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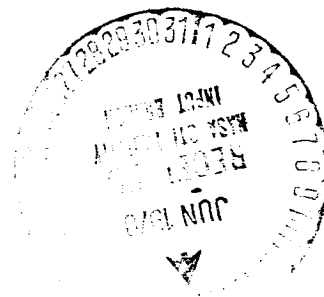
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JPL Contract 952532

A Study Program on the Development of a Mathematical Model(s) for Microbial Burden Prediction

Final Report ,
Addendum

Volume VIII:
Revisions to Volume VI
User's Manual



APRIL 1970

This work was performed for the Jet Propulsion Laboratory,
California Institute of Technology, sponsored by the
National Aeronautics and Space Administration under
Contract NAS7-100.

MARTIN MARIETTA CORPORATION

FACILITY FORM 602

(ACCESSION NUMBER)	(CATEGORY)
N701-28584	1
(PAGES)	(CODE)
CR-110141	08
(NASA CR OR TMX OR AD NUMBER)	(CATEGORY)

A STUDY PROGRAM ON THE DEVELOPMENT OF MATHEMATICAL
MODEL(S) FOR MICROBIAL BURDEN PREDICTION

JPL Contract 952532

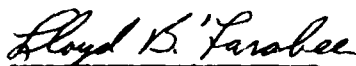
Volume VIII

Revisions to Volume VI

User's Manual

(Task 3 of Phase VIII)

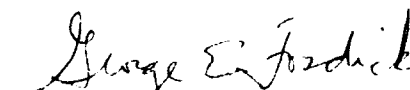
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FOREWORD

This document describes the work performed as Task 3 of Phase VIII of JPL Contract 952532. (This is a follow-on the JPL Contract 952028.) Phase VIII accomplished improvements in the preparation of input data for the computer programs generated in Phase III.

This document contains all the corrections to the Revised User's Manual for the Microbial Burden Prediction Model (Volume VI) and is to be considered an addendum to that Manual, and, by extension, to the original User's Manual for the Microbial Burden Prediction Model (Volume II).

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I. INTRODUCTION

During Phases I, II, and III of JPL Contract 952028 the requirements for the Microbial Burden Prediction Model (MBPM) were established, and the model was developed and programmed for computer utilization. During Phases IV, V, and VI, the model was used to estimate the burden on the Mariner V Spacecraft.

As a result of the above work, a number of changes were identified that would improve the effectiveness of the existing computer programs. These changes were effected during Phase VII of the carry-on contract (JPL Contract 952532). As a result of the experience gained during the preparation of the input data, the desirability of a more manageable method of preparing this data for input to the program was recognized.

The Input Translator Program (ITP) has been developed during Phase VIII of JPL Contract 952532 to meet this latter need. The ITP performs much of the repetitious and time-consuming work involved in preparing input data. In addition, it also performs bookkeeping chores such as maintaining the current status of all parts. The ITP has been programmed so that only minor revisions have been made to the previously developed portions of the program. In most cases, an error of input data to the ITP is printed as an error, but does not stop the production of an input tape for the Tape Alteration Subroutine (TAS). The manual preparation of input data is therefore reduced to coding the JPL Quality Assurance Daily Activity Report information for key punching, key punching this information, and making corrections to the errors which are flagged by the ITP. (Ref. 8)

Volume VII of this series of reports is a User's Manual which describes the various subroutines comprising the Input Translator Program, the method of data input, and the process of transferring the output data to the MBPM.

The principal factor in the development of the ITP that contributed to changes in existing programs was the change from making parts inputs at the Task level to making these inputs at the Subtask level.

Although the changes are minor in nature and small in number, the effect is felt on a number of pages of the User's Manual. All references to page number in this document are to Volume VI, the Revised User's Manual for the Microbial Burden Prediction Model. Revisions are listed sequentially, whether by reference to a revised item or by the issue of a revised page.

The ITP has been used to prepare input data based on the Mariner Mars 69-3 spacecraft for use of the MBPM. Using this input data, the MBPM has been run on the CDC 6400 at Martin Marietta's Denver facility and on the Univac 1108 at JPL in Pasadena.

Volume IX of this series of reports describes the preparation of the input data, the results of the burden prediction of the MM 69-3, and a comparison with swab sample data taken during the spacecraft preparation.

II. REVISIONS TO VOLUME VI

Page

- 4 Option #2 can no longer be used as before. If this option is used, the dumps will all be on Tape 3 in succession. Restart capabilities are built into the ITP.
- 6 Under item "---- START OF NEW SUBTASK ----", change "PREREQUISITE SUBTASKS - -0, -0" to read "PREREQUISITE TIME DISTRIBUTIONS- -0, -0".
- 9 Replace with new page 9, dated April 1970.
- 12 Change line starting "K = 2" from "Add M cards" to read "Add M records"
- 18 To the list of tapes add "Tape 3: Binary restart dumps (write)"; to the description of Tape 12 add "Tape 12 is written by the ITP for input to TAS".
- 22 Delete block labelled "Determine Task Start Time". This function has been transferred to the MBS.
- 23 Replace with new page 23, dated April 1970.
- 27 Replace with new page 27, dated April 1970.
- 28 Delete lines starting "IK = 3" and "IL = 4"; change "IK = 5" to read "IK = 3"; with reference to I2 = 2 it should be noted that the restart tape is no longer rewound at each task because of the new ITP, TAS, and BPS restart capability; therefore, restart dumps at the end of each task are now of no value.
- 29 Under discussion of KK = 6, change "Tape 2" to read "Tape 3".
- 30 Replace with new page 30, dated April 1970.
- 31 Replace with new page 31, dated April 1970.
- 32 Replace with new page 32, dated April 1970.
- 35 Delete description of SUBTASK DESCRIPTION CARD.

Appendix - Replace entirely with new program source deck listing.

Table 3 Tape 9 Record Formats

PARAMETERS													
Card Type	INTEGER						FLOATING OR ALPHAMERIC						
	1	2	2	4	5	6	7	8	9	10	11	12	13
CC	KK	IK	IL	I2	I5	I6	I3	I4					
RD	KR						←	←	←	←	←	←	←
SD	KS						←	←	←	←	←	←	←
TD	KT	L4	K3				←	←	←	←	←	←	←
EM							AES(1)	AES(2)	AES(3)	AES(4)			
ED	N						←	←	←	←	←	←	←
EQ	IEC	IET					AEC	AET	AED	AEF(1)	AEF(2)	AEF(3)	AEF(4)
OD	N						←	←	←	←	←	←	←
OQ	IOT	IOQ	IOC										
KD	N	L1	L2	L3			←	←	←	←	←	←	←
PD	N						←	←	←	←	←	←	←
PQ	LAB(1)	IAB(2)	LAB(3)	LAB(4)	LAB(5)	IAB(6)	AAG	AAS					
DD	N	M	L				←	←	←	←	←	←	←
KC	K	IR(1)	IR(2)	IR(3)	IR(4)		AR(1)	AR(2)	AR(3)				
KO	IO	IKE					AKT	AKQ					
PE	IP	LS					APD	APC	APS	APA(1)	APA(2)		
PE	IP	LK					AR(1)	AR(2)	AR(3)	AR(4)			
ZD	IZ						←	←	←	←	←	←	←
ZC	IP						FP(1)	FP(2)	FP(3)	FP(4)			
DQ	Different Format						22 Parameters: DR(N,1), DR(N,2),...,DR(N,11), XR(N,11) Numbered 1 thru 22.						

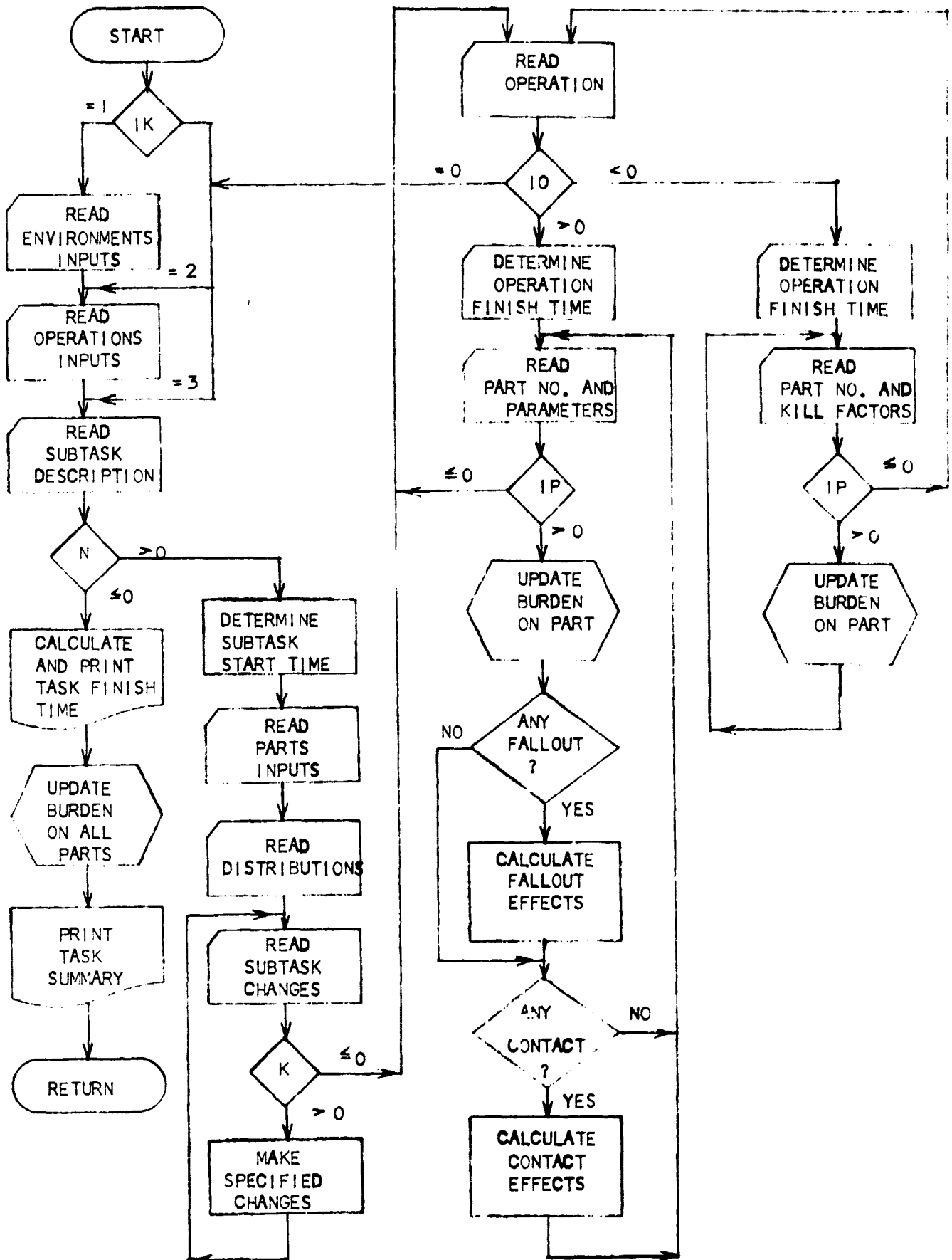
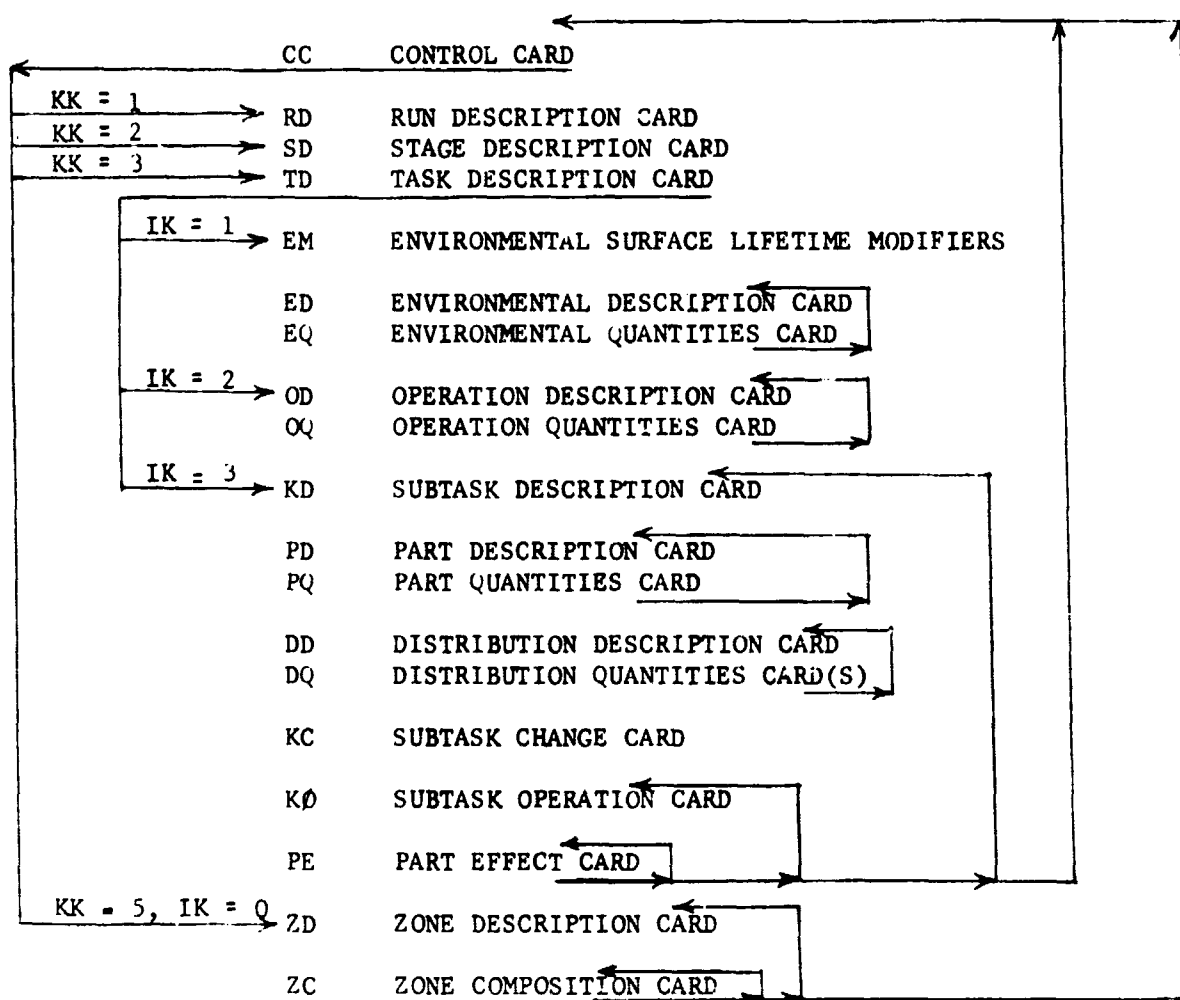


Figure 3. Subroutine MBS Macrologic

TABLE 8

Input Data Deck



RD RUN DESCRIPTION CARD

KR, RUN

FORMAT (I5, 1X, 7A6)

A RUN DESCRIPTION CARD is the first card to follow the CONTROL CARD initiating a run. KR is the run number and RUN is a 42 alphameric character description of the run.

SD STAGE DESCRIPTION CARD

KS, STG

FORMAT (I5, 1X, 7A6)

A STAGE DESCRIPTION CARD follows a RUN DESCRIPTION CARD or a CONTROL CARD initiating a stage. KS, which must be in the range 1 to 20, is the stage number and STG is a 42 alphameric character description of the stage.

TD TASK DESCRIPTION CARD

KT, TSK, L4, K3

FORMAT (I5, 1X, 7A6, 2X, 2I5)

A TASK DESCRIPTION CARD follows a STAGE DESCRIPTION CARD or a CONTROL CARD initiating a task. KT, which must be in the range 1 to 100, is the task number and TSK a 42 alphameric character description of the task. L4, if specified, causes the total microbial burden at the end of the task to be stored in special storage distribution L4 and to be available for later computation of a burden difference. 1K on the preceding CONTROL CARD indicates the card type to follow. L4 is in the range 1 to 20. K3 is a print flag which when non-zero causes burden distributions by zone and surface to be printed at the end of the task. This flag does not operate like I1 or I2 on CC. K3 must be non-zero for each print desired.

EM ENVIRONMENTAL AVERAGE LIFETIME MODIFIERS CARD

AES(1), AES(2), AES(3), AES(4)

FORMAT (4E10.3)

The ENVIRONMENTAL AVERAGE LIFETIME MODIFIERS appear on the first card of the environments inputs. AES(J) is the factor which modifies the quantity AET(N) on card EQ.

ED ENVIRONMENTAL DESCRIPTION CARD

N, DSC

FORMAT (I5, 1X, 4A6)

Each of the (up to 10) environments requires two input cards. The first of these is the ENVIRONMENT DESCRIPTION CARD which gives the index N and the 24 alphameric character description DSC. The last such description card is to be blank to indicate that all environment inputs have been read. All but the last (blank) ENVIRONMENT DESCRIPTION CARD are to be followed by an ENVIRONMENT QUANTITIES CARD.

EQ ENVIRONMENT QUANTITIES CARD

IEC(N), IET(N), AEC(N), AET(N), AED(N), AEF(N,1), AEF(N,2), AEF(N,3),
AEF(N,4)

FORMAT (2I5, 7E10.3)

IEC(N), AEC(N) describe the background number of organisms/cu ft (C) in environment N. IEC is a "shape" distribution index and AEC is the mean of the distribution for this application.

IET(N), AET(N) are the average lifetime distribution shape and mean (V).

AED(N) is the mean number of organisms per cubic foot of air per man in this environment (d).

AEF(N) is the fallout velocity mean value (f).

OD OPERATION DESCRIPTION CARD

N, DSC

FORMAT (I5, 1X, 4A6)

Each of the (up to 35) cataloged operations requires two input cards. The first of these is the OPERATION DESCRIPTION CARD which gives the index N and the 24 alphameric character description DSC. The last of these cards is to be blank to indicate that all operations input have been read. All but the last (blank) card are to be followed by an OPERATION QUANTITIES CARD.

OQ OPERATION QUANTITIES CARD

IOT(N), IOQ(N), IOC(N)

FORMAT (3I5)

IOT(N) is the distribution shape for the time required to perform operation N.

IOQ(N) is the distribution shape for the number of organisms per cubic foot per man.

IOC(N) is the distribution shape for the number of organisms on hand or tool (contact contamination).

KD SUBTASK DESCRIPTION CARD

N, DSC, L1, L2, L3

FORMAT (I5, 1X, 4A6, 3I5)

The input data for each of the subtasks per task is headed with a SUBTASK DESCRIPTION CARD that gives the subtask number N and the 24 alphameric character description DSC. L1 and L2 indicate the finish time special storage distributions of prerequisite tasks which are to determine the start time of this task. If only one prerequisite (L1) is specified, the new start time is set equal to the time stored in L1. If no prerequisite is specified, the start time is set equal to zero. L3 is the index of the finish time special storage distribution if this subtask is to be prerequisite for any later subtask. L1, L2, and L3 are in the range 1 to 20.

APPENDIX
PROGRAM SOURCE DECK
LISTINGS

```

SUBROUTINE TAS
C TAPE ALTERATION SUBROUTINE
C THIS SUBROUTINE READS FROM TAPE12 AND WRITES ON TAPE9
COMMON LN, LF, IX(6), XX(22), M, N1, N2, I(6,120), X(22,20),
      K(22,20), KIL, NE, KE(11), IAB(120,6), DR(500), XR(500),
      IO, AR(4), NP, LH(20), KXT, DUM(14423)
600 FORMAT(/13H ----- CHANGE,I10,2I5,F15.6/)
REWIND 9
REWIND 12
KXT=D
DO 1000 L=1,11
1000 KE(L)=0
N1=0
N2=0
KIL=1
ND=0
NE=0
LN=1
CALL PTS
DO 1 J=1,22
DO 1 L=1,20
1 K(J,L)=0
READ(5,500) NN, KK, MM, F, KLL
IF((NN, NE, 0), OR, (KK, NE, 2)) GO TO 9
NP=NP+3
IF(NP, GE, 55) CALL PTS
WRITE(6,600) NN, KK, MM, F
GO TO 21
2 READ(5,500) NN, KK, MM, F, KLL
500 FORMAT(I10,2I5,F10.0,15)
9 IF(KLL, GT, 0) KIL=KLL
3 CALL TRS
4 IF(NN-N1) 6666,7,5
5 CALL RAS
CALL RCWS
IF(LN, EQ, 0) RETURN
GO TO 3
6666 NP=NP+5
IF(NP, GE, 55) CALL PTS
WRITE(6,601)
601 FORMAT(/34H ***** INSTRUCTION OUT OF SEQUENCE)
WRITE(6,600) NN, KK, MM, F
6 READ(5,500) NN, KK, MM, F, KLL
IF(KLL, GT, 0) KIL=KLL
GO TO 4
7 NP=NP+3
IF(NP, GE, 55) CALL PTS
WRITE(6,600) NN, KK, MM, F
IF(KK, GT, 0) GO TO 8
CALL RAS
CALL RCWS
CALL EPS(0)
RETURN
8 GO TO(101,102,103,104,105,106,107,108),KK
C REPLACE RECORD NN WITH A NEW CARD
101 CALL CRS
CALL RCWS
IF(LN, EQ, 0) RETURN
GO TO 2
C ADD MM CARDS AFTER RECORD NN
102 CALL PAS
CALL RCWS

```

A2

6
6

```
      IF(LN.EQ.0) RETURN
21  IF(KLL.GT.0) KIL=KLL
      DO 20 L=1,MM
      CALL CRS
      CALL RCWS
      IF(LN.EQ.0) RETURN
20  CONTINUE
      GO TO 2
C    DELETE MM RECORDS STARTING WITH RECORD NN
103 DO 30 L=1,MM
      CALL TRS
30  CONTINUE
      GO TO 6
C    REPLACE PARAMETER MM ON RECORD NN BY F
104 IF(LP.EQ.17) GO TO 40
      IF(MM.LE.6) GO TO 41
      XX(MM-6)=F
      GO TO 6
41  IX(MM)=F
      GO TO 6
40  XX(MM)=F
      GO TO 6
C    MULTIPLY PARAMETER MM ON RECORD NN BY F
105 IF(LP.EQ.17) GO TO 50
      IF(MM.LE.6) GO TO 6
      XX(MM-6)=XX(MM-6)*F
      GO TO 6
50  XX(MM)=XX(MM)*F
      GO TO 6
C    REPLACE PARAMETER MM BY F ON NN AND SUBSEQUENT RECORDS
106 K(MM,LR)=1
60  IF(LR.EQ.17) GO TO 66
      IF(MM.LE.6) GO TO 64
      X(MM-5,LR)=F
      GO TO 6
64  I(MM,LR)=F
      GO TO 6
66  X(MM,LR)=F
      GO TO 6
C    MULTIPLY PARAMETER MM BY F ON NN AND SUBSEQUENT RECORDS
107 K(MM,LR)=2
      GO TO 60
C    STOP ALTERING PARAMETER MM. (RECORD NN IS NOT ALTERED.)
108 K(MM,LR)=0
      GO TO 6
      END
```

A3

```

SUBROUTINE TRS
C  TAPE READING SUBROUTINE (READS BINARY RECORDS FROM TAPE12)
COMMON  LN, LR, IX(6), XX(22), M, N1, N2, I(6,120), X(22,20),
      .  K(22,20), KIL, NC, KE(11), IAB(120,6), DR(500), XR(500),
      .  IO, AR(4), NP, LH(20), KYT, DUM(14423)
      N1=N1+1
      IF(LN.EQ.17) GO TO 5
      READ(12)LR,IV,(XX(J),J=1,7)
      RETURN
5  READ(12)LR,XX
      RETURN
      END

```

```

C      SUBROUTINE CRS
      CARD-READING SUBROUTINE
      COMMON  LN, LR, IX(6), XX(22), M, N1, N2, I(6,120), X(22,20),
      .       K(22,20), KIL, NE, KE(11), IAB(120,6), DR(500), XR(500),
      .       IO, AR(4), NP, LH(20), KXT, DUM(14423)
      LR=LN
      GO TO(1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,5),LN
1      READ(5,501) IX
501    FORMAT(4I5,10X,2I5)
      RETURN
2      READ(5,502) IX(1),(XX(J),J=1,4),(IX(J),J=2,4)
502    FORMAT(I5,1X,4A6,4I5)
      RETURN
3      READ(5,503) IX,(XX(J),J=1,3)
503    FORMAT(6I5,3E10,3)
      RETURN
4      READ(5,505) IX(1),IX(2),XX(1),XX(2)
      RETURN
5      READ(5,505) IX(1),IX(2),(XX(J),J=1,5)
505    FORMAT(2I5,7E10,3)
      RETURN
6      READ(5,508) IX(1),(XX(J),J=1,7)
      RETURN
7      READ(5,508) IX(1),(XX(J),J=1,7)
      RETURN
8      READ(5,508) IX(1),(XX(J),J=1,7),(IX(J),J=2,3)
508    FORMAT(I5,1X,7A6,2X,4I5)
      RETURN
9      READ(5,509) (XX(J),J=1,4)
509    FORMAT(8E10,3)
      RETURN
10     READ(5,502) IX(1),(XX(J),J=1,4)
      RETURN
11     READ(5,505) IX(1),IX(2),(XX(J),J=1,7)
      RETURN
12     READ(5,502) IX(1),(XX(J),J=1,4)
      RETURN
13     READ(5,501) (IX(J),J=1,3)
      RETURN
14     READ(5,508) IX(1),(XX(J),J=1,6)
      RETURN
15     READ(5,503) IX,XX(1),XX(2)
      RETURN
16     READ(5,502) IX(1),(XX(J),J=1,4),IX(3),IX(2)
      RETURN
17     READ(5,509) (XX(J),J=1,M)
      MP=M+11
      READ(5,509) (XX(J),J=12,MP)
      RETURN
18     READ(5,502) IX(1),(XX(J),J=1,4)
      RETURN
19     READ(5,519) IX(1),(XX(J),J=1,4)
519    FORMAT(I5,5X,4E10,7)
      RETURN
      END

```

6
6

6

C SUBROUTINE RAS
RECORD ALTERATION SUBROUTINE
COMMON LN, LR, IX(6), XX(22), M, N1, N2, I(6,120), X(22,20),
 Y(22,20), KIL, KE, KE(11), IAB(120,6), DR(500), XR(500),
 IO, AP(4), NP, LH(20), KXT, DUM(14423)
IF(LP.EQ.17) GO TO 29
DO 10 L=1,6
IF(K(L,LP).EQ.1) IX(L)=I(L,LR)
10 CONTINUE
DO 20 L=7,13
IF(K(L,LR)-1) 20,21,22
21 XX(L-6)=X(L-6,LR)
GO TO 20
22 XX(L-6)=XX(L-6)+X(L-6,LR)
20 CONTINUE
RETURN
29 DO 30 L=1,22
IF(K(L,LR)-1) 30,31,32
31 XX(L)=X(L,LR)
GO TO 30
32 XX(L)=XX(L)+X(L,LR)
30 CONTINUE
RETURN
END

```

SUBROUTINE RCWS
C RECORD CHECKING AND WRITING SUBROUTINE (WRITES BINARY ON TAPE9)
C LR IS CURRENT RECORD TYPE, LN IS NEXT RECORD TYPE.
COMMON LN, LR, IX(6), XX(22), M, N1, N2, I(6,120), X(22,20),
. K(22,20), KIL, KE, KE(11), IAB(120,6), DR(500), XR(500),
. IO, AR(4), NP, LH(20), KXT, DUM(14423)
DIMENSION CT(20)
DATA(CT(I),I=1,20)/2HCC,2HKD,2HXC,2HKO,2HPE,2HRD,2HSD,2HTD,2HEM,
.2HED,2HEO,2HOD,2HCO,2HPD,2HPO,2HDD,2HDO,2HZD,2HXC,2HPE/
DATA NAME / 6HTAS /
600 FORMAT(I7,3X,A2,I4,1H/,I3,1H/,I2)
N2=N2+1
LX=LN
NP=NP+1
IF(LR.EQ.17) NP=NP+2
IF(NP.GE.55) CALL PTS
GO TO(10,20,30,40,50,60,70,80,90,100,110,120,130,140,150,160,170,
.180,190,200),LR

C CC CARD
10 WRITE(6,600) N2,CT(LR)
WRITE(6,601) IX
501 FORMAT(1H+,23X,6I4)
KK=IX(1)
IF(KK.GT.0) GO TO 11
WRITE( 9) LR,IX,(XX(J),J=1,7)
WRITE(13) NAME, (( IAB(J,L), J=1,120 ), L=1,6 ), ( DR(J), J=1, 6
. 500 ), ( XR(J), J = 1, 500 ), ( LH(J), J = 1, 20 ), KS 6
CALL EPS(0)
LN=0
RETURN
11 IF(KK.LE.5) GO TO 12
KJI = 0
111 KJI = KJI + 1
READ (2) INAME, (( IAB(J,L), J=1,120 ), L=1,6 ), ( DR(J), J=1, 6
. 500 ), ( XR(J), J = 1, 500 ), ( LH(J), J = 1, 20 ), KS 6
IF ( INAME .EQ. NAME ) GO TO 113
IF ( KJI .LT. 2 ) GO TO 111
WRITE (6,112)
112 FORMAT ( 42H1*****ERROR***** NO TAS RESTART DUMP FOUND )
STOP
113 LN=1
IF(KK.EQ.6) GO TO 1000
KXT=0
CALL EPS(1)
LN=8
GO TO 1000
12 IF(KK-4) 13,14,15
13 IK=IX(2)
LN=KK+5
IF((IK.GT.0).AND.(IK.LE.3)) GO TO 1000
CALL EPS(1)
IK=3
GO TO 1000
14 IF((IX(3).LE.0).OR.(IX(3).GT.20)) CALL EPS(1)
IF((IX(4).LE.0).OR.(IX(4).GT.20)) CALL EPS(1)
LN=1
GO TO 1000
15 LN=18
IF(IX(2).EQ.1) LN=1
GO TO 1000

C KD CARD
20 IF ( IX(1) .NE. 0 ) N = IX(1) 6

```

	WRITE(6,600) N2,CT(LR),KS,KT,N	A7
	WRITE(6,602) (IX(J),J=1,4),(XX(J),J=1,4)	G
602	FORMAT (1H+,23X,4I4,13X,4A6)	G
	IF (IX(1) .GT. 0) GO TO 21	
	LN=1	
	GO TO 1000	
21	LN=14	G
22	L1=IX(2)	G
	IF(L1.LE.0) GO TO 24	G
	IF(L1.GT.20) GO TO 23	G
	IF(LH(L1).LE.0) CALL EPS(2)	G
	L2=IX(3)	G
	IF(L2.LE.0) GO TO 24	G
	IF(L2.GT.20) GO TO 23	G
	IF(LH(L2).LE.0) CALL EPS(2)	G
	GO TO 24	G
23	CALL EPS(1)	G
24	L3=IX(4)	G
	IF(L3.LE.0) GO TO 26	G
	IF(L3.GT.20) GO TO 25	G
	LH(L3)=1	G
	GO TO 26	G
25	CALL EPS(1)	G
26	IF(IX(5).GT.20) CALL EPS(1)	G
	DO 27 J = 101, 120	G
	DO 27 L = 1, 6	G
27	IAB(J,L) = 0	G
	GO TO 1000	G
C		
	KC CARD	
30	WRITE(6,600) N2,CT(LR),KS,KT,N	
	WRITE(6,603) IX,(XX(J),J=1,3)	
603	FORMAT(1H+,23X,6I4,3F10.3)	
	IF(IX(1).GT.0) GO TO 32	
	LN=4	
	GO TO 1000	
32	IF(XX(1).GT.0) GO TO 33	
	IF(IX(2)) 38,38,39	
33	I1=IX(2)	
	I2=IX(3)	
	IF((I1.LE.0).OR.(I1.GT.120)) GO TO 38	
	IF((I2.LE.0).OR.(I2.GT.4)) GO TO 38	
	IB=IAB(I1,I2)	
	I3=IX(4)	
	I4=IX(5)	
	IF((I3.LE.0).OR.(I3.GT.120)) GO TO 38	
	IF((I4.LE.0).OR.(I4.GT.4)) GO TO 38	
	IA=IAB(I3,I4)	
	IF(IA.GT.0) GO TO 34	
	CALL EPS(3)	
	GO TO 39	
34	IF(IR.GT.0) GO TO 35	
	CALL EPS(3)	G
	GO TO 39	G
35	DR(IA)=DR(IA)-XX(1)	
	DR(IR)=DR(IR)+XX(1)	
	WRITE(6,633) DR(IR),DR(IA)	A
633	FORMAT(1H+,83X,9HNEW AREA=,F8.3,5X,10HAREA LEFT=,F8.3)	
	IF(DR(IA)) 36,37,39	
36	IF ((DR(IA) + 1.E-6) .GT. 0) GO TO 37	G
	CALL EPS(10)	
37	DR(IA) = 0.	G
	GO TO 39	

38 CALL EPS(1)
39 LN=3
GO TO 1000

A8

C KO CARD
40 WRITE(6,600) N2,CT(LR),KS,KT,N
WRITE(6,604) (IX(J),J=1,2),(XX(J),J=1,2)
604 FORMAT(1H+,23X,2I4,16X,2F10.3)
IO=IX(1)
IF(IO) 49,41,42
49 LN=20
GO TO 1000
41 LN=2
GO TO 1000
42 IF(IO.GT.35) CALL EPS(1)
IF((IX(2).LE.-1).OR.(IX(2).GT.10)) CALL EPS(1)
LN=5
GO TO 1000

6

C PE CARD (CONTAMINATION)
50 WRITE(6,600) N2,CT(LR),KS,KT,N
WRITE(6,605) (IX(J),J=1,2),(XX(J),J=1,5)
605 FORMAT(1H+,23X,2I4,16X,5F10.3)
IP=IX(1)
IF(IP.GT.0) GO TO 51
LN=4
GO TO 1000
51 IF(IP.GT.120) GO TO 58
IF(IX(2).GT.500) CALL EPS(1)
AA=0.
DO 54 J=1,4
AR(J)=0.
IB=IAB(IP,J)
IF(IB.LE.0) GO TO 54
AR(J)=DR(IB)
AA=AA+AR(J)
54 CONTINUE
NP=NP+1
WRITE(6,635) IP,AR
635 FORMAT(55X,4HPART,I4,15H SURFACE AREAS=,4F10.3)
IF(AA.LE.0.) CALL EPS(8)
DO 55 J=1,2
IF(XX(J,3).GT.AR(J)) CALL EPS(9)
55 CONTINUE
GO TO 59
58 CALL EPS(1)
59 LN=5
GO TO 1000

C RD CARD
60 WRITE(6,600) N2,CT(LR)
WRITE(6,606) IX(1),(XX(J),J=1,7)
606 FORMAT(1H+,23X,I4,25X,7A6)
DO 61 J=1,100
DO 61 L=1,6
61 IAB(J,L)=0
DO 62 J=1,500
62 DR(J)=0.
DO 63 J=1,20
63 LR(J)=0
LN=7
GO TO 1000

6

6

C SD CARD
70 KS=IX(1)
WRITE(6,600) N2,CT(LR),KS

```

      WRITE(6,607) KS,(XX(J),J=1,7)
607 FORMAT(1H+,23X,14,25X,7A6)
      LN=8
      IF((KS.GT.0).AND.(KS.LE.20)) GO TO 1000
      CALL EPS(1)
      KS=-1
      GO TO 1000

```

C TD CARD

```

      80 KT=IX(1)
      WRITE(6,608) N2,CT(LR),KS,KT
      WRITE(6,608) (IX(J),J=1,3),(XX(J),J=1,7)
608 FORMAT(1H+,23X,3I4,17X,7A6)
      IF((KT.GT.0).AND.(KT.LE.100)) GO TO 82
      CALL EPS(1)
      KT=-1
      82 GO TO(801,802,803),IK
801 LN=9
      GO TO 1000
802 LN=12
      GO TO 1000
803 LN=2
      GO TO 1000

```

G
G

G

G

C EM CARD

```

      90 WRITE(6,609) N2,CT(LR),KS,KT
      WRITE(6,609) (XX(J),J=1,4)
609 FORMAT(1H+,47X,4F10.3)
      LN=10
      GO TO 1000

```

C ED CARD

```

      100 WRITE(6,610) N2,CT(LR),KS,KT
      WRITE(6,610) IX(1),(XX(J),J=1,4)
610 FORMAT(1H+,23X,14,25X,4A6)
      IF(IX(1).GT.0) GO TO 101
      LN=12
      GO TO 1000
      101 IF(IX(1).GT.10) CALL EPS(1)
      LN=11
      GO TO 1000

```

C EQ CARD

```

      110 WRITE(6,611) N2,CT(LR),KS,KT
      WRITE(6,611) (IX(J),J=1,2),(XX(J),J=1,7)
611 FORMAT(1H+,23X,2I4,16X,7F10.3)
      LN=10
      GO TO 1000

```

C OD CARD

```

      120 WRITE(6,612) N2,CT(LR),KS,KT
      WRITE(6,612) IX(1),(XX(J),J=1,4)
612 FORMAT(1H+,23X,14,25X,4A6)
      IF(IX(1).GT.0) GO TO 121
      LN=2
      GO TO 1000
      121 IF(IX(1).GT.35) CALL EPS(1)
      LN=13
      GO TO 1000

```

G

G

C OQ CARD

```

      130 WRITE(6,613) N2,CT(LR),KS,KT
      WRITE(6,613) (IX(J),J=1,3)
613 FORMAT(1H+,23X,3I4)
      LN=12
      GO TO 1000

```

C PD CARD

```

      140 WRITE(6,614) N2,CT(LR),KS,KT,N

```

G

```

        WRITE(6,614) IX(1),(XX(J),J=1,6)
614  FORMAT(1H+,23X,I4,25X,6A6)
        IF(IX(1).GT.0) GO TO 141
        LN=15
        GO TO 1000
141  IF(IX(1).GT.120) CALL EPS(1)
        IP=IX(1)
        LN=15
        GO TO 1000

```

```

C                                PQ CARD
150  WRITE(6,600) N2,CT(LR),KS,KT,N
        WRITE(6,615) IX,(XX(J),J=1,2)
615  FORMAT(1H+,23X,6I4,2F10.3)
        DO 152 J=1,4
        IF(IX(J).GT.500) GO TO 151
        IF((IX(J).GT.0).AND.(IX(J).LE.20)) GO TO 151
        IAB(JP,J)=IX(J)
        GO TO 152
151  CALL EPS(1)
152  CONTINUE
        IF(IX(5).CT.10) CALL EPS(1)
        IF(IX(6).GT.500) CALL EPS(1)
        IF(IX(6).LE.0) CALL EPS(3)
        LN=14
        GO TO 1000

```

```

C                                DD CARD
160  WRITE(6,600) N2,CT(LR),KS,KT,N
        WRITE(6,616) (IX(J),J=1,2),(XX(J),J=1,4)
616  FORMAT(1H+,23X,2I4,2I4,4A6)
        JD=IX(1)
        M=IX(2)
        IF(IX(1).GT.0) GO TO 161
        LN=3
        GO TO 1000
161  IF(IX(1).GT.500) CALL EPS(1)
        IF((M.GT.0).AND.(M.LE.11)) GO TO 162
        CALL EPS(1)
        M=11
162  LN=17
        GO TO 1000

```

```

C                                DD CARD
170  WRITE(6,600) N2,CT(LR),KS,KT,N
        WRITE(6,617) (XX(J),J=1,M)
617  FORMAT(8X,F10.2,10F10.6)
        DR(JD)=XX(1)
        XR(JD)=XX(M+11)
        IF(M.EQ.1) GO TO 172
        SUM=0.
        DO 171 J=2,M
171  SUM=SUM+XX(J)
        IF(ABS(SUM-1.).GT..0000001) CALL EPS(11)
172  MP=M+11
        WRITE(6,637) (XX(J),J=12,MP)
637  FORMAT(8X,11E10.2)
        LN=16
        IF(M.EQ.1) GO TO 1701
        DO 173 J=2,M
        IF(XX(J+10).LE.XX(J+11)) GO TO 173
        CALL EPS(6)
        GO TO 1001
173  CONTINUE
        GO TO 1001

```

C

ZD CARD

```

180 WRITE(6,600) N2,CT(LR),KS,KT
   WRITE(6,618) IX(1),(XX(J),J=1,4)
618 FORMAT(1H+,23X,14,25X,4A6)
   IF(IX(1).GT.0) GO TO 181
   LN=1
   GO TO 1000
181 IF(IX(1).GT.120) CALL EPS(1)
   LN=19
   GO TO 1000

```

C

ZC CARD

```

190 WRITE(6,600) N2,CT(LR),KS,KT
   WRITE(6,619) IX(1),(XX(J),J=1,4)
619 FORMAT(1H+,23X,14,20X,4F10.3)
   IF(IX(1).GT.0) GO TO 191
   LN=18
   GO TO 1000
191 IF(IX(1).GT.120) CALL EPS(1)
   LN=19
   GO TO 1000

```

C

PE CARD (DECONTAMINATION)

```

200 WRITE(6,600) N2,CT(LR),KS,KT,N
   WRITE(6,605) (IX(J),J=1,2),(XX(J),J=1,4)
   IP=IX(1)
   IF(IP.GT.0) GO TO 201
   LN=4
   GO TO 1000
201 IF(IP.GT.120) GO TO 208
   LK=IX(2)
   IF((LK.LE.0).OR.(LK.GT.500)) GO TO 58
   GO 202 J=1,4
   IF(XX(J)*XR(LK).GT.1.) CALL EPS(6)
202 CONTINUE
   GO TO 209
208 CALL EPS(1)
209 LN=20
1000 WRITE(9) LR,IX,(XX(J),J=1,7)
   IF(LR.NE.LX) CALL EPS(7)
   RETURN
1001 WRITE(9) LR,XX
   IF(LR.NE.LX) CALL EPS(7)
   RETURN
END

```

```

SUBROUTINE EPS(LE)
C  ERROR PRINTING SUBROUTINE
COMMON  LN, LP, IX(6), XX(22), M, N1, N2, I(6,120), X(22,20),
      .  K(22,20), KIL, NE, KE(11), IAB(120,6), DR(500), XR(500),
      .  JO, AR(4), NP, LH(20), KXT, DUM(14423)
      IF(LE.EQ.0) GO TO 100
      NE=NE+1
      KE(LF)=KE(LE)+1
      IF((KIL.EQ.1).AND.(LE.GT.7)) RETURN
      NP=NP+3
      IF(NP.GE.55) CALL PTS
      WRITE(6,600) NE
600  FORMAT(/12H *****ERROR,14)
      GO TO(1,2,3,4,5,6,7,8,9,10,11),LE
      1  WRITE(6,601)
601  FORMAT(1H+,17X,30HINDEX OUT OF RANGE      //)
      RETURN
      2  WRITE(6,602)
602  FORMAT(1H+,17X,30HPREREQUISITE MISSING    //)
      RETURN
      3  WRITE(6,603)
603  FORMAT(1H+,17X,30HNECESSARY DATA MISSING //)
      RETURN
      4  WRITE(6,604)
604  FORMAT(1H+,17X,30HTOO MANY CARDS IN SET    //)
      RETURN
      5  WRITE(6,605)
605  FORMAT(1H+,17X,30HINDEX USED PREVIOUSLY    //)
      RETURN
      6  WRITE(6,606)
606  FORMAT(1H+,17X,30HDATA OUT OF RANGE        //)
      RETURN
      7  WRITE(6,607)
607  FORMAT(1H+,17X,30HCARD OUT OF SEQUENCE     //)
      RETURN
      8  WRITE(6,608)
608  FORMAT(1H+,17X,30HAFFECTED PART AREA ZERO  //)
      RETURN
      9  WRITE(6,609)
609  FORMAT(1H+,17X,30HCONTACT AREA GT SURFACE AREA //)
      RETURN
      10  WRITE(6,610)
610  FORMAT(1H+,17X,30HREMAINING AREA NEGATIVE  //)
      RETURN
      11  WRITE(6,611)
611  FORMAT(1H+,17X,30HTOTAL PROB. NOT EQUAL TO 1 //)
      RETURN
100  WRITE(6,620)
620  FORMAT(1H1////////20X,27HMICROBIAL BURDEN DATA CHECK//)
      IF(NE.GT.0) GO TO 150
      WRITE(6,621)
621  FORMAT(24X,18HNO ERRORS THIS RUN)
      RETURN
150  WRITE(6,622)
622  FORMAT(20X,27H***** ERROR SUMMARY *****//)
      IOUT=0
      DO 152 J=1,7
      IF(KE(J)-1) 152,156,155
155  WRITE(6,623) KE(J)
623  FORMAT(16,9H ERRORS -)
      GO TO 159
156  WRITE(6,624) KE(J)

```

```

624 FORMAT(16.9H ERROR -)
159 IOUT=1
    GO TO(101,102,103,104,105,106,107),J
101 WRITE(6,601)
    GO TO 152
102 WRITE(6,602)
    GO TO 152
103 WRITE(6,603)
    GO TO 152
104 WRITE(6,604)
    GO TO 152
105 WRITE(6,605)
    GO TO 152
106 WRITE(6,606)
    GO TO 152
107 WRITE(6,607)
152 CONTINUE
    IF(KIL.NE.1) GO TO 154
    IF(KXT.EQ.1) RETURN
    IF(IOUT.EQ.1) CALL EXIT
    RETURN
154 DO 153 J=8,11
    IF(KE(J)-1) 153,158,157
157 WRITE(6,623) KE(J)
    GO TO 160
158 WRITE(6,624) KE(J)
160 JM=J-7
    GO TO(108,109,110,111),JM
108 WRITE(6,608)
    GO TO 153
109 WRITE(6,609)
    GO TO 153
110 WRITE(6,610)
    GO TO 153
111 WRITE(6,611)
153 CONTINUE
    IF(KXT.EQ.1) RETURN
    IF(IOUT.EQ.1) CALL EXIT
    RETURN
    END

```

A13

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```

SUBROUTINE PTS
PAGE TITLING SUBROUTINE
COMMON LN, LR, IX(6), XX(22), M, N1, N2, I(5,120), X(22,20),
      K(22,20), KIL, NE, KE(11), IAB(120,6), DR(500), XR(500),
      IO, AR(4), NP, LH(20), KXT, DUM(14423)
WRITE(6,600)
600 FORMAT( 115H1RECORD, TYPE, S/TSK/ST      1   2   3   4   5   6
      .7      8      9      10      11      12      13/)
      NP=0
      RETURN
      END

```

```

SUBROUTINE BPS
C BURDEN PREDICTION SUBROUTINE
C THIS PROGRAM READS FROM TAPE 9
COMMON KK, IK, KR, RUN(7), KS, STG(7), KT, TSK(7), DSC(6), ID,
. NE, AES(4), IEC(10), IET(10), AEC(10), AET(10), AED(10),
. AEF(10,4), NO, IOT(35), IOQ(35), IOC(35), NP, DAC(120,2),
. IU(120), IAB(120,6), AAG(120), AAS(120), AAT(120),
. NX(572), DR(572,11), XR(572,11), KO, NS, IR(5), AR(4),
. APA(2), NT, JT(100), XMT(100), XVT(100), L1, L2, L3, L4,
. KTS, ITE, K3, DUM(2664)
DIMENSION XX(7), IY(6)
3 FORMAT(34H1MICROBIAL BURDEN PREDICTION MODEL/4H RUN,15,2H, 7A6)
REWIND 9
REWIND 11
NT=0
100 READ (9) L, KK, IK, I1, I2, I5, I6, XX
C KK=1 INDICATES A NEW RUN, STAGE, AND TASK
C KK=2 INDICATES A NEW STAGE AND TASK
C KK=3 INDICATES A NEW TASK
C KK=4 CALLS FOR A BURDEN DIFFERENCE DETERMINATION
C KK=5 CALLS FOR ZONE BURDEN WRITEOUT
C IK=0 CALLS FOR ZONE DEFINITION DATA INPUTS
C IK=1 INDICATES ZONES CORRESPOND TO PARTS
C KK=6 CALLS FOR A RESTART AND REQUIRES A BINARY DECK INPUT
IF(KK,NE,6)GO TO 102
READ(2) KR, (RUN(J),J=1,7),KS, (STG(J),J=1,7),NE, (AES(J),J=1,4),
. (IEC(J),IET(J),AEC(J),AET(J),AED(J), (AEF(J,K),K=1,4),J=1,10),
. NO, (IOT(J),IOQ(J),IOC(J),J=1,35),NP, ((DAC(J,K),K=1,2),IU(J),
. (IAB(J,K),K=1,6),AAG(J),AAS(J),AAT(J),J=1,100),KO,NT,
. (JT(J),XMT(J),XVT(J),J=1,100),KTS, ID, ITE, K1, K2,
. (NX(I), (DR(I,J),XR(I,J),J=1,11),I=1,572)
GO TO 100
102 IF(KK-3) 103,130,109
103 IF(NT.EQ.0)GO TO 106
C
C WRITE STAGE SUMMARY FOR PRECEEDING STAGE
WRITE(6,3)KR, (RUN(J),J=1,7)
WRITE(6,4)KS, (STG(J),J=1,7)
4 FORMAT(6H STAGE,13,2H, 7A6/15H STAGE SUMMARY-//
. 3X,4H TASK,7X,4H MEAN,5X,6H FINISH/13X,6H BURDEN,5X,4H TIME/)
DO 104 I=1,NT
104 WRITE(6,5)JT(I),XMT(I),XVT(I)
5 FORMAT(17,E13.3,F10.3)
106 IF(KK.GT.0) GO TO 109
IF(K2.EQ.3) GO TO 108
C
WRITE(3) KR, (RUN(J),J=1,7),KS, (STG(J),J=1,7),NE, (AES(J),J=1,4),
. (IEC(J),IET(J),AEC(J),AET(J),AED(J), (AEF(J,K),K=1,4),J=1,10),
. NO, (IOT(J),IOQ(J),IOC(J),J=1,35),NP, ((DAC(J,K),K=1,2),IU(J),
. (IAB(J,K),K=1,6),AAG(J),AAS(J),AAT(J),J=1,100),KO,NT,
. (JT(J),XMT(J),XVT(J),J=1,100),KTS, ID, ITE, K1, K2,
. (NX(I), (DR(I,J),XR(I,J),J=1,11),I=1,572)
108 M=0
C
WRITE(11) M,KR,KS,M,M, (DSC(J),J=1,4),M,M, (RUN(J),J=1,7), (STG(J),
. J=1,7), (JT(J),J=1,18)
RETURN
109 GO TO (110,120,130,140,150),KK
C
C READ RUN NUMBER AND DESCRIPTION
110 READ (9) L,KR, (IX(J),J=1,5),RUN
WRITE(6,600) KR, (RUN(J),J=1,7)

```

```

600 FORMAT(34H1MICROBIAL BURDEN PREDICTION MODEL//4H RUN,I2,2X,7A6//)
      ID=0
      MD=0
      K1=0
      K2=1
      NE=0
      NO=0
      NP=0
      NT=0
      DO 111 I=1,120
      IU(I)=0
      AAG(I)=0.
      AAS(I)=0.
      AAT(I)=0.
      DO 111 J=1,6
111  IAB(I,J)=0
      DO 112 N=1,572
112  NX(N)=-1
      KO=508
      NX(KO)=1
      DR(KO,1)=0.
      XR(KO,1)=0.
C
C   READ STAGE NUMBER AND DESCRIPTION
120 READ (9) L,KS,(IX(J),J=1,5),STG
      NT=0
      M=1
C
      WRITE(11) M,KR,KS,M,M,(DSC(J),J=1,4),M,M,(RUN(J),J=1,7),(STG(J),
      J=1,7),(JT(J),J=1,18)
C
C   READ TASK NUMBER AND DESCRIPTION
C   L4 IS THE INDEX FOR SAVING THE TOTAL MICROBIAL BURDEN
C   IF NEEDED FOR USE IN DETERMINING A BURDEN DIFFERENCE
C   K3 IS BURDEN PRINT FLAG
130 READ(9) L,KT,L4,K3,(IX(J),J=1,3),TSK
      WRITE(6,612) KS,STG,KT,TSK
612 FORMAT(6H1STAGE,I3,2X,7A6/5H TASK,I4,2X,7A6/)
      IF(I1.GT.0)K1=I1
      IF(I2.GT.0)K2=I2
      IF(I5.LE.0) GO TO 138
      IF(ID.GT.0) MD=NX(ID)
      ID=I5
C   RESTORE THE FIRST 20 DISTRIBUTIONS
      DO 137 K=1,20
      J=K+552
      CALL MES(K,J)
137 CONTINUE
138 IF(I6.GT.0)ITE=I6
      NT=NT+1
      CALL MBS(MD,K1,K2)
      IF(K2.NE.2) GO TO 100
C
      WRITE(3) KR,(RUN(J),J=1,7),KS,(STG(J),J=1,7),NE,(AES(J),J=1,4),
      (IEC(J),IET(J),AEC(J),AET(J),AED(J),(AEF(J,K),K=1,4),J=1,10),
      NO,(ICT(J),ICG(J),ICC(J),J=1,35),NP,((DAC(J,K),K=1,2),IU(J),
      (IAB(J,K),K=1,6),AAG(J),AAS(J),AAT(J),J=1,100),KO,NT,
      (JT(J),XMT(J),XVT(J),J=1,100),KTS,ID,ITE,K1,K2,
      (NX(I),(DR(I,J),XR(I,J),J=1,11),I=1,572)
C
C   DETERMINE AND WRITE BURDEN DIFFERENCE
140 WRITE(6,3)KR,(RUN(J),J=1,7)

```

```

        WRITE(6,601)
601  FORMAT(/ /13H BURDEN DIFFERENCE/)
        L1=I1+530
        L2=I2+530
        WRITE(6,602) I1,DR(L1,1)
602  FORMAT(/17H BURDEN STORED IN,I3,7H: AREA=,F9.2,4X,6HBURDEN)
        CALL HWS(L1)
        WRITE(6,602) I2,DR(L2,1)
        CALL HWS(L2)
        A1=DR(L1,1)
        A2=DR(L2,1)
        DR(L1,1)=AVF(L1)
        DR(L2,1)=AVF(L2)
        CALL MCS(L2,L1,551,2)
        CALL HAS(551)
        WRITE(6,601)
        CALL HWS(551)
        DR(L1,1)=A1
        DR(L2,1)=A2
        GO TO 100

C
C   DETERMINE AND WRITE ZONE BURDEN DISTRIBUTIONS
150  WRITE(6,3)KR,(RUN(J),J=1,7)
        WRITE(6,7)KS,KT
        7  FORMAT(43H MICROBIAL BURDEN BY ZONES (FOLLOWING STAGE,I3,6H: TASK,
        .I3,2H)-/)
        IF(IK.EQ.1)GO TO 180

C
C   USE ZONE DEFINITION INPUTS
155  READ (9) L,IZ,(IX(J),J=1,5),DSC,XX(1)
        IF(IZ.LE.0)GO TO 100
        A=D.
        CALL HES(510,K0)
160  READ (9) L,IP,(IX(J),J=1,5),AR,(XX(J),J=1,3)
C   IP IS THE PART
C   AR(J) THE FRACTION OF SURFACE J OF PART IP BELONGING TO ZONE IZ
        IF(IP.LE.0)GO TO 170
        DO 165 J=1,4
        IF(AR(J).EQ.0.)GO TO 165
        IF(IA3(IP,J).EQ.0)GO TO 165
        F=AR(J)
        IB=IAB(IP,J)
        CALL HMS(IB,F,509)
        A=A+DR(509,1)
        DR(509,1)=AVF(509)
        CALL MCS(510,509,510,1)
165  CONTINUE
        GO TO 160
170  WRITE(6,9)IZ,(DSC(J),J=1,4),A
        9  FORMAT(5H ZONE,I4,2X,4A5,7H: AREA=,F8.3/33X,11HZONE BURDEN)
        CALL HWS(510)
        GO TO 155

C
C   USE PARTS AS ZONES
180  DO 180 I=1,100
        IF(IU(I).EQ.0)GO TO 190
        A=D.
        CALL HES(510,K0)
        DO 185 J=1,4
        IB=IAB(I,J)
        IF(IB.LE.0) GO TO 185
        A=A+DR(IB,1)

```

A18

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CALL MES(509,18)
DP(509,1)=AVF(18)
CALL HCS(510,509,510,1)
185 CONTINUE
WRITE(6,10)I,DAC(I,1),DAC(I,2),DR(510,1)
10 FORMAT(5H ZONE,14,2X,2A6,7H, AREA=,F7.2,8H, BURDEN)
CALL HWS(510)
190 CONTINUE
GO TO 100
END
```

A

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SUBROUTINE MBS(MD,K1,K2)
C MICROBIAL BUILDUP SUBROUTINE
COMMON KK, IK, KR, RUN(7), KS, STG(7), KT, TSK(7), DSC(6), ID,
. ME, AES(4), IEC(10), IET(10), AEC(10), AET(10), AED(10),
. AEF(10,4), NO, IOT(35), IOQ(35), IOC(35), NP, DAC(120,2),
. IU(120), IAB(120,6), AAG(120), AAS(120), AAT(120),
. NX(572), OR(572,11), XP(572,11), KO, NS, IR(5), AR(4),
. APA(2), NT, JT(100), XMT(100), XVT(100), L1, L2, L3, L4,
. KTS, ITE, K3, DUM(2664)
DIMENSION IX(6),XX(7),DES(6)
GO TO (100,120,200), IK
C
C ENVIRONMENTS INPUTS-
100 READ (9) L,IX,AES,(XX(J),J=1,3)
WRITE(6,8)(AES(J),J=1,4)
8 FORMAT(/30H ENVIRONMENTS INPUTS - - - - -/5H AES=,4E12.4)
C AES(J) IS THE SURFACE LIFETIME MODIFIER FOR SURFACE J
DO 110 I=1,11
READ (9) L,N,(IX(J),J=1,5),DSC,XX(1)
IF(N.LE.0)GO TO 120
READ (9) L,IEC(N),IET(N),(IX(J),J=1,4),AEC(N),AET(N),AED(N),
. (AEF(N,J),J=1,4)
C IEC,AEC DESCRIBE THE ENVIRONMENTS BIOTA CONCENTRATION
C IET,AET DESCRIBE THE REFERENCE ACCPETION TIME
C AED IS THE AIRBOURNE CONCENTRATION PER MAN
C AEF IS THE RATE AT WHICH, FOR ALL OTHER FACTORS STANDARD,
C BIOTA REACH EACH SURFACE
WRITE(6,20)N,(DSC(J),J=1,4),IEC(N),AEC(N),IET(N),AET(N),AED(N),
. (AEF(N,J),J=1,4)
20 FORMAT(/14,1X,4A6,4X,4HIEC=,13.6H, AEC=,F7.4,6H, IET=,13.6H, AET=,
. F7.2,6H, AED=,F7.4,6H, AEF=,4F6.2)
110 IF(NE.LT.N)NE=N
C
C OPERATIONS INPUTS-
120 DO 130 I=1,36
READ (9) L,N,(IX(J),J=1,5),DSC,XX(1)
IF(N.LE.0)GO TO 200
IF ( I .EQ. 1 ) WRITE (6,9)
9 FORMAT(/30H OPERATIONS INPUTS - - - - -/)
READ (9) L,IOT(N),IOQ(N),IOC(N),(IX(J),J=1,3),XX
WRITE(6,21)N,(DSC(J),J=1,4),IOT(N),IOQ(N),IOC(N)
21 FORMAT(/14,1X,4A6,4X,4HIOT=,13.6H, IOQ=,13.6H, IOC=,13)
C IOT IS THE OPERATION TIME INTERVAL
C IOQ IS THE DIRTINESS FACTOR
C IOC IS THE BIOTA CONCENTRATION FOR CONTACT CONTAMINATION
130 IF(NQ.LT.N)NQ=N
C
C SUBTASK LEVEL MICROBIAL BUILDUP DETERMINATION
200 DO 295 I=1,1001
READ(9) L,NS,L1,L2,L3,IX(1),IX(2),DSC,XX(1)
IF(NS.LE.0)GO TO 300
N1=L1
N2=L2
WRITE(6,12)NS,(DSC(J),J=1,4)
12 FORMAT(/13H *** SUBTASK,13.2H, ,4A6)
C L1 AND L2 ARE PREPEQUISITE TIME DISTRIBUTIONS
C L3 IS THE FINISH TIME DISTRIBUTION IF NEEDED
C AS PREPEQUISITE FOR ANOTHER SUBTASK
C
C DETERMINE SUBTASK START TIME
C IT IS THE SUBTASK START TIME INDEX
IT=0

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A20

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IF (L1.LE.0) GO TO 210
L1=L1+530
IF (L2.GT.0) GO TO 205
IT=L1
GO TO 210
205 L2=L2+530
IT=551
CALL HCS(L1,L2,IT,5)
IF (ID.LE.0) GO TO 210
IF (NX(IT).GT.NX(ID)) CALL HAS(IT)
210 IF ( I .NE. 1 ) GO TO 215
C KTS IS THE TASK START TIME
KTS = 552
IF ( IT .EQ. 0 ) CALL HES(KTS,K0)
IF ( IT .NE. 0 ) CALL HES(KTS,IT)
215 IF ( IT .NE. 0 ) GO TO 218
IT = 551
CALL HES(IT,KTS)
218 LL = IT
TI=DR(IT,1)

C
C PARTS INPUTS-
140 DO 150 K=1,121
READ (9) L,N,(IX(J),J=1,5),DES,XX(1)
IF (N.LE.0) GO TO 160
IF ( K .EQ. 1 .AND. K1 .GE. 1 ) WRITE(6,10)
10 FORMAT(/'30H PARTS INPUTS - - - - -')
DAC(N,1)=DES(5)
DAC(N,2)=DES(6)
IU(N)=0
AAT(N)=0.
IF (IT.GT.0) AAT(N)=DR(IT,1)
READ (9) L,(IAB(N,J),J=1,6),AAG(N),AAS(N),(XX(J),J=1,5)
IF (IAB(N,6).GT.0) GO TO 142
AAG(N)=0.
AAS(N)=0.
142 CONTINUE
C DAC IS THE PERMANENT ALPHAMERIC DESCRIPTION OF PART N
C IAB(J) INDICATES THE DISTRIBUTION FOR AREA/BURDEN FOR
C J=1, TOP SURFACE
C J=2, OTHER EXTERIOR SURFACE
C J=3, MATED SURFACE
C J=4, OCCLUDED SURFACE
C IAB(5) IS THE ENVIRONMENT INDEX (MAY BE LEFT BLANK)
C IAB(6) IS THE RETENTION DISTRIBUTION FOR CONTACT
C AAG IS THE RETENTION DISTRIBUTION MEAN FOR FALLOUT
C AAS IS THE RETENTION DISTRIBUTION MEAN FOR CONTACT
C AAT IS THE LAST TIME OF ACCRETION UPDATE
IF ( K1 .GE. 1 ) WRITE(6,22) N,(DES(J),J=1,6),(IAB(N,J),
J=1,6),AAG(N),AAS(N)
22 FORMAT(/'I4,1X,F4G,4X,4HIAB=,6I4,6H, AAG=,F7.3,6H, AAS=,F7.3)
DO 145 J = 1, 4
IF ( IAB(N,J) .GT. 0 ) CALL HES(IAB(N,J),K0)
145 CONTINUE
150 IF (NP.LT.N) NP=N
C
C DISTRIBUTIONS INPUTS -
160 DO 175 K=1,501
READ (9) L,N,M,(IX(J),J=1,4),DES,XX(1)
C M=1 INDICATES THE DISTRIBUTION IS A CONSTANT
IF (N.LE.0) GO TO 179
IF ( K .EQ. 1 .AND. K1 .GE. 1 ) WRITE(6,11)

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11 FORMAT(/'3CH DISTRIBUTIONS INPUTS - - - -'/)
   READ (9) L,(DR(N,J),J=1,11),(XR(N,J),J=1,11)
   NX(N)=M
   IF(DR(N,1).LE.0.) DR(N,1)=9F(N)
   IF(N.GT.20) GO TO 171
   J=N+552
   CALL MES(J,N)
171 IF(ID.LE.0) GO TO 172
   IF(M.GT.NX(ID)) CALL HAS(N)
172 IF ( K1 .GE. 1 ) WRITE(6,23) N,(DES(J),J=1,4),DR(N,1)
23  FORMAT(I4,1X,4A6/5X,12HCOEFFICIENT=,E11.4,6X,12HDISTRIBUTION)
   IF ( K1 .GE. 1 ) CALL HWS(N)
175 CONTINUE
179 IF(ID.LE.0) GO TO 190
   IF(MD.EQ.NX(ID)) GO TO 190
   DO 180 K=1,20
   IF(NX(K).GT.NX(ID)) CALL HAS(K)
180 CONTINUE
   IF(MD.LE.NX(ID)) GO TO 189
   DO 185 K=21,552
   IF(NX(K).GT.NX(ID)) CALL HAS(K)
185 CONTINUE
189 MD=NX(ID)
C
190 M=2
C
   WRITE(11) M,KR,KS,KT,NS,(DSC(J),J=1,4),IT,NX(IT),(DR(IT,J),J=1,
   .11),(XR(IT,J),J=1,11),(AEC(J),J=1,5),N1,N2,(JT(J),J=1,3)
   NC=0
C  ENVIRONMENT,AREA/PIOTA BURDEN CHANGES-
220 READ (9) L,K,IR,AR,(XX(J),J=1,3)
C  K IS THE CHANGE IDENTIFIER
C  IR(1),IR(2) ARE THE NEW PART AND SURFACE INDICES
C  IR(3),IR(4) ARE THE CONTRIBUTING PART AND SURFACE
C  IR(5) IS THE NEW ENVIRONMENT (IF ANY) FOR PART IR(1)
C  AR(1) IS THE AREA CHANGED TO IR(1),IR(2) FROM IR(3),IR(4)
C  AR(2) IS THE NEW AAG FACTOR
C  AR(3) IS THE NEW AAS FACTOR
C  IF IR(5), AR(1), AR(2), AR(3) ZERO, NO CHANGE IS MADE
   IF(K.LE.0) GO TO 240
   NC=NC+1
   IF ( NC .EQ. 1 .AND. K1 .GE. 2 ) WRITE(6,16)
16  FORMAT(/'6X,42HENVIRONMENT/AREA/RETENTION FACTOR CHANGES-'/)
   I1=IR(1)
   IF(NP.LT.I1) NP=I1
   IF(AR(1).LE.0.) GO TO 232
   CALL HAS(I1,T1)
   IU(I1)=IU(I1)+1
   I2=IR(2)
   I3=IR(3)
   CALL HAS(I3,T1)
   IU(I3)=IU(I3)+1
   I4=IR(4)
   I3=IAB(I1,I2)
   I4=IAB(I3,I4)
   IF(IR(5).GT.0) IAB(I1,5)=IR(5)
   IF(AR(2).GT.0) AAG(I1)=AR(2)
   IF(AR(3).GT.0) AAS(I1)=AR(3)
   IF(DR(IA,1).LE.0.) GO TO 220
   F=AR(1)/DR(IA,1)
   IF(F.LT..995) GO TO 230
   F=1.

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A22

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230 CALL HMS(IA,F,501)
A=DR(IB,1)+DR(501,1)
DR(IB,1)=AVF(IB)
DR(501,1)=AVF(501)
CALL HCS(IB,501,IB,1)
DR(IB,1)=A
F=1.-F
CALL HMS(IA,F,IA)
GO TO 220
232 IF(IR(5).GT.0) IAB(I1,5)=IR(5)
IF(AR(2).GT.C.) AAG(I1)=AR(2)
IF(AR(3).GT.0.) AAS(I1)=AR(3)
GO TO 220

```

C
C

OPERATIONAL LEVEL BUILDUP-

240 IE=ITE

6

C

IT IS THE CURRENT TIME DISTRIBUTION INDEX

6

250 READ (9) L,IO,IKE,(IX(J),J=1,4),AKT,AKG,(XX(J),J=1,5)

C

IO IS THE OPERATION

C

IKE IS THE OPERATION ENVIRONMENT WHEN DIFFERENT FROM

C

THE TASK ENVIRONMENT OR THE PREVIOUS OPERATION ENVIRONMENT

C

AKT IS THE OPERATION TIME MODIFIER

C

AKG IS THE NUMBER OF MEN

C

IO LT 0 INDICATES A DECONTAMINATION OPERATION FOR WHICH

C

AKT IS THE FIXED OPERATION INTERVAL

IF(IO)252,290,258

C

C

DECONTAMINATION

252 IO=-IO

T1=DR(IT,1)

IF(AKT.LE.0.)GO TO 253

NX(507)=1

DR(507,1)=AKT

XR(507,1)=AKT

CALL HCS(IT,507,IT,1)

253 IF(K1.GE.2) WRITE(6,37)IO,T1,DR(IT,1)

37 FORMAT(5X,9HOPERATION,I3,25H, (DECONTAMINATION), FROM,F8.2,3H TO, 6
.F8.2,5H HOURS)

T1=DR(IT,1)

6

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WRITE(11)M,KF,KS,KT,NS,(DSC(L),L=1,4),IB,NX(IB),(DR(IB,L),L=1,11),G
,(XR(IB,L),L=1,11),A,T1,(DAC(IP,L),L=1,2),A,IP,J,IO,IAB(IP,5),IF

```

255 F=(1.-AR(J))/DR(LK,1)

CALL HMS(LK,F,501)

DR(IB,1)=AVF(IB)

DR(501,1)=AVF(501)

CALL HCS(18,501,18,3)

BD=DR(18,1)

DR(18,1)=A

M=9

C

WRITE(11)M,KR,KS,KT,NS,(DSC(L),L=1,4),IB,NX(18),(DR(18,L),L=1,11),6

.(XR(18,L),L=1,11),A,T1,AKT,AR(J),A,IP,J,IO,LK,IP

IF(K1.EQ.3) WRITE(6,39)IP,DAC(IP,1),DAC(IP,2),J,A,AR(J),BD

39 FORMAT(10Y,4HPART,I4,2X,2A6,9H, SURFACE,I2,7H, AREA=,F8.3,

.15H, FFACTION REMOVED=,F5.3,17X,9H, BURDEN=,E10.3)

A

256 CONTINUE

GO TO 254

C

C FALLOUT CONTAMINATION-

258 IF(IKE.GT.0)IE=IKE

IC=IOC(10)

IQ=IOQ(10)

II=IET(IE)

JC=IEC(IE)

ITK=IOT(10)

T1=OP(IT,1)

IF(ITK.EQ.0)GO TO 259

F=AKT/DR(ITK,1)

CALL HMS(ITK,F,507)

DR(507,1)=AVF(507)

CALL HCS(IT,507,IT,1)

G

G

G

G

C

507 INDICATES THE OPERATION TIME DISTRIBUTION

259 IF(K1.GE.2) WRITE(6,29) IO,IE,T1,DR(IT,1),AKQ

29 FORMAT(5X,9HOPERATION,I3,13H, ENVIRONMENT,I3,6H, FROM,F8.2,3H TO, 6

.F8.2,7H HOURS,,F3.0,4H MEN)

G

AQ=AKQ/DR(10,1)

Q = AQ*AED(IE)

CALL HMS(10,Q,505)

DR(505,1)=AVF(505)

G

G

G

C

505 IS THE CURVE Q=D

AC=AEC(IE)/DR(JC,1)

CALL HMS(JC,AC,506)

DR(506,1)=AVF(506)

G

G

G

C

506 IS THE CURVE C

CALL HCS(505,506,506,1)

G

G

C

506 INDICATES THE TOTAL FALLOUT SOURCE CONCENTRATION (C+Q*D)

260 READ (9) L,IP,LS,(IX(J),J=1,4),APD,APC,APS,APA,(XX(J),J=1,2)

C

IP IS THE PART AFFECTED

C

LS IS THE TOOL STICKINESS DISTRIBUTION

C

APD IS NOT USED IN THIS VERSION

C

APC IS THE TOOL BIOTA CONCENTRATION MODIFIER

C

APS IS THE MEAN TOOL STICKINESS

C

APA IS THE CONTACT AREA FOR EACH TOUCHED SURFACE

IF(IP.LE.0)GO TO 250

IU(IP)=IU(IP)+1

DT=T1-AAT(IP)

CALL MAS(IP,T1)

IF(AQ.LE.0.)GO TO 275

IF(IE.LE.0)GO TO 275

IF(ITK.LE.0)GO TO 275

AAT(IP)=DR(IT,1)

DO 270 J=1,4

IB=IAB(IP,J)

F=AEF(IE,J)+AAG(IP)

IF(IB.LE.0)GO TO 270

IF(F.LE.0.)GO TO 270

A=DR(18,1)

IF(A.LE.O.)GO TO 270
 IF(OT.LE.O.) GO TO 263
 M=8

C
 WRITE(11)M,KR,KS,KT,NS,(DSC(L),L=1,4),IB,NX(IB),(DR(IB,L),L=1,11),G
 ,(XR(IB,L),L=1,11),A,T1,(DAC(IP,L),L=1,2),A,IP,J,I0,IAB(IP,5),IT
 263 F=F*A
 CALL HMS(506,F,505) G
 C 505 IS THE CURVE $A \cdot R = A \cdot F \cdot G \cdot (C + O \cdot D)$ G
 EE=AET(IE)*AES(J)/DR(II,1)
 CALL HMS(II,EE,502) G
 DR(502,1)=AVF(502) G
 C 502 IS THE CURVE V G
 CALL HCS(505,502,504,3) G
 C 504 IS THE CURVE $A \cdot V \cdot R$ G
 CALL HCS(507,502,502,4) G
 C 502 IS THE CURVE T/V G
 M=NX(502) G
 NX(503)=M G
 DO 265 JJ=1,M G
 DR(503,JJ)=DR(502,JJ) G
 XR(502,JJ)=EXP(-XR(502,JJ)) G
 265 XR(503,JJ)=1.-XR(502,JJ) G
 DR(502,1)=AVF(502) G
 DR(503,1)=AVF(503) G
 C 502 IS THE CURVE $\exp(-T/V)$ G
 C 503 IS THE CURVE $1-\exp(-T/V)$ G
 CALL HCS(504,503,504,3) G
 DR(18,1)=AVF(18)
 CALL HCS(18,502,502,3) G
 CALL HCS(502,504,18,1) G
 CALL HAS(18)
 BD=DR(18,1)
 DR(18,1)=A
 M=3
 C
 WRITE(11)M,KR,KS,KT,NS,(DSC(L),L=1,4),IB,NX(IB),(DR(18,L),L=1,11),G
 ,(XR(18,L),L=1,11),A,T1,AKT,AKO,A,IP,J,I0,IE,IP
 IF(K1.EQ.3) WRITE(6,30) IP,DAC(IP,1),DAC(IP,2),J,A,APC,APA(J),BD
 30 FORMAT(10X,4HPART,I4,2X,2A6,9H, SURFACE,I2,7H, AREA=,F8.3,
 ,14H, TOOL BURDEN=,F6.0,15H, AREA TOUCHED=,F6.3,9H, BURDEN=,E10.3)
 270 CONTINUE
 C
 C CONTACT CONTAMINATION-
 275 IF(IC.LE.O)GO TO 260
 DR(IC,1)=AVF(IC)
 IG=IAB(IP,6)
 IF(IG.LE.O) GO TO 260 A
 DR(IG,1)=AVF(IG)
 S1=.5*AAS(IP)*APC
 IF(LS.LE.O)GO TO 260
 DR(LS,1)=AVF(LS)
 IF(DR(LS,1).LE.O.)GO TO 260
 S2=.5*APS/DR(LS,1)
 B=S1*S2
 IF(9.5G.O.)GO TO 260
 S1=S1/(DR(IC,1)*DF(IG,1))
 DO 280 J=1,2
 IB=IAB(IP,J)
 IF(18.LE.O)GO TO 280
 A=DR(18,1)
 IF(A.LE.O.)GO TO 280

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IF (APA(J).LE.0.)GO TO 280
DR(IB,1)=AVF(IB)
F=S1*APA(J)
CALL HMS(IC,F,504)
CALL HCS(504,IG,504,3)
F=S2*APA(J)/A
CALL HMS(LS,F,505)
CALL HCS(IB,505,505,3)
CALL HCS(IB,505,IB,2)
CALL HCS(IB,504,IB,1)
CALL HAS(IB)
DR(IB,1)=A
M=4
C
WRITE(11)M,KR,KS,KT,NS,(DSC(L),L=1,4),IB,NX(IB),(DR(IB,L),L=1,11),G
.(XPR(IB,L),L=1,11),A,APA(J),AAS(IP),APS,APC,IP,J,IAB(IP,6),IC,IP
290 CONTINUE
GO TO 260
290 IF (DR(LL,1).LT.DR(IT,1))LL=IT
IF (L3.LE.0)GO TO 295
L3=L3+530
CALL HES(L3,LL)
295 CONTINUE
300 T=DR(LL,1)
WRITE(6,601) KR,KS,KT,(TSK(J),J=1,7)
601 FORMAT(13H1TASK SUMMARY/4H RUN,I2,7H, STAGE,I3,6H, TASK,I4,2X,7A6,
./29Y,15HTASK START TIME)
CALL HWS(KTS)
WRITE(6,604)
604 FORMAT(29X,16HTASK FINISH TIME)
CALL HWS(LL)
IF (K3.NE.0) WRITE(6,605)
605 FORMAT(/36H BURDEN DISTRIBUTIONS AT END OF TASK//50H BURDENS BY 20
.NE AND SURFACE - - - - -/)
DO 303 J=1,4
JJ=503+J
CALL HES(JJ,K0)
303 AR(J)=0.
DO 310 I=1,100
IF (IU(I).EQ.0)GO TO 310
CALL HAS(I,T)
IF (K3.NE.0) WRITE(6,602) I,(DAC(I,J),J=1,2)
602 FORMAT(/5H ZONE,I4,2X,2A6)
DO 305 J=1,4
JJ=503+J
IB=IAB(I,J)
IF (IB.LE.0)GO TO 305
IF (DR(IB,1).LE.0.)GO TO 305
A=DR(IB,1)
AR(J)=AR(J)+A
DR(IB,1)=AVF(IB)
CALL HCS(JJ,IB,JJ,1)
DR(IB,1)=A
IF (K3.NE.0) WRITE(6,603) J,DR(IB,1)
603 FORMAT(5X,14HSURFACE NUMBER,I2,7H, AREA=,F9.3,8H, BURDEN)
IF (K3.NE.0) CALL HWS(IB)
305 CONTINUE
310 CONTINUE
WRITE(6,608)
608 FORMAT(/50H BURDEN TOTALS BY SURFACE - - - - -/)
A=0.
CALL HES(501,K0)

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C
C

HISTOGRAM COMBINING SUBROUTINE

DIMENSION CA(11),CB(11),CR(21),ZP(21),QR(11,11),NQ(11)

```
COMMON  KK, IK, KR, RUN(7), KS, STG(7), KT, TSK(7), DSC(6), ID,
.       NE, AES(4), IEC(10), IET(10), AEC(10), AET(10), AED(10),
.       AEF(10,4), NC, IOT(35), IOQ(35), IOC(35), NP, DAC(120,2),
.       IU(120), IAB(120,6), AAG(120), AAS(120), AAT(120),
.       NX(572), DR(572,11), XR(572,11), KO, NS, IR(5), AR(4),
.       APA(2), NT, JT(100), XMT(100), XVT(100), L1, L2, L3, L4,
.       KTS, ITE, K3, DUM(2664)
```

NA=NX(IA)

NB=NX(IB)

A=DR(IA,1)

B=DR(IB,1)

X=XR(IA,1)

Y=XR(IB,1)

CR(1)=ZF(A,B,K)

CM=CR(1)

CP(IC,1)=CR(1)

ZR(1)=ZF(X,Y,K)

IF(NA.GT.1)GO TO 50

IF(X.NE.D.)GO TO 30

IF((K-3)*(K-4).EQ.0)GO TO 35

30 IF(NB.GT.1)GO TO 40

35 XR(IC,1)=ZR(1)

NX(IC)=1

GO TO 1000

40 NC=NB

DO 45 J=2,NC

Y=XR(IB,J)

CR(J)=DR(IB,J)

45 ZR(J)=ZF(X,Y,K)

GO TO 60

50 IF(NB.GT.1)GO TO 90

NC=NA

DO 55 J=2,NC

X=XR(IA,J)

CR(J)=DR(IA,J)

55 ZR(J)=ZF(X,Y,K)

60 NX(IC)=NC

IF(ZR(NC).GT.ZR(1))GO TO 70

XR(IC,1)=ZR(NC)

JC=NC

DO 65 J=2,NC

QR(IC,J)=CR(JC)

JC=JC-1

65 XR(IC,J)=ZR(JC)

GO TO 80

70 XR(IC,1)=ZR(1)

DO 75 J=2,NC

QR(IC,J)=CR(J)

75 XR(IC,J)=ZR(J)

80 IF(K.LE.4)GO TO 1000

C ELIMINATION OF DUPLICATE X VALUES FOR K=5

CR(1)=0.

CR(2)=0.

JC=1

ZP(1)=XR(IC,1)

DO 85 J=2,NC

CR(J)=CR(J)+DR(IC,J)

IF(XR(IC,J).LE.XR(IC,J-1))GO TO 85

```

      JC=JC+1
      CR(JC)=CR(J)
      ZR(JC)=XR(IC,J)
85   CR(J+1)=CR(J)
      NC=JC
      GO TO 300
90   IF(K.EQ.5)GO TO 200
      JA=0
      JB=0
      JC=0
      KA=NA+1
      KB=NB+1
      IF(NA.GE.NB)GO TO 94
      NC=NB
      KC=KB
      GO TO 100
94   NC=NA
      KC=KA
100  JC=JC+1
      KC=KC-1
      IF(JC.GT.KC)GO TO 140
      IF(JA+1.GE.KA)GO TO 124
      JA=JA+1
      KA=KA-1
      Y1=XR(IA,JA)
      X2=XR(IA,KA)
      IF(JB+1.GE.KB)GO TO 120
      JB=JB+1
      KB=KB-1
      Y1=XR(IB,JB)
      Y2=XR(IB,KB)
      IF(K.EQ.2)GO TO 110
      Z1=ZF(X1,Y1,K)
      Z2=ZF(X1,Y2,K)
      IF(Z2.GT.Z1)GO TO 102
      ZR(JC)=Z2
      GO TO 104
102  ZR(JC)=Z1
104  Z1=ZF(X2,Y1,K)
      Z2=ZF(X2,Y2,K)
      IF(Z2.GT.Z1)GO TO 106
      ZR(KC)=Z1
      GO TO 100
106  ZR(KC)=Z2
      GO TO 100
110  ZR(JC)=ZF(X1,Y1,K)
      ZR(KC)=ZF(X2,Y2,K)
      IF(ZR(JC)-ZR(KC))100,112,112
112  ZR(JC)=.5*(ZR(JC)+ZR(KC))
114  KC=KC+1
      IF(KC.GT.NC)GO TO 116
      JC=JC+1
      ZR(JC)=ZR(KC)
      GO TO 114
116  NC=JC
      GO TO 140
120  Y1=.5*(XR(IB,JB)+XR(IB,KB))
      ZR(JC)=ZF(X1,Y1,K)
      ZR(KC)=ZF(X2,Y1,K)
      GO TO 100
124  X1=.5*(XP(IA,JA)+XR(IA,KA))
      IF(JB+1.GE.KB)GO TO 128

```

```

JR=JB+1
KB=KB-1
Y1=XR(IB,JB)
Y2=XR(IB,KB)
IF(K.EQ.2)GO TO 130
Z1=ZF(X1,Y1,K)
Z2=ZF(X1,Y2,K)
IF(Z2.GT.Z1)GO TO 126
ZR(JC)=Z2
ZR(KC)=Z1
GO TO 100
126 ZR(JC)=Z1
ZR(KC)=Z2
GO TO 100
128 Y1=.5*(XR(IB,JB)+XR(IB,KB))
ZR(JC)=ZF(X1,Y1,K)
ZR(KC)=ZR(JC)
GO TO 100
130 ZR(JC)=ZF(X1,Y2,K)
ZR(KC)=ZF(X1,Y1,K)
GO TO 100
140 NX(IC)=NC
IF(NC.EQ.1)GO TO 35
IF(K.EQ.2)GO TO 171
DO 150 J=1,NC
150 CR(J)=0.
DO 170 JA=2,NA
DO 170 JB=2,NB
P=DR(IA,JA)*DR(IB,JB)
X1=XR(IA,JA-1)
X2=XR(IA,JA)
Y1=XR(IB,JB-1)
Y2=XR(IB,JB)
Z1=ZF(X1,Y1,K)
Z2=ZF(X1,Y2,K)
IF(Z2.GT.Z1)GO TO 154
ZA=Z2
GO TO 155
154 ZA=Z1
155 Z1=ZF(X2,Y1,K)
Z2=ZF(X2,Y2,K)
IF(Z2.GT.Z1)GO TO 158
ZB=Z1
GO TO 160
158 ZB=Z2
160 DO 170 JC=2,NC
IF(ZR(JC).LE.ZA)GO TO 170
IF(ZR(JC).GE.ZB)GO TO 166
CR(JC)=CR(JC)+P*(ZR(JC)-ZA)/(ZB-ZA)
GO TO 170
166 CR(JC)=CR(JC)+P
170 CONTINUE
GO TO 300
171 KC=1
DO 172 JC=2,NC
IF(ZR(JC).GT.ZR(NC))ZR(JC)=ZR(NC)
IF(ZR(KC).GE.ZR(JC))GO TO 172
KC=KC+1
ZR(KC)=ZR(JC)
172 CONTINUE
NC=KC
IF(NC.GT.1)GO TO 173

```

```

      NX(IC)=1
      YR(IC,1)=ZR(1)
      GO TO 1000
173  DO 174 JA=2,NA
174  CA(JA)=DR(IA,JA)
      DO 180 JC=2,NC
      Z1=ZR(JC-1)
      Z2=ZR(JC)
      DO 175 JA=1,NA
175  QR(JA,JC)=0.
      DO 178 JB=2,NB
      Y1=XR(IB,JB-1)
      Y2=XR(IB,JB)
      XA=ZF(Z1,Y1,1)+.0001
      XA=ZF(Z1,Y1,1)
      XB=ZF(Z2,Y2,1)
      DO 178 JA=2,NA
      IF(XR(IA,JA).LE.XA)GO TO 178
      IF(XR(IA,JA).GE.XB)GO TO 176
      GR(JA,JC)=GR(JA,JC)+DR(IB,JB)+((XR(IA,JA)-XA)/(XB-XA))
      GO TO 178
176  GR(JA,JC)=GR(JA,JC)+DR(IB,JB)
178  CONTINUE
      KA=NA
      DO 180 JA=2,NA
      QR(KA,JC)=QR(KA,JC)-QR(KA-1,JC)
      KA=KA-1
180  CONTINUE
      DO 190 JA=2,NC
      KC=0
      QRX=.0001
      DO 182 JC=2,NC
      IF(QR(JA,JC).LE.QRX)GO TO 182
      KC=JC
      NQ(JA)=KC
      QPX=QR(JA,JC)
182  CONTINUE
      DO 184 JC=2,NC
184  QR(JA,JC)=QR(JA,JC)/QRX
      CA(JA)=CA(JA)/QRX
      DO 188 J=2,NA
      IF(J.EQ.JA)GO TO 188
      QX=QR(J,KC)
      DO 186 JC=2,NC
      QR(J,JC)=QR(J,JC)-QX*QR(JA,JC)
186  CONTINUE
      CA(J)=CA(J)-QX*CA(JA)
188  CONTINUE
190  CONTINUE
      DO 192 JA=2,NC
      KC=NQ(JA)
192  CR(KC)=CA(JA)
      CR(1)=0.
      DO 194 JA=2,NC
      IF(CR(JA).LT.0.)CR(JA)=0.
194  CR(JA)=CR(JA)+CR(JA-1)
      GO TO 300
200  JA=1
      JB=1
      JC=0
      KA=0
      KB=0

```

```

CA(1)=C.
CB(1)=C.
NM=NA
IF(NM.LT.NB)NM=NB
205 IF(XR(IA,JA)-XR(IB,JB))210,235,255
210 IF(KA.GT.0)GO TO 260
    IF(XR(IA,JA).LT.XP(IB,1))GO TO 225
    DB=CB(JB-1)+(CB(JB)-CB(JB-1))*(XR(IA,JA)-XR(IB,JB-1))/
    .(XR(IB,JB)-XP(IB,JB-1))
    GO TO 220
215 DB=CB(NB)
220 JC=JC+1
    CR(JC)=CA(JA)*DB
    ZR(JC)=XR(IA,JA)
225 IF(JA.GE.NA)GO TO 230
    JA=JA+1
    CA(JA)=CA(JA-1)+DP(IA,JA)
    GO TO 205
230 IF(KB.GT.0)GO TO 280
    KA=1
    GO TO 205
235 JC=JC+1
    CR(JC)=CA(JA)*CB(JB)
    ZR(JC)=XP(IA,JA)
    IF(JA.GE.NA)GO TO 245
    JA=JA+1
    CA(JA)=CA(JA-1)+DP(IA,JA)
240 IF(JB.GE.NB)GO TO 250
    JB=JB+1
    CB(JB)=CB(JB-1)+DR(IB,JB)
    GO TO 205
245 IF(KB.GT.0)GO TO 280
    KB=1
    GO TO 240
250 IF(KA.GT.0)GO TO 280
    KB=1
    GO TO 205
255 IF(KB.GT.0)GO TO 215
    IF(XP(IB,JB).LT.XR(IA,1))GO TO 270
    DA=CA(JA-1)+(CA(JA)-CA(JA-1))*(XR(IB,JB)-XR(IA,JA-1))/
    .(XR(IA,JA)-XP(IA,JA-1))
    GO TO 265
260 DA=CA(NA)
265 JC=JC+1
    CR(JC)=CB(JB)*DA
    ZR(JC)=XR(IB,JB)
270 IF(JB.GE.NB)GO TO 275
    JB=JB+1
    CB(JB)=CB(JB-1)+DR(IB,JB)
    GO TO 205
275 IF(KA.GT.0)GO TO 280
    KB=1
    GO TO 205
280 NC=JC
290 IF(NC.LE.NM)GO TO 300
    DJ=1,
    JJ=2
    NC=NC-1
    DO 294 J=2,NC
    DS=(CR(J-1)+(CR(J+1)-CR(J-1))*(ZR(J)-ZR(J-1))/(ZR(J+1)-ZR(J-1))
    .-CR(J))*2
    IF(DS.GE.DJ)GO TO 294

```

```
DJ=05
JJ=J
IF(DJ.LT..0001)GO TO 296
294 CONTINUE
296 DO 298 J=JJ,NC
    CR(J)=CR(J+1)
298 ZR(J)=ZR(J+1)
    GO TO 290
300 F=1./CR(NC)
    DO 302 J=2,NC
302 CR(J)=F*CR(J)
    XR(IC,1)=ZR(1)
308 DO 310 J=2,NC
    DR(IC,J)=CR(J)-CR(J-1)
310 XR(IC,J)=ZR(J)
    NX(IC)=NC
1000 DR(IC,1)=AVF(IC)
    IF(K.EQ.5) RETURN
    IF(DR(IC,1).EQ.0.) RETURN
    F=CM/DR(IC,1)
    CALL HMS(IC,F,IC)
    RETURN
END
```

SUBROUTINE HAS(N)

HISTOGRAM ADJUSTING SUBROUTINE

```

COMMON  KK, IK, KR, RUN(7), KS, STG(7), KT, TSK(7), DSC(6), ID,
      .   NE, AES(4), IEC(10), IET(10), AEC(10), AET(10), AED(10),
      .   AEF(10,4), NO, IOT(35), IOQ(35), IOC(35), NP, DAC(120,2),
      .   IU(120), IAB(120,6), AAG(120), AAS(120), AAT(120),
      .   NX(572), DR(572,11), XR(572,11), KO, NS, IR(5), AR(4),
      .   APA(2), NT, JT(100), XMT(100), XVT(100), L1, L2, L3, L4,
      .   KTS, ITE, K3, DUM(2664)
DIMENSION C(11),D(11),Z(11)
M=NX(N)
IF(M.EQ.1) RETURN
IF(ID.LE.0) RETURN
IF(NX(ID).LE.0) RETURN
AVER=AVF(N)
MD=NX(ID)
IF(MD.GT.1) GO TO 5
XR(N,1)=AVER
NX(N)=1
RETURN
5  C(1)=0.
   D(1)=0.
   Z(MD)=XR(N,M)
   DO 10 I=2,M
10  C(I)=C(I-1)+DR(N,I)
   IF(C(M).EQ.1.) GO TO 19
   IF(C(M).EQ.0.) RETURN
   DO 15 I=2,M
15  C(I)=C(I)/C(M)
19  DO 20 I=2,MD
20  D(I)=D(I-1)+DR(ID,I)
   IF(D(MD).EQ.1.) GO TO 27
   IF(D(MD).EQ.0.) RETURN
   DO 25 I=2,MD
   DR(ID,I)=DR(ID,I)/D(MD)
25  D(I)=D(I)/D(MD)
27  IF(D(MD-1).NE.1.) GO TO 30
   MD=MD-1
   NX(ID)=MD
   GO TO 27
30  I=2
   J=2
31  DR(N,I)=DR(ID,I)
32  IF(C(J).LE.D(I)) GO TO 33
   Z(I)=XR(N,J-1)+(D(I)-C(J-1))*(XR(N,J)-XR(N,J-1))/(C(J)-C(J-1))
   I=I+1
   GO TO 31
33  J=J+1
   IF(J.LE.M) GO TO 32
   DO 35 I=2,MD
35  XR(N,I)=Z(I)
   NX(N)=MD
   AVR=AVF(N)
   IF(AVR.EQ.0.) RETURN
   F=AVER/AVR
   DO 40 I=1,M
40  XR(N,I)=XR(N,I)*F
   RETURN
END

```

SUBROUTINE HES(J,K)

A34

C
C
C

HISTOGRAM EQUATING SUBROUTINE

SET J=K.

COMMON KK, IK, KR, RUN(7), KS, STG(7), KT, TSK(7), DSC(6), ID,
NE, AES(4), IEC(10), IET(10), AEC(10), AET(10), AED(10),
AEF(10,4), NO, IOT(35), IOQ(35), IOC(35), NP, DAC(120,2),
IU(120), IAB(120,6), AAG(120), AAS(120), AAT(120),
NX(572), DR(572,11), XR(572,11), KO, NS, IR(5), AR(4),
APA(2), NT, JT(100), XPT(100), XVT(100), L1, L2, L3, L4,
KTS, ITE, K3, DUM(2664)

M=NX(K)

NX(J)=M

DO 10 I=1,M

DR(J,I)=DR(K,I)

10 XR(J,I)=XR(K,I)

RETURN

END

SUBROUTINE HMS(IA,C,IC)

A35

C
C
C

HISTOGRAM MULTIPLYING SUBROUTINE

HISTOGRAM IC EQUALS IA MULTIPLIED BY CONSTANT C

COMMON KK, IK, KR, RUN(7), KS, STG(7), KT, TSK(7), DSC(6), ID,
NE, AES(4), IEC(10), IET(10), AEC(10), AET(10), AED(10),
AEF(10,4), NO, IOT(35), IOQ(35), IOC(35), NP, DAC(120,2),
IU(120), IAB(120,6), AAG(120), AAS(120), AAT(120),
NX(572), DR(572,11), XR(572,11), KO, NS, IR(5), AR(4),
APA(2), NT, JT(100), XMT(100), XVT(100), L1, L2, L3, L4,
KTS, ITE, K3, DUM(2664)

IF(C.EQ.0.)GO TO 20

M=NX(IA)

NX(IC)=M

DO 10 J=1,M

DR(IC,J)=DR(IA,J)

10 XR(IC,J)=XR(IA,J)*C

DR(IC,1)=DR(IA,1)*C

RETURN

20 NX(IC)=1

DR(IC,1)=0.

XR(IC,1)=0.

RETURN

END

```

      SUBROUTINE HWS(I)
C  HISTOGRAM WRITING ROUTINE
C  VERSION 16 JULY,1969
      COMMON  KK, IK, KR, RUN(7), KS, STG(7), KT, TSK(7), DSC(6), ID,
      .       NE, AES(4), IEC(10), IET(10), AEC(10), AET(10), AED(10),
      .       AEF(10,4), NO, IOT(35), IOQ(35), IOC(35), NP, DAC(120,2),
      .       IU(120), IAB(120,6), AAS(120), AAT(120),
      .       NX(572), DR(572,11), XR(572,11), KO, NS, IR(5), AR(4),
      .       APA(2), NT, JT(100), XMT(100), XVT(100), L1, L2, L3, L4,
      .       KTS, ITE, K3, DUM(2664)
      M=NX(I)
      IF(M.LE.1) GO TO 100
      D=AVF(I)
      WRITE(6,600) D
600  FORMAT(1H+,46X,13HMEAN VALUE = ,E12.5)
      WRITE(6,601) (DR(I,J),J=2,M)
601  FORMAT(15H  PROBABILITY =,5X,10F10.5)
      WRITE(6,602) (XR(I,J),J=1,M)
602  FORMAT(10H  RANGE = ,11E10.2)
      WRITE(6,609)
609  FORMAT(/)
      RETURN
100  WRITE(6,603) XR(I,1)
603  FORMAT(1H+,46X,2H= ,E12.5/)
      RETURN
      END

```

SUBROUTINE MAS(I,T)

A37

C
C
C

MICROBIAL ACCRETION SUBROUTINE

I IS THE PART AFFECTED, T THE TIME OF UPDATE

COMMON KK, IK, KR, RUN(7), KS, STG(7), KT, TSK(7), OSC(6), ID,
 NE, AES(4), IEC(10), IET(10), AEC(10), AET(10), AED(10),
 AEF(10,4), NO, IOT(35), IOQ(35), IOC(35), NP, DAC(120,2),
 IU(120), IAB(120,6), AAG(120), AAS(120), AAT(120),
 NX(572), DR(572,11), XR(572,11), KO, NS, IR(5), AR(4),
 APA(2), NT, JT(100), XMT(100), XVT(100), L1, L2, L3, L4,
 KTS, ITE, K3, DUM(2664)

DT=T-AAT(I)

IF(DT.LE.0.)RETURN

AAT(I)=T

IE=IAB(I,5)

IF(IE.LE.0)RETURN

IC=IEC(IE)

C=AAG(I)*AEC(IE)/DR(IC,1)

DO 40 J=1,4

IF(IAB(I,J).EQ.0)GO TO 40

IF(AEF(IE,J).EQ.0.)GO TO 40

IB=IAB(I,J)

A=DR(IB,1)

F=C*AEF(IE,J)*A

CALL HMS(IC,F,501)

DR(501,1)=AVF(501)

V=AET(IE)*AES(J)

F=EXP(-DT/V)

CALL HMS(IB,F,502)

DR(502,1)=AVF(502)

F=V*(1.-F)

CALL HMS(501,F,503)

CALL HCS(502,503,IB,1)

DR(IB,1)=A

40 CONTINUE

RETURN

END

6
66
66
6

C FUNCTION AVF(I)
 AVERAGE VALUE FUNCTION
COMMON KK, IK, KR, RUN(7), KS, STG(7), KT, TSK(7), DSC(6), ID,
 . NE, AES(4), IEC(10), IET(10), AEC(10), AET(10), AED(10),
 . AEF(10,4), NO, IOT(35), IOQ(35), IOC(35), NP, DAC(120,2),
 . IU(120), IAB(120,6), AAG(120), AAS(120), AAT(120),
 . NX(572), DR(572,11), XR(572,11), KO, NS, IR(5), AR(4),
 . APA(2), NT, JT(100), XMT(100), XVT(100), L1, L2, L3, L4,
 . KTS, ITE, K3, DUM(2664)
 M=NX(I)
 IF(M.GT.1) GO TO 10
 AVF=XR(I,1)
 RETURN
10 AVF=D.
 DO 20 J=2,M
20 AVF=AVF+DR(I,J)*(XR(I,J-1)+XR(I,J))
 AVF=.5*AVF
 RETURN
 END

FUNCTION ZF(X,Y,K)

A39

```
C
C      Z FUNCTION OF X AND Y
C      K DETERMINES THE OPERATION + - * /.
      GO TO (10,20,30,40,50),K
10    ZF=X+Y
      RETURN
20    ZF=X-Y
      RETURN
30    ZF=X*Y
      RETURN
40    ZF=X/Y
      RETURN
50    ZF=X
      IF(Y.GT.X)ZF=Y
      RETURN
      END
```

```

SUBROUTINE DPS
C DETAILED PRINTOUT SUBROUTINE (READS FROM TAPE11)
COMMON/X/M,MR,MG,MT,MS,DSC(4),N,NX,DR(11),XR(11),P(5),NP(5)
REWIND 11
READ(11) M,MR,MG,MT,MS,(DSC(J),J=1,4),N,NX,(DR(J),J=1,11),
.(XR(J),J=1,11),(P(J),J=1,5),(NP(J),J=1,5)
WRITE(6,601) MP,(DR(J),J=1,7)
601 FORMAT(35H1MICROBIAL BURDEN DETAILED PRINTOUT/4H RUN,I2,2X,7A6//)
READ(5,500) K,NS,NT,NST,NS2,NT2,NST2
500 FORMAT(7I5)
C K=0 CALLS EXIT
C K=1 PRINTS STAGE NS, TASK NT (SUBTASK NST)
C K=2 PRINTS FROM NS,NT,(NST) TO NS2,NT2,(NST2)
10 READ(11) M,MR,MG,MT,MS,(DSC(J),J=1,4),N,NX,(DR(J),J=1,11),
.(XR(J),J=1,11),(P(J),J=1,5),(NP(J),J=1,5)
IF(M.LE.0) CALL EXIT
11 IF(MG.NE.NS) GO TO 10
IF(MT.NE.NT) GO TO 10
IF((NST.GT.0).AND.(NST.NE.MS)) GO TO 10
IF(K.EQ. 2) GO TO 20
15 CALL PLS
READ(11) M,MR,MG,MT,MS,(DSC(J),J=1,4),N,NX,(DR(J),J=1,11),
.(XR(J),J=1,11),(P(J),J=1,5),(NP(J),J=1,5)
IF(M.LE.0) CALL EXIT
IF(MG.NE.NS) GO TO 100
IF(MT.NE.NT) GO TO 100
IF((NST.GT.0).AND.(NST.NE.MS)) GO TO 100
GO TO 15
20 NS=NS2
NT=NT2
NST=NST2
25 CALL PLS
READ(11) M,MR,MG,MT,MS,(DSC(J),J=1,4),N,NX,(DR(J),J=1,11),
.(XR(J),J=1,11),(P(J),J=1,5),(NP(J),J=1,5)
IF(M.LE.0) CALL EXIT
IF(MG.NE.NS) GO TO 25
IF(MT.NE.NT) GO TO 25
IF((NST.GT.0).AND.(NST.NE.MS)) GO TO 25
100 READ(5,500) K,NS,NT,NST,NS2,NT2,NST2
IF(K.LE.0) CALL EXIT
GO TO 11
END

```

A41

```

SUBROUTINE PLS
C  PARAMETER LABELING SUBROUTINE
COMMON/X/M,MR,MG,MT,MS,DSC(4),N,NX,DR(11),XR(11),P(5),NP(5)
600 FORMAT(/40X,3HRUN,I2,7H, STAGE,I3,6H, TASK,I4,9H, SUBTASK,I3,2X,
.4A6)
GO TO(1,2,3,4,5,6,7,8,9),M
1 WRITE(6,601) MR,(DR(J),J=1,7),MG,(DR(J),J=8,11),(XR(J),J=1,3)
601 FORMAT(35HIMICROBIAL BURDEN DETAILED PRINTOUT/4H RUN,I2,2X,7A6/
.6H STAGE,I3,2X,7A6//)
RETURN
2 WRITE(6,600) MR,MG,MT,MS,(DSC(J),J=1,4)
WRITE(6,602) NP(1),NP(2)
602 FORMAT(31H+---- START OF NEW SUBTASK ----/33H PREREQUISITE TIME DIG
.STRIBUTIONS-,I4,1H,I4,42X,10HSTART TIME)
CALL HPS
RETURN
3 WRITE(6,600) MR,MG,MT,MS,(DSC(J),J=1,4)
WRITE(6,603) NP(1),NP(2),P(1),NP(3),P(3),NP(4),P(4)
603 FORMAT(26H+PART BURDEN AFTER FALLOUT/5H PART,I4,7H, SURF.,I2,
.7H, AREA=,F7.2,7H, OPER.,I3,1H,,F6.2,6H HOURS,
.1CH, ENVIRON.,I3,1H,,F4.0,5H MEM.,10X,6HBURDEN)
CALL HPS
RETURN
4 WRITE(6,600) MR,MG,MT,MS,(DSC(J),J=1,4)
WRITE(6,604) NP(1),NP(2),(P(J),J=1,5)
604 FORMAT(26H+PART BURDEN AFTER CONTACT/5H PART,I4,7H, SURF.,I2,
.7H, AREA=,F7.2,10H, CONTACT=,F5.3,5H, S1=,F5.3,5H, S2=,F5.3,
.7H, TOOL=,F7.1,7X,6HBURDEN)
CALL HPS
RETURN
5 WRITE(6,600) MR,MG,MT,MS,(DSC(J),J=1,4)
CALL HPS
RETURN
6 WRITE(6,600) MR,MG,MT,MS,(DSC(J),J=1,4)
RETURN
7 WRITE(6,600) MR,MG,MT,MS,(DSC(J),J=1,4)
RETURN
8 WRITE(6,600) MR,MG,MT,MS,(DSC(J),J=1,4)
WRITE(6,608) NP(1),(P(J),J=3,4),NP(2),P(1),P(2),NP(4)
608 FORMAT(25H+PART BURDEN AFTER UPDATE/5H PART,I4,2X,2A6,7H, SURF.,
.I2,7H, AREA=,F7.2,7H, TIME=,F9.3,10H, ENVIRON.,I3,14X,6HBURDEN)
CALL HPS
RETURN
9 WRITE(6,600) MR,MG,MT,MS,(DSC(J),J=1,4)
WRITE(6,609) NP(1),NP(2),P(1),NP(3),P(4),P(5)
609 FORMAT(34H+PART BURDEN AFTER DECONTAMINATION/5H PART,I4,7H, SURF.,
.I2,7H, AREA=,F7.2,7H, OPER.,I3,1H,,F6.2,25H HOURS, FRACTION REMOVE
.D=,F6.3,8X,6HBURDEN)
CALL HPS
RETURN
END

```

A

```
      SUBROUTINE HPS
C  HISTOGRAM WRITING ROUTINE
      COMMON/X/M,MP,MG,MT,MS,DSC(4),N,NX,DR(11),XR(11),P(5),NP(5)
      IF(NX.LE.1) GO TO 100
      D=D.
      DO 20 J=2,NX
      20 D=D+.5*DP(J)*(XR(J-1)+XR(J))
      WRITE(6,600) D
      600 FORMAT(1H+.94X.13HMEAN VALUE = .E12.5)
      WRITE(6,601) (DR(J),J=2,NX)
      601 FORMAT(15H PROBABILITY =.5X.10F10.5)
      WRITE(6,602) (XR(J),J=1,NX)
      602 FORMAT(10H RANGE = .11E10.2)
      RETURN
      100 WRITE(6,603) XR(1)
      603 FORMAT(1H+.94X.2H= .E12.5)
      RETURN
      END
```