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Computer Program for Management of a
Bibliographic Data Base

**DAVID W. TAYLOR NAVAL SHIP
RESEARCH AND DEVELOPMENT CENTER**

Bethesda, Maryland 20084



6 COMPUTER PROGRAM FOR MANAGEMENT OF A
BIBLIOGRAPHIC DATA BASE

by

14 Anne M. Becka

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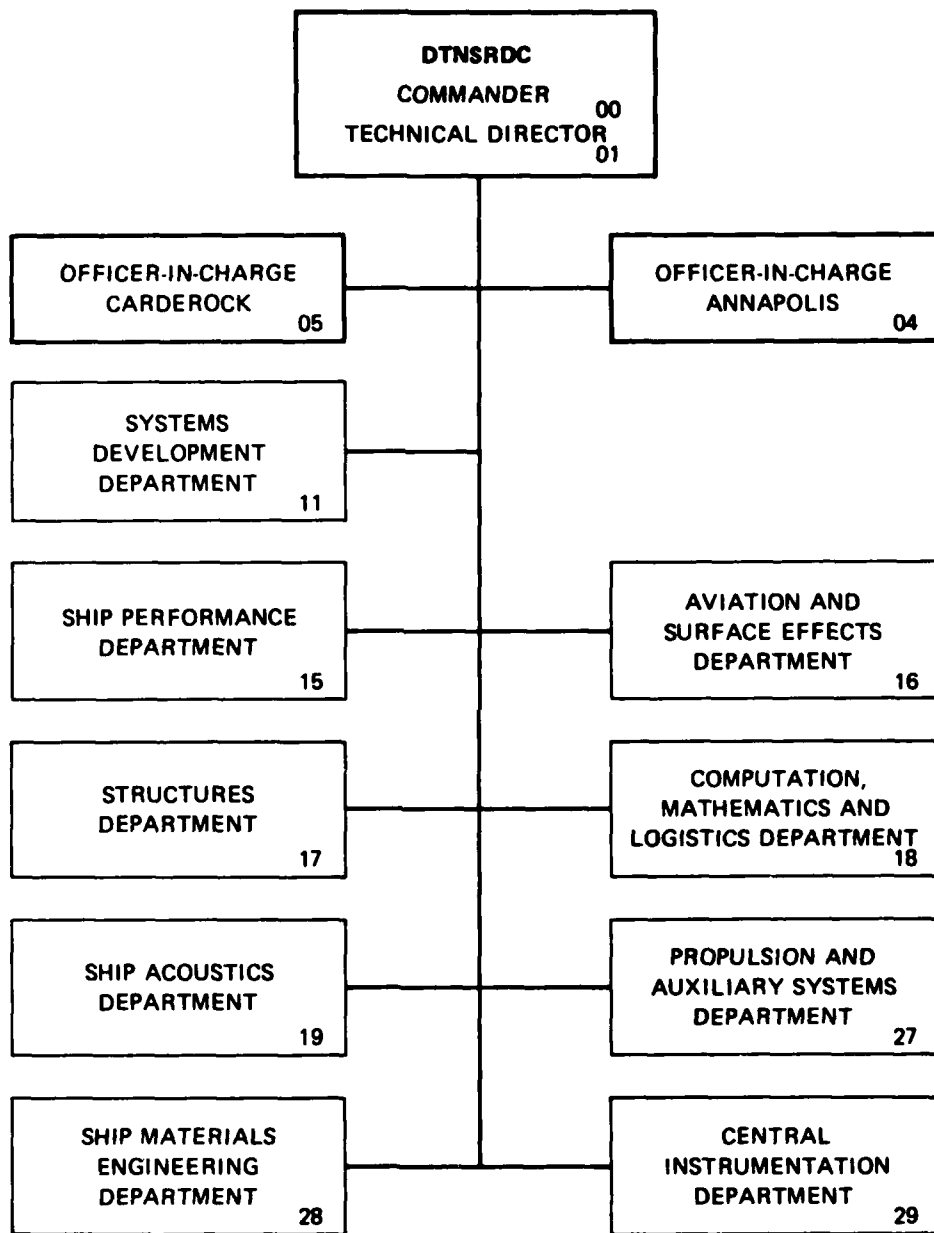
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LIST OF KEY WORDS

Computer Indexing; Data Base; Information Retrieval; and Batch Processing

ABSTRACT

The computerized bibliography allows the indexing and retrieval of scientific research papers for intense short-term efforts through the use of a large mainframe in the batch mode. Criteria are entered through keypunched cards and the computer produces the requested subsets.

INTRODUCTION

Personnel involved in scientific research often have the need to assemble a bibliography for use in a paper or book or as a tool for advancement of their research. Often this bibliography will cover a broad topic with numerous subtopics identified. This is the situation which precipitated the development of this computer program. Several researchers at this facility were requested to prepare a paper on "Fouling Control Technology". Upon preparation of the outline, 40 initial subtopics were identified. A library computer search supplied the assigned authors with several thousand titles and abstracts applicable to this area. Review of the titles and abstracts revealed a large number of articles worthy of further review and these were obtained. A filing and cross-referencing system was necessary with only about 1 month notice and very limited funds for computer time and personnel.

Due to the limited time and funds, an in-house task was developed to allow organization of the bibliography utilizing the on-site CDC 6600/6700 computing system with a NOS/BE operating system and FORTRAN IV programming language. The program developed may not be the most efficient possibly due to the relatively inexperienced programmer and limited time available, but it proved invaluable for short-term organization of a large number of references. Table 1 is a copy of the outline used for this program. With minor modifications, the program could be adapted to any outline. The program is limited to the number of topics by the configuration of the hardware of the computing system. The articles are cross-referenced by a bit set allowing one bit in a word of memory to represent each section. The CDC 6600/6700 system utilizes a 60 bit word

TABLE 1 - "FOULING CONTROL TECHNOLOGY" OUTLINE

- 1.0 Introduction
 - 1.1 Designing Integrated Fouling Control System
- 2.0 Evaluation of Efficacy
 - 2.1 In Situ Testing
 - 2.1.1 Raft Tests
 - 2.2 Accelerated Tests
 - 2.2.1 Dynamic
 - 2.2.2 Bioassay
 - 2.2.3 Leaching Rate
- 3.0 Chemical Control Technology
 - 3.1 Toxic Control Agents
 - 3.1.1 Delivery Systems
 - 3.1.1.1 Coatings
 - 3.1.1.2 Elastomers
 - 3.1.1.3 Direct Injection
 - 3.1.1.4 Impregnation (Wood)
 - 3.1.1.5 Structural Incorporation
 - 3.2 Non-Toxic Control Agents
 - 3.2.1 Delivery Systems
- 4.0 Physical Control Technology
 - 4.1 Mechanical Methods of Control
 - 4.1.1 Scrubbing
 - 4.1.1.1 Exterior
 - 4.1.1.2 Interior
 - 4.1.2 Jets
 - 4.1.3 Sonics
 - 4.1.3.1 Ultrasonics
 - 4.1.3.2 Infrasonics
 - 4.1.4 Low Surface Energy Materials
 - 4.2 Electrical Methods
 - 4.3 Magnetic Methods
 - 4.4 Optical Methods
 - 4.5 Nuclear Methods
 - 4.6 Thermal Methods

TABLE 1 - "FOULING CONTROL TECHNOLOGY" OUTLINE
(continued)

- 4.7 Osmotic Methods
 - 4.8 Surface Modification Methods
 - 4.9 Explosive Removal Methods
 - 5.0 Conclusions
 - 5.1 Present Practice
 - 5.2 Future Directions
-

and therefore the program can be utilized on this system for up to 60 topics without increasing memory requirements.

PROGRAM CAPABILITIES

This program was designed with limited resources and time. It is for a specific purpose, but many of its methods can be adapted for a wide range of purposes.

The program will read an existing file of references into its working array and then add to it a set of new references. The working array is sorted alphabetically then copied onto a new permanent file. References to all sections requested alphabetically are printed out, then the array is sorted chronologically. References to all sections requested chronologically are printed out, the array is sorted numerically and all sections requested in that order are printed out.

The program requires about 185 CP seconds to run with 550 articles. An array size of 850 references requires 42,000 bytes of memory. For 350 articles about 115 CP seconds are required to run the program and an array size of 1000 references requires 47,000 bytes of memory. A permanent reference file of 550 references takes up 120 PRU's of storage space on the CDC 6600/6700 system.

DATA HANDLING

In the text of this report, a single piece of data is considered to be a single bibliographic reference. Upon receipt of a reference, the authors were instructed to assign the reference a unique accession (access) number. This number was assigned by placing one of preprinted, sequentially numbered labels supplied by the data manager onto the reference.

Upon receipt of 30 references, the authors were prepared to complete a set of data submission sheets. These sheets were specially formatted, standard keypunch forms which correspond to the data entry format in the computer program and are seen as Figures 1, 2, and 3. The author would complete the same line on all three forms for each reference.

Several key instructions were given in completing the forms.

A. Figure 1 (Card 1)

1. Place the accession number as far to the right as possible in the six columns (i.e., 32 becomes 000032, not 320000).
2. Ten spaces are allowed for authors' last names. If a name is longer than 10 letters use nine letters and an asterisk (*) in the tenth space.
3. Put both initials, if known, no periods.
4. In the event a reference has more than 3 authors, put an asterisk (*) in the first space of the area for 3rd author's last name. Leave the rest of the area for 3rd author blank.
5. If an article is by an anonymous author put ANON in the area designated for 1st author's last name.
6. In the event that a title is longer than the 36 spaces allowed, put 35 characters and an asterisk (*) in the 36th space.

B. Figure 2 (Card 2)

1. Free area, 38 spaces are allowed for primary publication information, use ASTI (Applied Science and Technology Index) standard abbreviations for titles, wherever possible.
2. The last 2 digits of the year of publication must be in the columns designated. In the event the year is unknown, put 00.

ACCT#	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
631	KORENZ	J	SAUSON	G	PHILLIP	GF																								
632	LOFIELO	D	SAUSON	G	PHILLIP	GF																								
633	ROCKSTEIN	G	GLEW																											
634	PHILLIP	A																												
635	DUNN	P	SAUSON																											
636	CHILTREE	BC																												
637	BEITER	CB	HAFNER																											
638	DE FORST	A	PETTIS																											
639	RIENOUR	G	GHINGOLS																											
640	PORTER	G																												
641	DEXTER	SC	SULLIVAN	JN																										
642	CRISP	BJ																												
643	GERENCSEA	V	BARNOOTHY	MF	BARNOOTHY	MF																								
644	HITCHELL	R																												
645	CHADWICK	WL	CLARK	F	FOX																									
646	WHITE	HE																												
647	TULLIS	D	HILL	LC	HENDERSON	AT																								
648	VEAGER	WL	CASTELL	VJ																										
649	ANDERSEN	OM																												
650	ERAMP	HC	VAN LONDE	AM	OE	WOLF																								
651	ARNOLD	MA	CLARKE	HJ																										
652	ANON																													
653	CHET	J	MITCHELL	R																										
654	CLARKE	GL																												
655	CORNER	ED	SARROW																											
656	ANON																													
657	ANON																													
658	ANON																													
659	FISK	NA																												
660	FLEMING	H																												
661																														

FIGURE 1 - CARD 1

6-2 166 0-17

FIGURE 2 - CARD 2

1	1000	INTRODUCTION
2	1100	DESIGNING INTEGRATED FOULING CONTROL SYSTEM
3	2000	EVAL. OF EFFICACY
4	2100	IN SITU TESTING
5	2110	RAFT TESTS
6	2200	ACCELERATED TESTS
7	2210	DYNAMIC
8	2220	BIOASSAY
9	2230	LEACHING RATE
10	3000	CHEMICAL CONTROL TECHNOLOGY
11	3100	TOXIC CONTROL AGENTS
12	3110	DELIVERY SYSTEMS
13	3111	COATINGS
14	3112	ELASTOMERS
15	3113	DIRECT INJECTION
16	3114	IMPREGNATION (WOOD)
17	3115	STRUCTURAL INCORPORATION (GRP CONCRETE)
18	3200	NON-TOXIC CONTROL AGENTS
19	3210	DELIVERY SYSTEMS
20	4000	PHYSICAL CONTROL TECHNOLOGY
21	4100	MECHANICAL METHODS OF CONTROL
22	4110	SCRUBBING
23	4111	EXTERIOR (FISHNET)
24	4112	INTERIOR (FLAGELLATION LINE)
25	4120	JETS
26	4130	SONICS
27	4131	ULTRASONICS
28	4132	INFRASONICS
29	4140	LOW SURFACE ENERGY MATERIALS
30	4200	ELECTRICAL METHODS
31	4300	MAGNETIC METHODS
32	4400	OPTICAL METHODS
33	4500	NUCLEAR METHODS
34	4600	THERMAL METHOD: STEAM PURGE
35	4700	OSMOTIC METHODS
36	4800	SURFACE MOD. METHODS
37	4900	EXPLOSIVE REMOVAL METHODS
38	5000	CONCLUSIONS
39	5100	PRESENT PRACTICE
40	5200	FUTURE DIRECTIONS

FIGURE 3 - CARD 3

C. Figure 3 (Card 3)

1. Place a 1 (one) in the columns corresponding to the sections under which the reference is useful.
2. Each article should be designated under as broad a range of categories as possible (i.e., if an article is applicable to section 4112, it would be anticipated to also be applicable to sections 4110, 4100, and 4000).

D. General Instructions

1. Use all capital letters in filling out the data sheets.

Upon completion of a set of data sheets, the articles were filed and the sheets were sent for keypunching.

Data sheet design was based on several constraints of the program. We were hoping to limit memory usage and run time, and provide access to data lines by NETED, (text editor modeled after the standard Arpanet Editor). The data sheets proved rather tedious to complete, but suited the purpose of the program ideally.

DATA INPUT

Data (references) can be input in two ways. One is to submit groups of up to 30 first cards, followed by the same number of second, then third cards. This is referred to as block input.

The second method is to submit the cards sequentially i.e., the three cards for each reference are together. The deck of data cards is preceded by a single card with a flag which indicates the order the cards are in. A flag of zero (0) in the 1st column represents sequential input and a flag of one (1) represents block input. Blank cards within the deck represents the end of the input of data.

Upon reading in the new data the program will output any sections requested with the references in alphabetical order, then any sections requested with the references in chronological order, and finally any sections requested with the references in numerical order.

Various possible input decks are illustrated in Table 2. An example block input and the resulting output is in Appendix B.

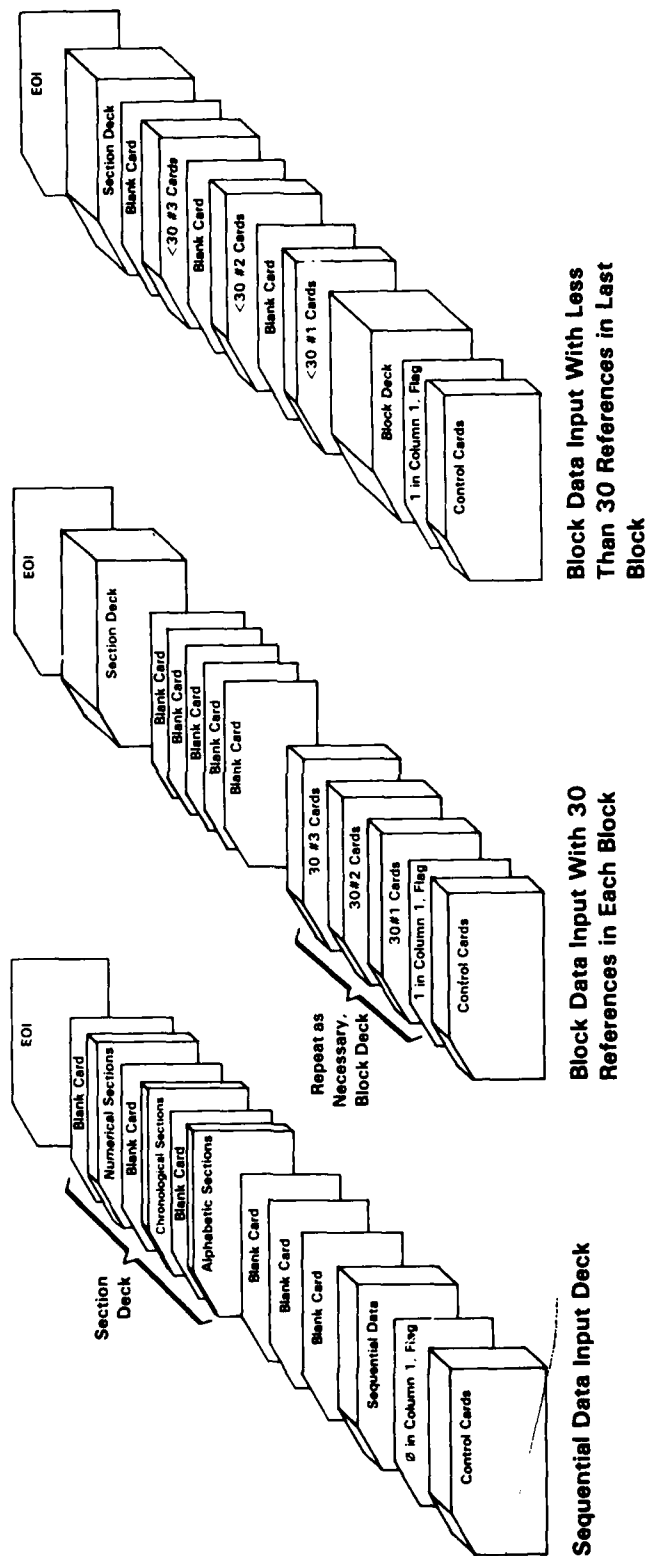


TABLE 2

Sections are referenced by four digit section numbers corresponding to the subtopic numbers seen in Table 1, (i.e., 4.1 becomes 4100, 3.1.1.2 becomes 3112).

PROGRAM LOGIC

The program logic can best be illustrated through the use of Figure

4. The various abbreviations are defined below:

- A. BIBLIO - The title of the source program.
- B. PREFS - The permanent file containing the old references.
- C. INPUT - The card deck containing new references and sections desired.
- D. RDFLE - The subroutine which reads PREFS into the working array.
- E. READIN - The subroutine which reads in sequential data.
- F. RDBLK - The subroutine which reads in block data.
- G. BINDEX - The subroutine which computes the index corresponding to the sections identified on the data sheets.
- H. SORT - The subroutine which sorts the working array into alphabetical order by 1st author's last name.
- I. DUPS - Subroutine which checks 1st author's last name and year for duplicates.
- J. WRTOUT - The subroutine which writes out a reference onto output.
- K. WRTFLE - The subroutine which writes out a copy of the working array onto NEWREF.
- L. NEWREF - An alphabetical file containing an updated version of the full reference list (to be changed to PREFS, by operator, after program is complete).
- M. PRNT - The subroutine which prints out all the references identified for any one section.
- N. BINBAC - The subroutine which back calculates the sections from the index.
- O. SORTYR - The subroutine which arranges the working array in chronological order.
- P. SORTAC - The subroutine which arranges the working array in numerical order by access number.

FIGURE 4

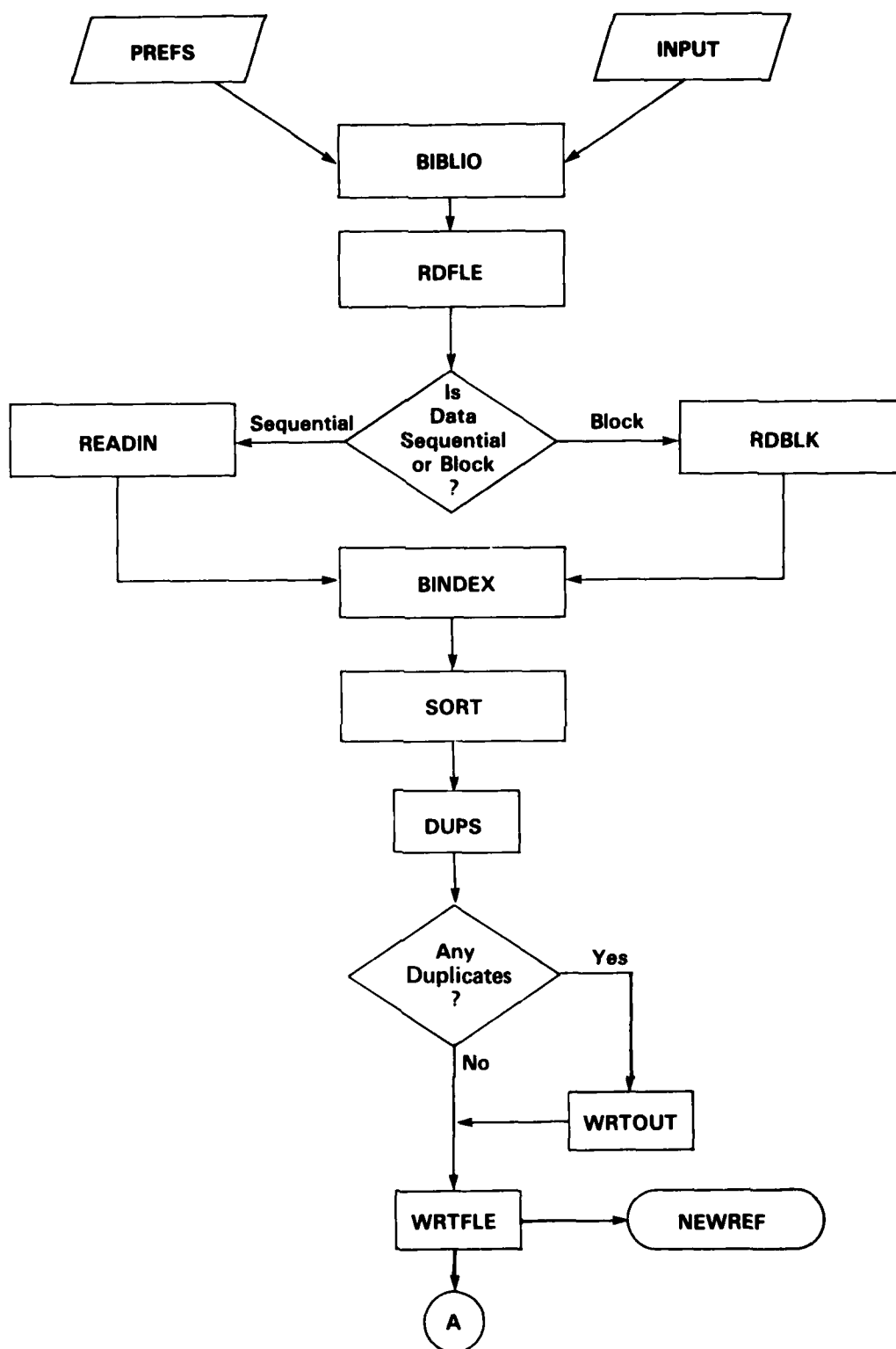
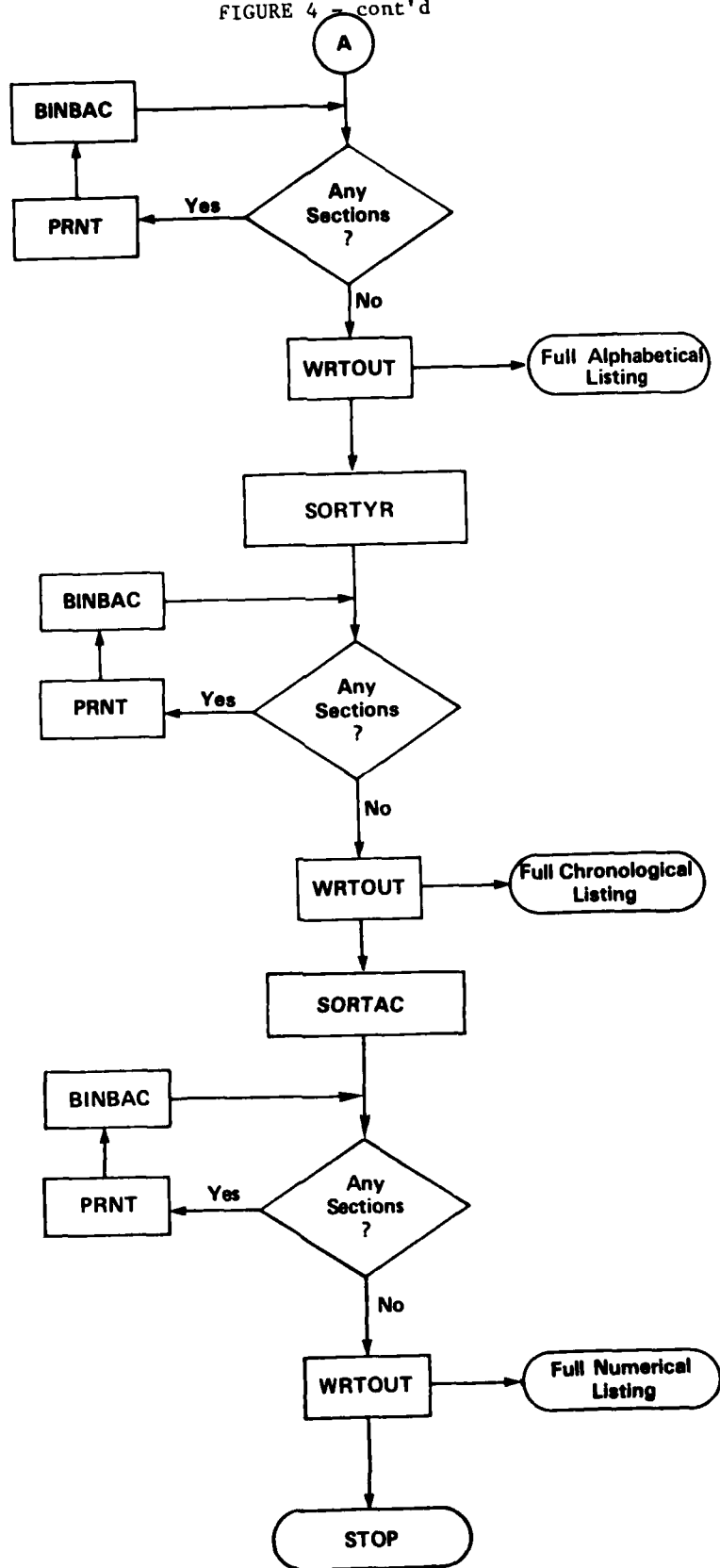


FIGURE 4 - cont'd



COMPUTER SYSTEM ENVIRONMENT

HARDWARE

The hardware configuration of DTNSRDC's CDC 6600/6700 is as follows:

- o Dual central processors, 131,072 60-bit word memory each,
- o 20 peripheral processors for each central processor,
- o Model 844 disk drives,
- o One 1700 terminal, and
- o Two 2550 data concentrators

SOFTWARE

The software operating system installed for the computer is the CDC NOS/BE v. 1.4 operating system. A typical control deck for this program is as follows:

- o REQUEST,NEWREF,*PF.
- o ATTACH,PREFS,ID=XXXX.
- o ATTACH,BIBLIO,ID=XXXX.
- o FIN,I=BIBLIO,SL=0,R=0,PD=8.
- o LGO,PL=100000.
- o CATALOG,NEWREF,PREFS,ID=XXXX.
- o PURGE,PREFS,PREFS,ID=XXXX.

(XXXX specifies user's registered computer initials.)

This format allows for the Fortran source code to be maintained on the computer (BIBLIO) as well as the permanent reference data base (PREFS). Old versions of PREFS are purged as soon as the file is updated. The sorting of the data base is done by the source program and the data base is edited interactively using the available on-line editor NETED v. 1.4.

APPENDIX A

SOURCE LISTING

```

PROGRAM BIBLIO (INPUT,OUTPUT,PREFS,NEWREF,TAPE5=INPUT,TAPE6
1=OUTPUT,TAPE8=NEWREF,TAPE9=PREFS)

```

```

C
C*****
C
C   THIS PROGRAM IS DESIGNED TO TAKE A LARGE AMOUNT OF
C   BIBLIOGRAPHIC DATA, SORT IT,CHECK FOR DUPLICATES AND BE ABLE TO
C   OUTPUT CERTAIN CATEGORIES OF REFERENCES.
C
C*****
C
C   COMMON LIST (1000,17),INDEX (40),ITWOS(40)
C   DO 2 I=1,40
C   N=I-1
C   ITWOS(I)=2**N
C   2 CONTINUE
C   J=0
C
C*****
C
C   READ IN PERMANENT REFERENCE FILE (PREFS) INTO PROGRAM
C   OPERATING ARRAY.
C
C*****
C
C   CALL RDFLE (J)
C   READ (5,1) IFLAG
C   1 FORMAT (I1)
C
C*****
C
C   EVALUATE FLAG TO SEE WHAT FORMAT NEW BIBLIOGRAPHIC ENTRIES
C   ARE IN.  1 INDICATES BLOCK FORMAT, 0 INDICATES SEQUENTIAL
C   FORMAT.
C
C*****
C
C   IF (IFLAG.EQ.0) CALL READIN (J)
C   IF (IFLAG.EQ.1) CALL RDBLK (J)
C   DO 80 L6=1,3
C
C*****
C
C   PERFORM ALPHABETICAL SORT IF THIS IS THE FIRST TIME IN THE LOOP
C
C*****
C
C   IF (L6.EQ.1)CALL SORT (J)
C
C*****
C
C   PERFORM CHRONOLOGICAL SORT IF THIS IS THE SECOND TIME IN THE
C   LOOP.
C
C*****
C
C   IF (L6.EQ.2) CALL SORTYR (J)

```

```

C
C*****
C
C   PERFORM NUMERICAL SORT BY ACCESS NUMBER IF THIS IS THE THIRD
C   TIME IN THE LOOP.
C
C*****
C
C       IF (L6.EQ.3) CALL SORTAC (J)
C       CONTINUE
C       DO 30 L=1,50
C       READ (5,120) ISECT
C
C*****
C
C   READ IN THE SECTION TO BE WRITTEN OUT.
C   IF SECTION IS EQUAL TO 00 GO TO THE TOP OF THE LOOP AND PERFORM
C   THE NEXT SORT OR FINISH OUT THE PROGRAM IF THE LAST SORT
C   PERFORMED WAS THE NUMERICAL SORT.
C
C*****
C
C   120 FORMAT (I4)
C       IF (ISECT.EQ.0) GO TO 50
C       CALL FRNT (ISECT,J)
C   30 CONTINUE
C   50 CONTINUE
C       WRITE (6,100)
C   100 FORMAT ('1',"FULL REFERENCE LIST",//)
C       DO 40 K=1,J
C
C*****
C
C   WRITE OUT THE FULL REFERENCE LIST TO GIVE A LISTING OF ALL
C   REFERENCE AVAILABLE IN THE ORDER OF THE LATEST SORT.
C
C*****
C
C       CALL WRTOUT (K)
C   40 CONTINUE
C   80 CONTINUE
C       STOP
C       END

```

```

      SUBROUTINE BINBAC (I)
C
C*****
C
C      THIS SUBROUTINE BRINGS BACK THE SECTION CODE FROM THE INDEX
C      CALCULATED IN SUBROUTINE BINDEX
C
C*****
C
      COMMON LIST (1000,17), INDEX(40),ITWOS(40)
      P=LIST (I,17)
      DO 5 I1=1,40
      INDEX (I1)=0
5  CONTINUE
      DO 15 K=1,40
      L=41-K
      M=P-ITWOS(L)
      IF (M.LT.0) GO TO 25
      INDEX(L)=1
      P=M
25  CONTINUE
15  CONTINUE
      RETURN
      END

```

```

SUBROUTINE BINDEX (M)
C
C*****
C
C   THIS SUBROUTINE CALCULATES THE INDEX WHICH DETERMINES TO WHICH
C   OF THE 40 CATEGORIES THE ENTRY APPLIES
C
C*****
C
COMMON LIST (1000,17), INDEX (40),ITWOS(40)
IND=0
DO 5 K=1,40
IF (INDEX(K).EQ.1) IND=IND+ITWOS(K)
5 CONTINUE
LIST (M,17)=IND
RETURN
END

```



```

      SUBROUTINE DUPS (N)
C
C*****
C      THIS SUBROUTINE CHECKS THE REFERENCE ARRAY FOR DUPLICATES
C*****
C      COMMON LIST (1000,17),INDEX(40),ITWOS(10)
      WRITE (6,1)
1  FORMAT ('1',"POTENTIAL DUPLICATES INCLUDE:",//)
      I=0
5  CONTINUE
      I=I+1
      DO 10 I1=I,N
      I2=I1+1
      IF (LIST(I,2).NE.LIST(I2,2)) GO TO 20
10  CONTINUE
20  CONTINUE
      I3=I2-2
      IF (I.GE.N) RETURN
      IF (I.GT.I3) GO TO 15
      DO 30 I4=I,I3
      I5=I4+1
      IF (LIST (I,16).NE.LIST(I5,16)) GO TO 25
      CALL WRTOUT (I)
      CALL WRTOUT (I5)
25  CONTINUE
30  CONTINUE
      I=I+1
      IF (I.GE.I3) GO TO 15
      GO TO 20
15  I=I3
      I=I+1
      GO TO 5
      END

```

```

SUBROUTINE PRNT (IN,N)
C
C*****
C
C   THIS SUBROUTINE WILL DETERMINE WHICH OF THE SECTIONS ARE
C   DESIRED AND CONVERT THE SECTION NUMBER INTO A FORM UNDERSTOOD
C   BY THE INDEX CALCULATION TO DETERMINE THE NEEDED REFERENCES
C
C*****
C
COMMON LIST (1000,17),INDEX(40),ITWOS(40)
IF (IN.EQ.1000) GO TO 10
IF (IN.EQ.1100) GO TO 20
IF (IN.EQ.2000) GO TO 30
IF (IN.EQ.2100) GO TO 40
IF (IN.EQ.2110) GO TO 50
IF (IN.EQ.2200) GO TO 60
IF (IN.EQ.2210) GO TO 70
IF (IN.EQ.2220) GO TO 80
IF (IN.EQ.2230) GO TO 90
IF (IN.EQ.3000) GO TO 100
IF (IN.EQ.3100) GO TO 110
IF (IN.EQ.3110) GO TO 120
IF (IN.EQ.3111) GO TO 130
IF (IN.EQ.3112) GO TO 140
IF (IN.EQ.3113) GO TO 150
IF (IN.EQ.3114) GO TO 160
IF (IN.EQ.3115) GO TO 170
IF (IN.EQ.3200) GO TO 180
IF (IN.EQ.3210) GO TO 190
IF (IN.EQ.4000) GO TO 200
IF (IN.EQ.4100) GO TO 210
IF (IN.EQ.4110) GO TO 220
IF (IN.EQ.4111) GO TO 230
IF (IN.EQ.4112) GO TO 240
IF (IN.EQ.4120) GO TO 250
IF (IN.EQ.4130) GO TO 260
IF (IN.EQ.4131) GO TO 270
IF (IN.EQ.4132) GO TO 280
IF (IN.EQ.4140) GO TO 290
IF (IN.EQ.4200) GO TO 300
IF (IN.EQ.4300) GO TO 310
IF (IN.EQ.4400) GO TO 320
IF (IN.EQ.4500) GO TO 330
IF (IN.EQ.4600) GO TO 340
IF (IN.EQ.4700) GO TO 350
IF (IN.EQ.4800) GO TO 360
IF (IN.EQ.4900) GO TO 370
IF (IN.EQ.5000) GO TO 380
IF (IN.EQ.5100) GO TO 390
IF (IN.EQ.5200) GO TO 400
WRITE (6,1) IN
1 FORMAT ('1','SECTION ',I4,' IS NON-EXISTENT, CHECK OUTLINE')
RETURN

```

```

10 WRITE (6,2)
  2 FORMAT ('1',"INTRODUCTION (DEFINITION OF MARINE FOULING) SECTION
1 REFERENCES",//)
  I=1
  GO TO 6000
20 WRITE (6,3)
  3 FORMAT ('1',"DESIGN INTEGRATED FOULING CNTRL SYSTS REFERENCES",//)
  I=2
  GO TO 6000
30 WRITE (6,4)
  4 FORMAT ('1',"EVAL OF EFFICACY SECTION REFERENCES",//)
  I=3
  GO TO 6000
40 WRITE (6,5)
  5 FORMAT ('1',"IN SITU TESTING SECTION REFERENCES",//)
  I=4
  GO TO 6000
50 WRITE (6,6)
  6 FORMAT ('1',"RAFT TESTS SECTION REFERENCES",//)
  I=5
  GO TO 6000
60 WRITE (6,7)
  7 FORMAT ('1',"ACCELERATED TESTS SECTION REFERENCES",//)
  I=6
  GO TO 6000
70 WRITE (6,8)
  8 FORMAT ('1',"DYNAMIC SECTION REFERENCES",//)
  I=7
  GO TO 6000
80 WRITE (6,9)
  9 FORMAT ('1',"BIOASSAY SECTION REFERENCES",//)
  I=8
  GO TO 6000
90 WRITE (6,11)
11 FORMAT ('1',"LEACHING RATE SECTION REFERENCES",//)
  I=9
  GO TO 6000
100 WRITE (6,12)
12 FORMAT ('1',"CHEM CONTROL TECHNOLOGY SECTION REFERENCES",//)
  I=10
  GO TO 6000
110 WRITE (6,13)
13 FORMAT ('1',"TOXIC CNTRL AGENTS SECTION REFERENCES",//)
  I=11
  GO TO 6000
120 WRITE (6,14)
14 FORMAT ('1',"DELIVERY SYSTEMS SECTION REFERENCES",//)
  I=12
  GO TO 6000
130 WRITE (6,15)
15 FORMAT ('1',"COATINGS SECTION REFERENCES",//)
  I=13
  GO TO 6000

```

```

140 WRITE (6,16)
16 FORMAT('1',"ELASTOMERS SECTION REFERENCES",//)
I=14
GO TO 6000
150 WRITE (6,17)
17 FORMAT ('1',"DIRECT INJECTION SECTION REFERENCES",//)
I=15
GO TO 6000
160 WRITE (6,18)
18 FORMAT ('1',"IMPREGNATION (WOOD) SECTION REFERENCES",//)
I=16
GO TO 6000
170 WRITE (6,19)
19 FORMAT ('1',"STRUCTURAL INCORPORATION SECTION REFERENCES",//)
I=17
GO TO 6000
180 WRITE (6,21)
21 FORMAT ('1',"NON-TOXIC CONTROL AGENTS SECTION REFERENCES",//)
I=18
GO TO 6000
190 WRITE (6,22)
22 FORMAT ('1',"DELIVERY SYSTEMS SECTION REFERENCES",//)
I=19
GO TO 6000
200 WRITE (6,23)
23 FORMAT ('1',"PHYSICAL CONTROL TECHNOLOGY SECTION REFS",//)
I=20
GO TO 6000
210 WRITE (6,24)
24 FORMAT ('1',"MECH METHODS OF CNTRL SECTION REFERENCES",//)
I=21
GO TO 6000
220 WRITE (6,25)
25 FORMAT ('1',"SCRUBBING SECTION REFERENCES",//)
I=22
GO TO 6000
230 WRITE (6,26)
26 FORMAT ('1',"EXTERIOR SECTION REFERENCES",//)
I=23
GO TO 6000
240 WRITE (6,27)
27 FORMAT ('1',"INTERIOR SECTION REFERENCES",//)
I=24
GO TO 6000
250 WRITE (6,28)
28 FORMAT ('1',"JETS SECTION REFERENCES",//)
I=25
GO TO 6000
260 WRITE (6,29)
29 FORMAT ('1',"SONICS SECTION REFERENCES",//)
I=26
GO TO 6000
270 WRITE (6,31)
31 FORMAT ('1',"ULTRASONICS SECTION REFERENCES",//)
I=27
GO TO 6000

```

```

280 WRITE (6,32)
  32 FORMAT ('1',"INFRASONICS SECTION REFERENCES",//)
    I=28
    GO TO 6000
290 WRITE (6,33)
  33 FORMAT ('1',"LOW SURFACE ENRGY SECTION REFERENCES",//)
    I=29
    GO TO 6000
300 WRITE (6,34)
  34 FORMAT ('1',"ELECTRICAL METHODS SECTION REFERENCES",//)
    I=30
    GO TO 6000
310 WRITE (6,35)
  35 FORMAT ('1',"MAGNETIC METHODS SECTION REFERENCES",//)
    I=31
    GO TO 6000
320 WRITE (6,36)
  36 FORMAT ('1',"OPTICAL METHODS SECTION REFERENCES",//)
    I=32
    GO TO 6000
330 WRITE (6,37)
  37 FORMAT ('1',"NUCLEAR METHODS SECTION REFERENCES",//)
    I=33
    GO TO 6000
340 WRITE (6,38)
  38 FORMAT ('1',"THERMAL METHODS SECTION REFERENCES",//)
    I=34
    GO TO 6000
350 WRITE (6,39)
  39 FORMAT ('1',"OSMOTIC METHODS SECTION REFERENCES",//)
    I=35
    GO TO 6000
360 WRITE (6,41)
  41 FORMAT ('1',"SURFACE MOD METHODS SECTION REFERENCES",//)
    I=36
    GO TO 6000
370 WRITE (6,42)
  42 FORMAT ('1',"EXPLOSIVE REMOVAL SECTION REFERENCES",//)
    I=37
    GO TO 6000
380 WRITE (6,43)
  43 FORMAT ('1',"CONCLUSIONS SECTIONS REFERENCES",//)
    I=38
    GO TO 6000
390 WRITE (6,44)
  44 FORMAT ('1',"PRESENT PRACTICE SECTION REFERENCES",//)
    I=39
    GO TO 6000
400 WRITE (6,45)
  45 FORMAT ('1',"FUTURE DIRECTIONS SECTION REFERENCES",//)
    I=40
6000 CONTINUE

```

```

        WRITE (6,6911)
6911  FORMAT (1X,"ACCESS    FIRST",10X,"SECOND",8X,"THIRD",9X,"TITLE",
        136X,"PUBLISHER",25X,"YEAR")
        WRITE (6,6912)
6912  FORMAT (1X,"NUMBER    AUTHOR",9X,"AUTHOR",8X,"AUTHOR",///)
        DO 7000 I1=1,N
        CALL BINBAC (I1)
        IF (INDEX(I).EQ.0) GO TO 6999
        CALL WRTOUT (I1)
6999  CONTINUE
7000  CONTINUE
        WRITE (6,7001)
7001  FORMAT (////)
        RETURN
        END

```

```

SUBROUTINE RDELK (J)
C
C*****
C
C    THIS SUBROUTINE WILL READ IN THE DATA IN BLOCKS OF 30 CARDS
C
C*****
C
COMMON LIST (1000,17),INDEX(40),ITWDS(40)
DO 10 I=1,500
N=0
DO 20 I1=1,30
J=J+1
READ (5,100)(LIST(J,J1),J1=1,11)
100 FORMAT (I6,A10,A2,A10,A2,A10,A2,3A10,AB)
IF (LIST (J,1).EQ.0) GO TO 25
N=N+1
20 CONTINUE
25 CONTINUE
I8=J-N+1
K3=J
IF (N.LT.30) I8=I8-1
IF (N.LT.30) K3=K3+1
DO 30 I2=I8,K3
READ (5,110)(LIST(I2,J2),J2=12,16)
110 FORMAT (3A10,A6,I2)
30 CONTINUE
DO 40 I3=I8,K3
READ (5,120)(INDEX(K5),K5=1,40)
120 FORMAT (40I2)
CALL BINDEX (I3)
40 CONTINUE
IF (N.LT.30) GO TO 15
10 CONTINUE
15 J=J-1
RETURN
END

```

```

      SUBROUTINE RDFLE (J)
C
C*****
C
C      THIS SUBROUTINE READS A FILE CALLED REFS INTO THE
C      PROGRAM OPERATING ARRAY
C
C*****
C
      COMMON LIST (1000,17),INDEX (40),ITWDS(40)
      DO 5 I=1,1000
      READ (9,100)(LIST (I,K),K=1,17)
100  FORMAT (I6,A10,A2,A10,A2,A10,A2,3A10,A8,3A10,A6,I2,I13)
      IF (LIST(I,1).EQ.0) RETURN
      J=J+1
5  CONTINUE
      END

```



```

      SUBROUTINE READIN (J)
C
C*****
C
C      THIS SUBROUTINE READS IN EACH OF THE BIBLIOGRAPHIC ENTRIES
C
C*****
C
      COMMON LIST (1000,17),INDEX (40),ITWOS(40)
      K1=J+1
      DO 10 I=K1,1000
      READ (5,100)(LIST(I,J1),J1=1,16)
100  FORMAT (I6,A10,A2,A10,A2,A10,A2,3A10,AB,/,3A10,A6,I2)
      READ (5,110) (INDEX(K),K=1,40)
110  FORMAT (40I2)
      IF (LIST(I,1).EQ.0) RETURN
      J=J+1
      CALL BINDEK (I)
10  CONTINUE
      END

```

```

      SUBROUTINE SORT (N)
C
C*****
C
C      THIS SUBROUTINE SORTS THE ENTRIES INTO ALPHEBETICAL ORDER AND
C      CHECKS FOR DUPLICATES
C
C*****
C
      COMMON LIST (1000,17),INDEX (40),ITWDS(40)
      M1=N
25  I2=0
      M1=M1-1
      DO 5 I=1,M1
        I1=LIST (I,2)
        J=I+1
        I3=LIST (J,2)
        IF (I3-I1) 10,20,20
10  DO 15 K=1,17
        M=LIST(I,K)
        LIST (I,K)=LIST(J,K)
        LIST (J,K)=M
15  CONTINUE
20  I2=I2+1
5   CONTINUE
      IF (I2.GT.0) GO TO 25
      CALL DUPS (N)
      CALL WRTFLE (N)
      RETURN
      END

```

```

SUBROUTINE SORTAC (N)
C
C*****
C
C    THIS SUBROUTINE SORTS THE REFERENCES BY
C    ACCESS NUMBER
C*****
C
COMMON LIST (1000,17),INDEX(40),ITWDS(40)
M1=N
25 I2=0
M1=M1-1
DO 5 I=1,M1
I1=LIST(I,1)
J=I+1
I3=LIST(J,1)
IF (I3-I1) 10,20,20
10 DO 15 K=1,17
M=LIST (I,K)
LIST (I,K)=LIST(J,K)
LIST (J,K)=M
15 CONTINUE
I2=I2+1
20 CONTINUE
5 CONTINUE
IF (I2.GT.0) GO TO 25
RETURN
END

```

```

      SUBROUTINE SORTYP (N)
C
C*****
C      THIS SUBROUTINE SORTS THE REFERENCES BY YEAR
C*****
C      COMMON LIST (1000,17),INDEX (40),ITWOS(40)
      M1=N
25  I2=0
      M1=M1-1
      DO 5 I=1,M1
        I1=LIST (I,16)
        J=I+1
        I3=LIST (J,16)
        IF (I3-I1) 10,20,20
10  DO 15 K=1,17
        M=LIST (I,K)
        LIST (I,K)=LIST (J,K)
        LIST (J,K)=M
15  CONTINUE
        I2=I2+1
20  CONTINUE
      5 CONTINUE
      IF (I2.GT.0) GO TO 25
      RETURN
      END

```

```

      SUBROUTINE WRTOUT (I1)
C
C*****
C
C      THIS SUBROUTINE WRITES OUT ANY REFERENCE ON THE OUTPUT
C      DEVICE.
C
C*****
C
      COMMON LIST (1000,17), INDEX (40),ITWDS(40)
      WRITE (6,6998) (LIST(I1,L),L=1,16)
6998 FORMAT ('0',I5,1X,A10,',',A2,';',1X,A10,',',A2,';',1X,A10,
1',',A2,';',1X,3A10,A8,3X,3A10,A6,2X,I2)
      RETURN
      END

```

```

      SUBROUTINE WRTFLE (N)
C
C*****
C
C      THIS SUBROUTINE WRITES OUT THE REFERENCES IN ALPHABETICAL
C      ORDER ONTO A PERMANENT FILE
C
C*****
C
      COMMON LIST (1000,17),INDEX(40),ITWOS(40)
      N1=N+1
      DO 5 I=1,N1
      WRITE (8,100) (LIST (I,J),J=1,17)
100  FORMAT (I6,A10,A2,A10,A2,A10,A2,3A10,A8,3A10,A6,I2,I13)
      5  CONTINUE
      RETURN
      END

```

APPENDIX B

SAMPLE INPUT AND OUTPUT

BLOCK OF 30
CARD #1

631LORENZ	J			ANTIFOULING MEASURES ON SHIPS-A GENERAL
632OLDFIELD	D SANSOM	GF		POTENTIAL ANTIFOULING COATINGS FOR II*
633BOCKSTEIN	G GLEW	G PHILLIP		AT UNDERWATER MARINE COATINGS-ELIMINATION*
634PHILLIP	AT			UNDERWATER MARINE COATINGS- PART I- M*
635OUNN	P SANSOM	GF		COATED TIMBER FOR UNDERWATER APPLICATION*
636OCHILTREE	BC			ANTIFOULING ELASTOMERIC COMPOSITIONS
637BEITER	CBHAFNER	LA		AQUEOUS ANTIFOULING COATING COMPOSITION*
638DE FORST	A PETTIS	RWPHILLIP		AT UNDERWATER MARINE COATINGS-A DETAILED*
639RIDENOUR	G MINGOLS	PSARMBRUSTER		SPORICIDAL PROPERTIES OF CHLORINE DIO*
640PORTER	G			END OF THE FREE RIDE
641DEXTER	SCSULLIVAN	JD*		INFLUENCE OF SUBSTRATE WETTABILITY ON*
642CRISP	DJ			STUDIES OF BARNACLE HATCHING SUBSTANCE
643GERENCSE	VFBARNOTHY	MFARNOTHY		JMINHIBITION OF BACTERIAL GROWTH BY MAG*
644MITCHELL	R			BIOLOGICAL REPELLENTS:A NEW APPROACH *
645CHADWICK	WLCLARK	FSFOX		DLTHERMAL CONTROL OF MARINE FOULING AT *
646WHITE	HE			CONTROL OF MARINE FOULING IN SEA-WATER*
647TULLIS	DHNEILL	LCHENDERSON		ATCONTROL OF MARINE ORGANISMS IN A SALT*
648YEAGER	WLCATELLI	VJ		ANTIFOULING APPLICATIONS OF VARIOUS T*
649ADDERSEN	DM			ROGANOTIN PRESERVATIVES FOR WOOD STRU*
650EKAMA	HCVAN LONDEN	AMDE WOLF		P RESULTS OF AN INQUIRY INTO THE CONDIT*
651ARNOLD	MHCLARKE	HJ		PROJECT B:ULTRASONIC ANTIFOULING SHIP*
652ANON				PROGRESS REPORT ON THE TECHNIUM PRO*
653CHET	I MITCHELL	R		THE RELATIONSHIP BETWEEN CHEMICAL STW*
654CLARKE	GL			POISONING AND RECOVERY IN BARNACLES A*
655CORNER	EDSPARROW			THE MODES OF ACTION OF TOXIC AGENTS-1*
656ANON				THE 'TOXION' SYSTEM-A NEW ANTIFOULING *
657ANON				REDUCING THE BARNACLE BILL
658ANON				SHIPS' HULL PROTECTED-ULTRASONIC VIB*
659FISK	NR			A VIEW OF ANTIFOULING
660FLEMING	H			EFFECT OF HIGH FREQUENCY FIELDS ON M1*

BLOCK OF 30
CARD #2

AD-8032 858	78
AD-918 043	73
AD-8006 675	74
AD-907 612	72
AD-902 136	72
AD-911 382	72
US PATENT# 4,052,354	77
AD-922 986	74
WATER SEWAGE WORKS.V96.N8.P279-83.A*79	
NRS DIMENSIONS.V04.N2.P12-7.1980	80
APP MICROBIOL.V30.N2.P298-308.AUG 1975	
COMP BIOCHEM PHYSIOL.V30.N6.P1037-4*69	
NATURE.V196.N485.P539-41.NOV 10.196262	
NAVSEA JOUR. 62-6.JULY 1976	76
TRANS ASME.V72.P127-31.FEB 1950	50
TRANS ASME.V22.P117-26.FEB 1950	50
J INST PET.V45.N426.P155-67.JUN 195959	
ORGANOMETALLIC POLYMERS.ED CE CARRA*77	
DTNSRDC REPORT # SME-78/41.JUN 1979 79	
TNO REPORT 47C.	1962
TECHNICAL MINUTE #93	52
UNIV OF VIRGINIA ALUM PATENTS FOUND*79	
CAN.J MICROBIOL.V22.P1206-08.N8.197676	
BIOLOGICAL BULL.V92.P73-91.1947	47
J MAR BIOL ASS UK.V35.P531-48.1956	56
CORR PREV & CONT.P49-54.MARCH 1960	60
CHEM WEEK.V72.N9.87-91.FEB 28.1953	53
ENGINEERING.V180.P416. SEPT 23.1955	55
PAINT TECH.V24.N270.P15-18.MAY 1960	60
ELEC ENG.P18-21.JAN 1944	44

The diagram is a large, irregular shape composed of many small squares. Most of these squares are empty, but many contain the number '1'. The '1's are distributed across the entire shape, with some appearing in small groups and others in isolation. The overall pattern of '1's is complex and non-uniform, suggesting a random or pseudo-random distribution within the defined area.

SECTION
DECK

3112
4110
4111
(blank card)
(blank card)
(blank card)

37

OUTPUT FOR PRECEDING INPUT

1. POTENTIAL DUPLICATES (NOT INCLUDED)
2. ALPHABETIC SECTIONS REQUESTED (INCLUDED)
3. FULL ALPHABETIC REFERENCE LIST (NOT INCLUDED
OVER 500 LINES OF OUTPUT)
4. FULL CHRONOLOGICAL REFERENCE LIST
(NOT INCLUDED)
5. FULL NUMERICAL REFERENCE LIST
(NOT INCLUDED)

ELASTOMERS SECTION REFERENCES					PUBLISHER	YEAR
ACCESS NUMBER	FIRST AUTHOR	SECOND AUTHOR	THIRD AUTHOR	TITLE		
356	BINGHAM	MH; MUM	PU;	IMPRESSED CURRENT CATHODIC PROTECTION	ANTI-CORROSION	78
64	CASTELLI	VJ; MONTENAR	JAI FISCHER	ORGANOMETALLIC POLYMERS-ANTI FOULING	MARINE TECH SOC J VOL 9 N7 P16	75
272	CASTELLI	VJ;	;	CORROSION AND BIOFOULING ON THE NON-H	FIRST ANN OTEC BIOFOUL AND CORR SYM	77
289	CASTELLI	VJ;	;	CORROSION AND BIOFOULING ON THE HEAT	DTNSRDC REPORT #79/054, MAY 1979, 82P	79
355	DEAR	M;	;	THE DESIGN AND APPLICATION OF ANTIFOUL	ADV ORGANIC COAT SCI TECH N7P152	79
152	DEFORST	A; PETTIS	RM; PHILLIP	ELASTOMERIC ANTIFOULING COATINGS	AUST. MATERIALS RESEARCH LAB (TN378)	75
638	DE FORST	A; PETTIS	RM; PHILLIP	UNDERWATER MARINE COATINGS-A DETAILED	AD-922 986	74
157	DICK	RJ; MERRILL	BJ;	EVALUATION OF PROTECTIVE COATINGS FOR	DOT/USCG (REPT. CG-D-24-77) MAY 1977	77
464	EDELSTEIN	HP; ELLER	SA; GRUNTHIER	FOULING RESISTANT ELASTOMERIC MATERIAL	NAVAL ENG J V82 N1 2/70 P15-21	70
151	FISCHER	EC; BIRNBAUM	LS;	SURVEY REPORT: NAVY BIOLOGICAL FOULING	NAVAL UNDERSEA CENTER (NUC TP456) MAR	70
154	FROMER	RL;	;	APPLICATION OF NOFOUL RUBBER BY R.F.	US NAVY UNDERWATER SOUND LAB MAR 1989	69
35	HOHMAN	AE;	;	ELASTOMERIC COATINGS TO PROTECT AGAIN	PROC 4TH INT CONG ON MAR COR & FOUL	76
61	KRONSTEIN	M;	;	ENVIRONMENTAL PROTECTED ANTIFOUL COAT	MOD. PAINT COATINGS, DEC 1980, P45 47	80
108	KRONSTEIN	M;	;	CONTROLLED RELEASE OF POLYMERIC ORGAN	ACS, DIV POLYMER CHEM PREPRINTS 1981	80
348	KUMAR	A; WITTER	D;	COATINGS AND CATHODIC PROTECTION OF	MATERIALS PERFORM V18 N12 P9-19	79
216	MAJOR	CJ; CARDARELLI	HF;	BIOCIDAL RUBBER FOR WATER RECLAMATION	AERO MED RES LAB REPORT TR69-17 JUNE	69
590	MITCHELL	R; BENSON	PH;	MICRO- AND MACROFOULING IN THE OTEC	ARGONNE NAT LAB REPORT #ANL/OIEC-80	80
183	MOCK	JA;	;	MARINE COATINGS SET A NEW COURSE	MATERIALS ENGINEERING VOL 90 N4	19
636	OCHILTREE	BC;	;	ANTI FOULING ELASTOMERIC COMPOSITIONS	AD-911 382	72
67	PETTIS	RM; PHILLIP	AT;	ANTIFOULING ACTIVITY OF PHYTO TOXIC CO	DDO NAT RES. LABS, AUSTRALIA MLR698	77
634	PHILLIP	AT;	;	UNDERWATER MARINE COATINGS- PART I -	AD-907 612	72
37	SHERARD	JR; DICK	RJ; NOMACKI	NEW MARINE COATINGS TECHNOLOGY APPLIE	PROC 4TH INT CONG ON MAR COR & FOUL	76
354	STEELE	MD; DRISCO	RM;	FUNGAL-RESISTANT ORGANOTIN PAINTS	JOUR COAT TECHNOL V48 N616 P59-63	76
254	THUST	U;	;	ORGANOTIN COMPOUNDS IN THE D.D.R. -	TIN AND ITS USES, N122, P3-5, 1979	79
426	WOODFORD	JH;	;	UNDERWATER MARINE COATINGS-PART 2	AUST DOD/DEF STD LAB (RP1966) 3/72	72

SCRUDDING SECTION REFERENCES

ACCESS NUMBER	FIRST AUTHOR	SECOND AUTHOR	THIRD AUTHOR	TITLE	PUBLISHER	YEAR
168	ANDON J			SHIP UNDERWATER MAINTENANCE, EVALUATION	US NAVY/NAVSEC (REPT 6136-77-9)	77
442	ANDON K			NEW UNDERWATER PROCESS CUTS HULL CLEAN	UNDERSEA TECHNOLOGY 9/69 P55	69
463	BENSON	PH; BRINING	DL; PERLIN	MARINE FOULING AND ITS PREVENTION	MAR TECHNOL V10 N1 1/73 P30-37	73
273	BRASWELL	JA; LOTT	DF; HELDICKA	PRELIMINARY EVALUATION OF FLOW DRIVEN	BIOFOULING, CORROSION AND MATERIALS	79
272	CASTELLI	VJ		CORROSION AND BIOFOULING ON THE NON-H	FIRST ANN OTEC BIOFOUL AND CORR SYM	77
277	CASTELLI	VJ; FRITSCH	AB; ADAMSON	AN EVALUATION OF SOME MECHANICAL CLEAN	PROC 5TH OTEC CONF, MIAMI BEACH, FLA	78
289	CASTELLI	VJ		CORROSION AND BIOFOULING ON THE HEAT	DYNARDC REPORT #79/054, MAY 1979, 92P	79
319	COLLOER	CP; BOHLANDER	GS; PREISER	REVIEW OF UNDERWATER CLEANING METHODS	J COAT TECHNOL V49 N682 P531-55	77
424	FETKOVICH	JG; GRAMMANN, GN		A STUDY OF FOULING/CORROSION PROBLEMS	USA-DOE (RPT CGO-4041-9) 9/77	77
478	FRASER	I		UNDERWATER HULL CLEANING THE SAVING	SHIPBUILD&SHIPG REC V113 N23 6/69	69
583	FREEMAN	JH		MARINE FOULING OF FIXED OFFSHORE INST	CORR PREVENT CONTROL, V25, N6, P7-14, 19	78
271	FRITSCH	A; ADAMSON	W; CASTELLI	AN EVALUATION OF MECHANICAL CLEANING	FIRST ANN OTEC BIOFOUL AND CORR SYM	77
86	GOODMAN	EH; GREENEBAUM, B	MARRON	EFFECTS OF EXTREMELY LOW FREQUENCY EM	RADIATION RESEARCH V56 P531-540	19 76
285	HAGEL	D; CONN	AF; RICE	METHODS FOR CLEANING OTEC HEAT EXCHANG	PROC OTEC BIOFOULING AND CORR SYM	77
276	KERN	MI		INCREASING HEAT EXCHANGER EFFICIENCY	PROC 4TH ANN CONF ON OTEC, NEW ORLEANS	77
587	KUESTER	CK; LYNCH	CE	AMERTAP AT ENGLISH STATION	WINTER ANN MEET ENER SYS EXP ASKE	66
278	LEVINTHAL	EL		A BIOFOULING CONTROL SYSTEM FOR AN OT	PROC 5TH OTEC CONF, MIAMI BEACH, FLA	78
631	LORENZ	J		BIOFOULING MEASURES ON SHIPS-A GENER	AD-8032 858	78
460	MALONE	JA; ALLMAN	M	HULL PERFORMANCE ASSESSMENT MODEL VOL	NTIS PB80-145816 (DOC-MARAD930-80015	80
112	MILNE	A		HULL SURFACE MAINTENANCE-SMOOTHING TH	CANADIAN SHIP&MAR ENG VOL 49 N04P18	78
590	MITCHELL	R; BENSON	PH	MICRO- AND MACROFOULING IN THE OTEC	ARGONNE NAT LAB REPORT #ANL/OTEC-80	80
274	NUBEL	ED		AUTOMATIC TUBE CLEANING SYSTEM-BRUSH	PROC 4TH ANN CONF ON OTEC, NEW ORLEANS	77
113	PASCOE	DW		CARWASH APPROACH HAS MERIT	CANADIAN SHIP&MAR ENG VOL 49 N04P13	78
14	PREISER	HS; BOHLANDER	GS; COLOGER	FOULING CONTROL MEANS FUEL SAVINGS FOR	SHAME STAR SYM, 25MAY1977 SANFRANCA	77
51	PREISER	HS; COLOGER	CP; BOHLANDER	UNDERWATER HULL CLEANING FOR FUEL CON	RMZN COR & FOUL COM, PROC 5TH INTER	77
245	SATO	S; NAGATA	K; OGISO	EFFECT OF SPONGE BALL CLEANING ON CORR	SUMITOMO LIGHT METAL TECHNICAL REPO	72
284	SCHLESING, HA			ECONOMICS OF ALTERNATIVES FOR OTEC B	PROC OTEC BIOFOULING AND CORR SYM	77
425	SPIDNER	CH		ASSESSMENT OF CORROSION PRODUCTS FROM	USA-EPA (RPT EPA600/7-89-026) 11/80	80
569	TROTMAN	DW		UNDERWATER CLEANING	PROC 1ST INTER SHIP PAINT CORR CONF	74
570	TROTMAN	DW; JACKSON		UNDERWATER CLEANING	PROC 1ST INTER SHIP PAINT CORR CONF	74
75	VAN LONDEN, AM	JOHNSEN	S; GOVERS	THE CASE OF LONG-LIFE ANTIFOULINGS	J PAINT TECHNOL V47 N600 P62-68	75
87	WAYLAND	JR		THEORETICAL APPROACH TO THE EFFECTS OF	RADIATION RESEARCH V74 P207-216	19 78

EXTERIOR SECTION REFERENCES				TITLE	PUBLISHER	YEAR
ACCESS NUMBER	FIRST AUTHOR	SECOND AUTHOR	THIRD AUTHOR			
272	CASTELLI, VJ;			CORROSION AND BIOFOULING ON THE NON-H ₂	FIRST ANN OTEC BIOFOUL AND CORR SYM	77
289	CASTELLI, VJ;			CORROSION AND BIOFOULING ON THE HEAT &	DINERDC REPORT #79/054, MAY 1979, 82P	79
565	BRACE, RC;			INCREASING HEAT EXCHANGER EFFICIENCY &	BIOFOULING CONTROL PROCEDURES, POLLUT	77
583	FREEMAN, JH;			MARINE FOULING OF FIXED OFFSHORE INSTA	CORR PREVENT CONTROL, V25, N6, P7-14, 19	78
590	HITCHELL, R; BENSON, PH;			MICRO- AND MACROFOULING IN THE OTEC P&	ARGONNE NAT LAB REPORT #ANL/OTEC-DCR	80
14	PREISER, HS; BOHLANDER, GS;			FOULING CONTROL MEANS FUEL SAVINGS FOR	SKANE "STAR" SYM, 25MAY1977 SAME RANGE	77
51	PREISER, HS; COLDGER, CP; BOHLANDER, GS;			UNDERWATER HULL CLEANING FOR FUEL CON	RNZN COR & FOUL COM, PROC 5TH INTER	74
569	TROTMAN, DW;			UNDERWATER CLEANING	PROC 1ST INTER SHIP PAINT CORR COM	74
570	TROTMAN, DW; JACKSON, S;			UNDERWATER CLEANING	PROC 1ST INTER SHIP PAINT CORR COM	74
75	VAN LINDEN, AN; JOHNSON, S;			THE CASE OF LONG-LIFE ANTIFOULINGS	J PAINT TECHNOL VA7 N600 P62-68	75

APPENDIX C

AUXILIARY PROGRAMS

PRECEDING PAGE BLANK-NOT FILMED

Several auxiliary programs proved helpful in editing the references file (PREFS). Most editing was performed by the use of the on-line editor, NETED, v. 1.4, maintained on the DTNSRDC computer system. In the event an entry was duplicated, the duplicate was deleted through the use of the editor. Since there were several individuals submitting data to this bibliography, it was desired that all sections marked by each author be combined into the calculated index on the remaining entry. A method was required to do this calculation.

Program NEWIND will combine two indices and give a new index, to be inserted into the reference file, which will cover all sections marked by both authors.

Program INDICES will back calculate and give a listing of all sections in a single index or a group of indices. This was useful in comparing what sections were marked for the same article by two different authors. For 41 duplicates with a total of 278 sections marked, 41% of the sections were marked by both authors. This shows a definite advantage to examining references on more than one occasion.

Additionally, two programs were written to help in formatting the bibliographic entries. Program WRITE will write out the permanent reference file (maintained in alphabetic order) in an expanded format to allow for completion of the final bibliography. It also numbers the entries so that a record of the size of the bibliography is maintained. Program LIST will numerically sort the references and give the list out in appropriate format for the citations to be placed in the text of the article or book (i.e., Jones, 1966).

Program SECCOR is used as an interactive editor to correct the sections a reference is found in. By connecting the files INPUT, OUTPUT, and TTY to a terminal, corrections are easily made with interactive prompts. The program will ask for the access number and then give the author and section index for that access number. The program will then ask for a section number and if the section is to be inserted or deleted. It is not necessary to know the status of the section in the original index, the program will check that status. It will continue to ask for sections until the number "0" is typed in, at that point it will ask for a new

access number. A response of "0" to the access number will stop the program. A new file of the references, with the corrected section index numbers, will be created under file name NEWREF. This file must then be cataloged under the permanent reference file name PREFS. This program requires that the permanent reference file be maintained under file name PREFS.


```

      PROGRAM NEWIND (INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT)
C
C*****
C
C THIS PROGRAM WILL COMBINE TWO INDICES AND GIVE A NEW INDEX.
C IT IS ESSENTIALLY DOING A LOGICAL AND ON TWO 40 BIT WORDS.
C
C*****
C
      1 READ (5,100) IND1
        IF (IND1.EQ.0) STOP
        READ (5,100) IND2
      100 FORMAT (I13)
        P=IND1
        P1=IND2
        IND=0
C
C*****
C
C CHECK IF THE BIT IS SET ON EITHER WORD AND SET THE NEW BIT IF THIS
C CONDITION IS MET.
C
C*****
C
      DO 15 K=1,40
        L=40-K
        M=P-2**L
        M1=P1-2**L
        IF (M.GE.0.OR.M1.GE.0) IND=IND+2**L
        IF (M.GE.0) P=M
        IF (M1.GE.0) P1=M1
      15 CONTINUE
C
C*****
C
C PRINT OUT THE OLD INDICES AND THE NEW COMBINED INDEX.
C
C*****
C
      WRITE (6,110) IND1,IND2,IND
      110 FORMAT ('0','THE OLD INDICES WERE ',I13,' AND ',I13,6X,'THE NEW '
        A,'COMBINED INDEX IS ',I13)
      GO TO 1
      END

```

INPUT

26791580349
469108736
16891348565
468703594
0000
0000

OUTPUT

THE OLD INDICES WERE	26791580349 AND	469108736	THE NEW COMBINED INDEX IS	26842962621
THE OLD INDICES WERE	16891348565 AND	468703594	THE NEW COMBINED INDEX IS	17178812287

NEWIND INPUT AND OUTPUT

```

PROGRAM INDICES (INPUT,OUTPUT,TAPE5=INPUT,TAPE6=OUTPUT)
C
C*****
C
C   THIS PROGRAM GIVES THE SECTION NUMBERS RELATED TO ANY INPUT
C   INDEX.  THE APPLICABLE SECTION NUMBERS ARE DESIGNATED BY A '1'
C   THE INDEX NUMBERS WHICH ARE DESIRED TO BE BACK CALCULATED SHOULD
C   BE INPUT ON CONSECUTIVE CARDS FOLLOWED BY A BLANK CARD
C   THE PROGRAM ACCEPTS THE DATA IN I13 FORMAT AND LOOKS FOR A ZERO
C   AS A FLAG FOLLOWING THE LAST DATA ENTRY.
C
C*****
C
C
C   COMMON INDEX(40)
C   CALL WRT
C   CONTINUE
C   1 READ (5,100)IBINX
C 100 FORMAT (I13)
C   IF (IBINX.EQ.0) STOP
C   P=IBINX
C
C*****
C
C CHECK WHICH BITS ARE SET AND INDICATE BY PUTTING ONES IN AN
C ARRAY.
C
C*****
C
C   DO 5 I=1,40
C   INDEX (I)=0
C 5 CONTINUE
C   DO 15 K=1,40
C   L=40-K
C   M=P-2**L
C   N=41-K
C   IF (M.LT.0) GO TO 25
C   INDEX (N)=1
C   P=M
C 25 CONTINUE
C 15 CONTINUE
C   WRITE (6,140) IBINX,(INDEX(I),I=1,40)
C 140 FORMAT ('0',I13,1X,40I2)
C   GO TO 1
C   END

```

```

SUBROUTINE WRT
C
C*****
C
C THIS SUBROUTINE WRITES OUT THE HEADINGS WHICH ARE THE SECTION
C NUMBERS TO WHICH THE SET BITS CORRESPOND.
C
C*****
C
COMMON INDEX (40)
WRITE (6,100)
100 FORMAT('1',15X,'1 1 2 2 2 2 2 2 2 3 3 3 3 3 3 3 3 3',
A' 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 4 5 5 5')
WRITE (6,110)
110 FORMAT (16X,'0 1 0 1 1 2 2 2 2 0 1 1 1 1 1 1 2 2 0 1 1 1',
A' 1 1 1 1 1 1 2 3 4 5 6 7 8 9 0 1 2')
WRITE (6,120)
120 FORMAT (16X,'0 0 0 0 1 0 1 2 3 0 0 1 1 1 1 1 0 1 0 0 1 1 1',
A' 2 3 3 3 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0')
WRITE (6,130)
130 FORMAT (1X,'INDEX',10X,'0 0 0 0 0 0 0 0 0 0 0 0 1 2 3 4 5',
A' 0 0 0 0 0 1 2 0 0 1 2 0 0 0 0 0 0 0 0 0 0 0 0')
RETURN
END

```

INPUT

26791580349
 469108736
 16891348565
 468703594
 0000

OUTPUT

	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	5	5
	0	1	0	1	1	2	2	2	2	0	1	1	1	1	1	1	2	2	0	1	1	1	1	1	1	1	1	1	2	3	4	5	6	7	8	9	0	1	2
INDEX	0	0	0	0	1	0	1	2	3	0	0	1	1	1	1	1	0	1	0	0	1	1	1	2	3	3	3	4	0	0	0	0	0	0	0	0	0	0	0
26791580349	1	0	1	1	1	1	0	1	0	1	0	0	1	0	0	0	1	1	1	0	0	1	1	1	0	0	1	1	1	1	0	0	0	1	1	0	0	0	0
469108736	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0
16891348565	1	0	1	0	1	0	1	0	0	1	1	0	0	0	0	1	1	0	1	1	0	0	1	1	0	1	1	1	0	1	1	1	1	1	0	0	0	0	0
468703594	0	1	0	1	0	1	1	0	1	0	0	1	1	0	1	1	1	1	1	0	1	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0

INDICES INPUT AND OUTPUT

```

PROGRAM WRITE (PREFS,OUTPUT,TAPE1=PREFS,TAPE2=OUTPUT)
C
C*****
C
C   THIS PROGRAM IS DESIGNED TO REWRITE AND RENUMBER A BIBLIOGRAPHIC
C   FILE INTO A FORM SUITABLE FOR EDITING PRIOR TO TYPING
C
C*****
C
COMMON LIST (1000,17)
DO 5 I=1,1000
READ (1,100) (LIST(I,K),K=2,17)
100 FORMAT (I6,A10,A2,A10,A2,A10,A2,3A10,A8,3A10,A6,I2)
IF (LIST(I,2).EQ.0) GO TO 10
LIST (I,1)=I
WRITE (2,110) (LIST(I,K),K=1,17)
110 FORMAT ('*',I6,2X,I6,2X,A10,' ',',',1X,A2,' ',',',2X,A10,' ',',',1X,A2,' ',',',2X,
AA10,' ',',',1X,A2,' ',',',15X,3A10,A8/, '*',3A10,A6,70X,'19",I2,/)
5 CONTINUE
10 STOP
END

```

PROGRAM LIST (PREFS,TTY,OUTPUT,TAPE5=PREFS,TAPE6=TTY,TAPE7=OUTPUT)

```
C
C*****
C
C  THIS PROGRAM IS DESIGNED TO INTERPRET THE REFERENCE FILE AND
C  PLACE THE REFERENCES IN A FORM APPROPRIATE FOR THE
C  CITATIONS IN THE TEXT OF THE PAPER.
C
C*****
C
      COMMON IWKLST (850,5)
      N=0
      DO 5 I=1,850
      READ (5,100)(IWKLST(I,J),J=1,5)
100  FORMAT(I6,A10,2X,A10,2X,A10,76X,I2)
      IF (IWKLST(I,1).EQ.0) GO TO 10
      N=N+1
      5  CONTINUE
10  CONTINUE
      M1=N
35  I2=0
      M1=M1-1
      DO 15 I=1,M1
      I1=IWKLST(I,1)
      J=I+1
      I3=IWKLST(J,1)
      IF (I3-I1) 20,25,25
20  DO 30 K=1,5
      M=IWKLST(I,K)
      IWKLST(I,K)=IWKLST(J,K)
      IWKLST(J,K)=M
30  CONTINUE
      I2=I2+1
25  CONTINUE
15  CONTINUE
      IF(I2.GT.0)GO TO 35
      DO 40 I=1,N
      IF (IWKLST(I,4).GE.0) GO TO 50
      IF (IWKLST(I,3).GE.0) GO TO 60
      WRITE (6,110) IWKLST(I,1),IWKLST(I,2),IWKLST(I,5)
110  FORMAT (5X,I6,10X,A10," ",1X,"19",I2)
      GO TO 45
      50  WRITE (6,120) IWKLST(I,1),IWKLST(I,2),IWKLST(I,5)
120  FORMAT (5X,I6,10X,A10," ET AL",1X,"19",I2)
      GO TO 45
      60  WRITE (6,130)IWKLST(I,1),IWKLST(I,2),IWKLST(I,3),IWKLST(I,5)
130  FORMAT(5X,I6,10X,A10," AND ",A10," ",1X,"19",I2)
      45  CONTINUE
      40  CONTINUE
      STOP
      END
```

```

      PROGRAM SECCOR (OUTPUT,TTY,PREFS,INPUT,NEWREF,TAPE1=OUTPUT,
      ATAPE2=TTY,TAPE3=PREFS,TAPE4=INPUT,TAPE5=NEWREF)
C
C*****
C
C   THIS PROGRAM IS DESIGNED AS AN INTERACTIVE METHOD TO CORRECT
C   THE SECTIONS A REFERENCE IS FOUND IN.  THE FILES INPUT,
C   OUTPUT AND TTY MUST BE CONNECTED TO YOUR TERMINAL AND THE FILE
C   PREFS, PERMANENT REFERENCES, MUST BE AVAILABLE TO THE
C   PROGRAM AS THE WORKING DATA FILE.
C
C*****
C
      COMMON LIST(1000,14),INDEX(40),IBIT(40)
      DO 10 I=1,1000
      READ (3,1) (LIST(I,J),J=1,14)
      1  FORMAT (I6,A10,10A10,A2,I13)
      IF (LIST(I,1).EQ.0) GO TO 20
      10 CONTINUE
      20 CONTINUE
      DO 12 I6=1,40
      I7=I6-1
      IBIT(I6)=2**I7
      12 CONTINUE
C
C*****
C
C   IDENTIFY REFERENCE YOU WISH TO AMEND, INSERT 00 IF YOU WISH
C   TO END PROGRAM.  INPUT MUST BE IN I6 FORMAT, IE 111 IS INPUT
C   AS 000111.
C
C*****
C
      2  PRINT (2,5)
      5  FORMAT ('0','TYPE IN ACCESS NO. IN I6 FORMAT.  ')
      READ (4,15) IAC
      15  FORMAT (I6)
      IF (IAC.EQ.0) GO TO 4
      IND=0
      DO 30 I=1,1000
      IF (IAC.EQ.LIST(I,1)) WRITE (2,25)(LIST(I,J),J=1,2),LIST(I,14)
      25  FORMAT ('0','$',I6,2X,'FIRST AUTHOR ',A10,2X,'INDEX ',I13)
      IF (IAC.EQ.LIST(I,1)) NUM=I
      IF (IAC.EQ.LIST(I,1)) IND=LIST(I,14)
      IF (LIST(I,1).EQ.0)GO TO 40
      30 CONTINUE
      40 CONTINUE

```



```

C
C*****
C
C   WAS REFERENCE FOUND?  IF NOT, ASK FOR ACCESS NUMBER AGAIN.
C
C*****
C
C       IF (IND.EQ.0) GO TO 2
C       IND1=IND
C
C*****
C
C   TRANSLATE INDEX NUMBER OF REFERENCE IN SECTIONS PREVIOUSLY SET.
C
C*****
C
C       DO 55 I=1,40
C       N=41-I
C       INDEX(N)=0
C       M=IND1-IBIT(N)
C       IF (M.LT.0) GO TO 65
C       INDEX(N)=1
C       IND1=M
C   65 CONTINUE
C   55 CONTINUE
C
C*****
C
C   IDENTIFY SECTION YOU WANT CHANGED.  INSERT 00 IF YOU ARE
C   FINISHED WITH THIS ACCESS NUMBER.
C
C*****
C
C   3 PRINT (2,35)
C   35 FORMAT ('0','TYPE IN SECTION NUMBER  ')
C   8 READ (4,45) ISECT
C   IF (ISECT.EQ.0) GO TO 2
C   45 FORMAT (I4)
C   CALL SECTIN (ISECT,I1)
C   IF (I1.EQ.0) PRINT (2,100)
C   100 FORMAT ('0','ERROR IN SECTION NUMBER, RE-ENTER  ')
C   IF (I1.EQ.0) GO TO 8
C   I5=I1-I

```

```

C
C*****
C
C   DO YOU WANT SECTION ADDED OR REMOVED?
C
C*****
C
C   PRINT (2,75)
C   75 FORMAT ('0','TYPE IN 1 FOR INSERTION, 2 FOR DELETION ')
C   READ (4,85) IFLAG
C   85 FORMAT (I1)
C   IF (IFLAG.EQ.2) GO TO 6
C
C*****
C
C   CHECK IF SECTION IS ALREADY PRESENT. IF NOT, ADD
C   APPROPRIATE FACTOR TO THE SECTION INDEX.
C
C*****
C
C   IF (INDEX(I1).EQ.0) IND=IND+IBIT(I1)
C   LIST(NUM,14)=IND
C   GO TO 3
C
C*****
C
C   CHECK IF SECTION IS NOT PRESENT. IF PRESENT, SUBTRACT
C   APPROPRIATE FACTOR FROM THE SECTION INDEX.
C
C*****
C
C   6 IF (INDEX(I1).EQ.1) IND=IND-IBIT(I1)
C   LIST(NUM,14)=IND
C   GO TO 3
C
C*****
C
C   WRITE OUT A NEW CORRECTED REFERENCE FILE TO FILE NEWREF.
C
C*****
C
C   4 DO 50 I=1,1000
C     WRITE (5,95)(LIST(I,J),J=1,14)
C   95 FORMAT (I6,A10,10A10,A2,I13)
C     IF (LIST(I,1).EQ.0) STOP
C   50 CONTINUE
C   END

```

```

SUBROUTINE SECTIN (ISECT,I1)
COMMON LIST (1000,14),INDEX (40),IBIT(40)
C
C*****
C
C   THIS SUBROUTINE IDENTIFIES THE SECTION YOU ARE REFERRING TO,
C   FOR COMPUTER USAGE.
C
C*****
C
I1=0
IF (ISECT.EQ.1000) I1=1
IF (ISECT.EQ.1100) I1=2
IF (ISECT.EQ.2000) I1=3
IF (ISECT.EQ.2100) I1=4
IF (ISECT.EQ.2110) I1=5
IF (ISECT.EQ.2200) I1=6
IF (ISECT.EQ.2210) I1=7
IF (ISECT.EQ.2220) I1=8
IF (ISECT.EQ.2230) I1=9
IF (ISECT.EQ.3000) I1=10
IF (ISECT.EQ.3100) I1=11
IF (ISECT.EQ.3110) I1=12
IF (ISECT.EQ.3111) I1=13
IF (ISECT.EQ.3112) I1=14
IF (ISECT.EQ.3113) I1=15
IF (ISECT.EQ.3114) I1=16
IF (ISECT.EQ.3115) I1=17
IF (ISECT.EQ.3200) I1=18
IF (ISECT.EQ.3210) I1=19
IF (ISECT.EQ.4000) I1=20
IF (ISECT.EQ.4100) I1=21
IF (ISECT.EQ.4110) I1=22
IF (ISECT.EQ.4111) I1=23
IF (ISECT.EQ.4112) I1=24
IF (ISECT.EQ.4120) I1=25
IF (ISECT.EQ.4130) I1=26
IF (ISECT.EQ.4131) I1=27
IF (ISECT.EQ.4132) I1=28
IF (ISECT.EQ.4140) I1=29
IF (ISECT.EQ.4200) I1=30
IF (ISECT.EQ.4300) I1=31
IF (ISECT.EQ.4400) I1=32
IF (ISECT.EQ.4500) I1=33
IF (ISECT.EQ.4600) I1=34
IF (ISECT.EQ.4700) I1=35
IF (ISECT.EQ.4800) I1=36
IF (ISECT.EQ.4900) I1=37
IF (ISECT.EQ.5000) I1=38
IF (ISECT.EQ.5100) I1=39
IF (ISECT.EQ.5200) I1=40
RETURN
END

```

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