 *      1 * 1  1  1  1 * MATRIX *
* NOTEPR * 1 *      1 *      * 1 *      1 * 1  1  1  1 * MDAMAD *
* PRINTX * 1 *      1 *      * 1 *      1 * 1  1  1  1 * MKRON *
* PUNCH  * 1 *      1 *      * 1 *      1 * 1  1  1  1 * MMULT  *
* RPRINT * 1 *      1 *      * 1 *      1 * 1  1  1  1 * MOP    *
* SETQ   * 1 *      1 *      * 1 *      1 * 1  1  1  1 * MRAISE *
* SETUP  * 1 *      1 *      * 1 *      1 * 1  1  1  1 * MTRIAN *
* STMT   * 1 *      1 *      * 1 *      1 * 1  1  1  1 * MXTX   *
* STORE  * 1 *      1 *      * 1 *      1 * 1  1  1  1 * STORMT *
* TAPOP  * 1 *      1 *      * 1 *      1 * 1  1  1  1 * TRANSF *
* TAPOP2 * 1 *      1 *      * 1 *      1 * 1  1  1  1 *****
* XFORMT * 1 *      ***** * 1 *      1 * 1  1 ***** 1
* XHEAD  * 1 *      * DETRNC * * 1 *      1 * 1 * COALES * 1
* XOMNIT * 1 *      * INVCHK * * 1 *      1 * 1 * FPPT  * 1
***** 1 *      * INVERT * * 1 *      1 * 1 * HDIAG * 1
1 *      * MPROP  * * 1 *      1 * 1 * MEIGEN * 1
----- *      * ORTHRV * * 1 *      1 * 1 * ONEWAY * 1
1 *      * PROCHK * * 1 *      1 * 1 * RANKO  * 1
1 *      * PVTRI  * * 1 *      1 * 1 * TPCTPT * 1
1 *      * RCSUM  * * 1 *      1 * 1 ***** 1
1 *      * SKSYMV * * 1 *      1 * 1  1  1
1 *      * SPINV  * * 1 *      1 * 1  1  1
1 *      ***** * 1 *      1 * 1  1  1
1 *      * 1 *      1 *      1  1  1
1 *      * 1 *      1 *      1  1  1
1 ***** * 1  1 ***** 1  1
1 *      * 1  1 *      1  1
1

```

```

1          GROUP * 7      *          1 1      *          1          1
1          *          *          1 1      *          1          1
1          ***** ***** 1 ---      *          1          1
1          * ORTHO *      * 1 1      *          1          1
1          *****      * 1 1      *          1          1
1          *          * --- 1      *          1          1
1          *          *      1 1      *          1          1
1          ***** ***** 1 1      *          1          1
1          *          *          1 1      *          1          1
1 GROUP * 8      * GROUP * 9      * GROUP * 10      * 1 1      *          1          1
1          *          *          *          * 1 1      *          1          1
1          ***** *          ***** *          ***** * 1 1      *          1          1
1          * OANOVA *      * OCOEFF *      * OCOVAR * 1 1      *          1          1
1          ***** *          ***** *          ***** * 1 1      *          1          1
1          *          *          *          * 1 1      *          1          1
1          GROUP * 11      GROUP * 12      * 1 1 GROUP * 13      1          GROUP 1 14
1          *          *          * 1 1      *          1          1
1          ***** *****      * 1 1      ***** 1          *****
1          * OPONE *      * ORTPLT *      * 1 1      * FPROB * 1          * BJORCK *
1          ***** *****      * 1 1      * FRDIST * 1          * CORREL *
1          *          *          * 1 1      * FREQC * 1          * CSPINV *
1          *          *          * 1 1      * HISTGM * 1          * INVCOR *
1          ***** ***** 1 1      * STATIS * 1          * MIST *
1          *          1 1      ***** 1          * RANKS *
1          *          1 1      *          1          * RANKX *
1          *          ----- 1          *****
1          *          1          1
1          *          1          1
1          *          1          1
1          *          1          1
1 GROUP * 15      GROUP 1 16      1          GROUP 1 17
1          *          1          ----- 1          1
1          *****      ***** 1          *****
1          * TWOWAY *      * ALLSUB *      1          * COMPLX *
1          *****      * CHANGE *      1          * DEFINE *
1          -----      * CMPARA *      1          * ERASE *
1          1          * CMSEPA *      1          * EXTREM *
1          GROUP 1 18      * EXCHNG *      1          * QUAD *
1          1          * FLIP *      1          * MISC2 *
1          *****      * INTERP *      1          * MOVE *
1          *          * INTRP *      1          * MSCROW *
1          * BESSEL *      * ITERAT *      1          * PDMOTE *
1          * LABELED COMMON *      * PROROW *      1          *****
1          * ABEKI *      * SELECT *      1
1          *****      * SORDER *      1
1          1          ***** 1
1          1          1
1          ----- 1
1          1          1
1 GROUP 1 19      GROUP 1 20      GROUP 1 21
1          1          1          1
1          *****      *****      *****
1          * BEJN *      * BEZERO *      * DUMMYA *
1          * BINTJO *      * BEZONE *      * DUMMYB *
1          * DBEJ *      * CBEI *      * DUMMYC *
1          * STRUVE *      * CBK *      * DUMMYD *
1          *****      * COMELL *      * DUMME *
1          *          * FOURIA *      * DUMMYF *
1          *****      *****

```

APPROXIMATE SIZE OF EACH GROUP ON THE NBS COMPUTER
 THE SIZE AS INDICATED BELOW ASSUMES THAT A MACHINE WORD
 IS 36 BITS LONG, A FLOATING POINT NUMBER USES ONE STORAGE
 UNIT, AND EACH MACHINE INSTRUCTION IS ONE STORAGE UNIT LONG.

I	GROUP 1	43000 STORAGE UNITS
	A.	ROUTINES 12000
	B.	LABELED COMMON 31000 (THIS INCLUDES A WORK SHEET OF 12500 STORAGE UNITS)
	C.	NOT COUNTED BUT MUST BE ADDED ARE LIBRARY FUNCTION ROUTINES (I. E. SIN,COS,ETC), AND INPUT OUTPUT ROUTINES. (FOR THE NBS UNIVAC 1108 SYSTEM THIS IS ABOUT 4500 STORAGE UNITS)
II	GROUP 2	2900 STORAGE UNITS
III	GROUP 3	3200 STORAGE UNITS
IV	GROUP 4	4100 STORAGE UNITS
V	GROUP 5	4000 STORAGE UNITS
VI	GROUP 6	3700 STORAGE UNITS
VII	GROUP 7	4400 STORAGE UNITS (THIS GROUP INCLUDES GROUPS 8 THROUGH 12)
VIII	GROUP 13	3400 STORAGE UNITS
IX	GROUP 14	3800 STORAGE UNITS
X	GROUP 15	4000 STORAGE UNITS
XI	GROUP 16	4300 STORAGE UNITS
XII	GROUP 17	3000 STORAGE UNITS
XIII	GROUP 18	3300 STORAGE UNITS (THIS GROUP INCLUDES GROUPS 19 AND 20)
XIV	GROUP 21	4400 STORAGE UNITS (THIS SEGMENT IS WHERE THE USER MAY ADD HIS SUBROUTINES)

PART V

CHANGES NECESSARY IF WORK SHEET AND SCRATCH AREAS ARE TO BE MODIFIED

IN ADDITION TO THE CHANGES LISTED ON PAGES 24 THROUGH 26 IN NBS TECHNICAL
 NOTE 550, THE FOLLOWING CHANGES WILL HAVE TO BE MADE:

LET NSIZRC BE THE SIZE OF WORK SHEET REQUIRED AND

$NSIZR7 = \text{INTEGRAL PART OF } (NSIZRC - 200) / 4$

NSIZRC AND NSIZR7 MUST BE INTEGER CONSTANTS AND NOT VARIABLES.

A. THE STATEMENTS

DOUBLE PRECISION AA(1000),B(1000),W(100)
EQUIVALENCE (A(1),AA),(A(2001),B),(A(4001),W)
IF(NR.GT.1000) L=1000
IF(LNR.GT.1000) LNR=1000

BES2640*
BES3230*

MUST BE CHANGED TO

DOUBLE PRECISION AA(NSIZR7),B(NSIZR7),W(100)
EQUIVALENCE (A(1),AA),(A(2*NSIZR7+1),B),(A(4*NSIZR7+1),W)
IF(NR.GT.NSIZR7) L=NSIZR7
IF(LNR.GR.NSIZR7) LNR=NSIZR7

BES2640*
BES3230*

IN SUBROUTINE BESSEL

* IDENTIFICATION NUMBERS IN COLUMNS 73 THROUGH 79

B. THE STATEMENTS

COMMON/SCRAT/ NS,NS2,A(13500)
EQUIVALENCE (A(4001),W)

MUST BE CHANGED TO

COMMON/SCRAT/ NS,NS2,A(NSIZRC+1000)
EQUIVALENCE (A(4*NSIZR7+1),W)

IN PROGRAM UNIT LABELED PROGRAM GRP19

C. THE STATEMENTS

COMMON/SCRAT/ NS,NS2,A(13500)
DOUBLE PRECISION AA(1000),B(1000)
EQUIVALENCE (A(1),AA),(A(2001),B)

MUST BE CHANGED TO

COMMON/SCRAT/ NS,NS2,A(NSIZRC+1000)
DOUBLE PRECISION AA(NSIZR7),B(NSIZR7)
EQUIVALENCE (A(1),AA),(A(2*NSIZR7+1),B)

IN PROGRAM UNIT LABELED PROGRAM GRP20

U.S. DEPT. OF COMM. BIBLIOGRAPHIC DATA SHEET	1. PUBLICATION OR REPORT NO. NBS-TN-734	2. Gov't Accession No.	3. Recipient's Accession No.
4. TITLE AND SUBTITLE OMNITAB II Segmentation Structure for the SCOPE Operating System		5. Publication Date June 1972	
		6. Performing Organization Code	
7. AUTHOR(S) Sally T. Peavy and Ruth N. Varner		8. Performing Organization	
9. PERFORMING ORGANIZATION NAME AND ADDRESS NATIONAL BUREAU OF STANDARDS DEPARTMENT OF COMMERCE WASHINGTON, D.C. 20234		10. Project/Task/Work Unit No. 1510585	
		11. Contract/Grant No.	
12. Sponsoring Organization Name and Address Same as Number 9.		13. Type of Report & Period Covered N/A	
		14. Sponsoring Agency Code	
15. SUPPLEMENTARY NOTES			
16. ABSTRACT (A 200-word or less factual summary of most significant information. If document includes a significant bibliography or literature survey, mention it here.) OMNITAB II is an interpretive system developed and maintained by the National Bureau of Standards to enable scientists to use a large computer easily, effectively and accurately for numerical, statistical and data analysis without prior computer experience. The system is as machine independent as possible, making implementation relatively easy. Since OMNITAB II has a large memory requirement, segmentation and overlay are virtually essential. Overlay procedures are dependent upon the operating system of the computer. Changes are necessary to the OMNITAB II program when the overlay procedure requires specific overlay CALL statements to external procedures in other overlay links. This Technical Note describes a method of segmentation and overlay for a particular operating system (CDC - 6000 series). The method can readily be adapted to other operating systems with modifications to the control statements.			
17. KEY WORDS (Alphabetical order, separated by semicolons) ANSI FORTRAN; General-purpose computer program, Implementation of OMNITAB II; Links; OMNITAB II; Overlay procedures; SCOPE operating system; Segmentation.			
18. AVAILABILITY STATEMENT ☒ UNLIMITED. ☐ FOR OFFICIAL DISTRIBUTION. DO NOT RELEASE TO NTIS.		19. SECURITY CLASS (THIS REPORT) UNCLASSIFIED	21. NO. OF PAGES 25
		20. SECURITY CLASS (THIS PAGE) UNCLASSIFIED	22. Price 35¢

NBS TECHNICAL PUBLICATIONS

PERIODICALS

JOURNAL OF RESEARCH reports National Bureau of Standards research and development in physics, mathematics, and chemistry. Comprehensive scientific papers give complete details of the work, including laboratory data, experimental procedures, and theoretical and mathematical analyses. Illustrated with photographs, drawings, and charts. Includes listings of other NBS papers as issued.

Published in two sections, available separately:

• Physics and Chemistry

Papers of interest primarily to scientists working in these fields. This section covers a broad range of physical and chemical research, with major emphasis on standards of physical measurement, fundamental constants, and properties of matter. Issued six times a year. Annual subscription: Domestic, \$9.50; \$2.25 additional for foreign mailing.

• Mathematical Sciences

Studies and compilations designed mainly for the mathematician and theoretical physicist. Topics in mathematical statistics, theory of experiment design, numerical analysis, theoretical physics and chemistry, logical design and programming of computers and computer systems. Short numerical tables. Issued quarterly. Annual subscription: Domestic, \$5.00; \$1.25 additional for foreign mailing.

TECHNICAL NEWS BULLETIN

The best single source of information concerning the Bureau's measurement, research, developmental, cooperative, and publication activities, this monthly publication is designed for the industry-oriented individual whose daily work involves intimate contact with science and technology—for engineers, chemists, physicists, research managers, product-development managers, and company executives. Includes listing of all NBS papers as issued. Annual subscription: Domestic, \$3.00; \$1.00 additional for foreign mailing.

Bibliographic Subscription Services

The following current-awareness and literature-survey bibliographies are issued periodically by the Bureau: Cryogenic Data Center Current Awareness Service (weekly), Liquefied Natural Gas (quarterly), Superconducting Devices and Materials (quarterly), and Electromagnetic Metrology Current Awareness Service (monthly). Available only from NBS Boulder Laboratories. Ordering and cost information may be obtained from the Program Information Office, National Bureau of Standards, Boulder, Colorado 80302.

NONPERIODICALS

Applied Mathematics Series. Mathematical tables, manuals, and studies.

Building Science Series. Research results, test methods, and performance criteria of building materials, components, systems, and structures.

Handbooks. Recommended codes of engineering and industrial practice (including safety codes) developed in cooperation with interested industries, professional organizations, and regulatory bodies.

Special Publications. Proceedings of NBS conferences, bibliographies, annual reports, wall charts, pamphlets, etc.

Monographs. Major contributions to the technical literature on various subjects related to the Bureau's scientific and technical activities.

National Standard Reference Data Series. NSRDS provides quantitative data on the physical and chemical properties of materials, compiled from the world's literature and critically evaluated.

Product Standards. Provide requirements for sizes, types, quality, and methods for testing various industrial products. These standards are developed cooperatively with interested Government and industry groups and provide the basis for common understanding of product characteristics for both buyers and sellers. Their use is voluntary.

Technical Notes. This series consists of communications and reports (covering both other-agency and NBS-sponsored work) of limited or transitory interest.

Federal Information Processing Standards Publications. This series is the official publication within the Federal Government for information on standards adopted and promulgated under the Public Law 89-306, and Bureau of the Budget Circular A-86 entitled, Standardization of Data Elements and Codes in Data Systems.

Consumer Information Series. Practical information, based on NBS research and experience, covering areas of interest to the consumer. Easily understandable language and illustrations provide useful background knowledge for shopping in today's technological marketplace.

CATALOGS OF NBS PUBLICATIONS

NBS Special Publication 305, Publications of the NBS, 1966-1967. When ordering, include Catalog No. C13.10:305. Price \$2.00; 50 cents additional for foreign mailing.

NBS Special Publication 305, Supplement 1, Publications of the NBS, 1968-1969. When ordering, include Catalog No. C13.10:305/Suppl. 1. Price \$4.50; \$1.25 additional for foreign mailing.

NBS Special Publication 305, Supplement 2, Publications of the NBS, 1970. When ordering, include Catalog No. C13.10:305/Suppl. 2. Price \$3.25; 85 cents additional for foreign mailing.

U.S. DEPARTMENT OF COMMERCE
National Bureau of Standards
Washington, D.C. 20234

OFFICIAL BUSINESS

Penalty for Private Use, \$300

POSTAGE AND FEES PAID
U.S. DEPARTMENT OF COMMERCE
2 15

