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A COMPUTER CODE FOR CALCULATING PERSONNEL DOSES DUE TO TRITIUM EXPOSURES

Curtis L. Graham

Joseph R. Parlagreco

February 2, 1977

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LCL-52138

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A COMPUTER CODE FOR CALCULATING PERSONNEL DOSES DUE TO TRITIUM EXPOSURES

Abstract

This report describes a computer code written in LLL modified Fortran IV that can be used on a CDC 7600 for calculating personnel doses due to exposures to tritium. The code is capable of handling various exposure situations, and is also capable of detecting a large variety of data input errors that would lead to errors in the dose assessment.

Introduction

This computer code is used to calculate personnel doses that occur from a large variety of exposure situations. The code will maintain an up-to-date record of doses for those personnel who have had no recent positive bioassay results as well as those personnel who have chronic or acute exposures to tritium. The effective half-life is calculated for each set of bioassay data, and is changed when appropriate for each computer run so that each person is assigned the dose which corresponds to his elimination rate. The code also checks whether the bioassay data are consistent with the exposure category that was assumed for each person. If the exposure category is not consistent with the bioassay data, an error statement will appear on the printout explaining the error. Thus, two primary sources of error, the exposure category and the effective half-life assumptions, are minimized. The code will also detect a variety of other input errors. This code offers good flexibility with good accuracy.

For acute exposures, the dose rate is assumed to follow a simple exponential decay. For chronic exposures, the average dose rate for the sampling period is assumed.

The printout includes many desirable categories for personnel dosimetry records. Personnel are arranged by ID numbers on the printout which lists the doses for the present and previous year and quarter, the dose received

between sampling periods, the infinity dose, the lifetime dose due to tritium exposures, the effective half-life, the last bioassay results and sample day, and the exposure category (i.e., chronic or acute).

The code is written in LLL modified Fortran IV which can be modified to ANSI FORTRAN IV.

Types of Exposures.

Exposures are divided into three groups:

Group 1: No known exposure has occurred between sample days.

Group 1a: A known exposure has occurred, and the probable day is known.

Group 2: Chronic exposure - exposures occurring on a routine basis and occurring approximately once or more per week.

Definitions of symbols:

C_o = old concentration level (OLEV).

C_n = new concentration level (NLEV).

C_e = concentration level on day of known exposure.

t_o = old sample date (ODAY).

t_n = new sample date (NDAY).

t_e = exposure date (EXP).

D = dose received between t_o and t_n (mrem/sample).

D_∞ = infinity dose (dose that will be received at times greater than t_n if no further exposures occur) (mrem/INF).

MRL = mrem received in the present quarter up to the last sample date.

MY = mrem received in the present year up to the last sample date.

MRL = mrem received in the lifetime up to the last sample date.

MRPQ = mrem received in the previous quarter.

MRPY = mrem received in the previous year.

T = effective half-life for tritiated water ($T_{1/2}$).

Terms in parenthesis are used for computer printout.

General Calculations

The critical organ is the body water. The Quality Factor for tritium is 1.0. The density of body tissue is assumed to be 1.0.

The dose-equivalent rate (mrem/day) is:

$$R(t) = \frac{3.7 \times 10^4 \text{ dps/}\mu\text{Ci} \times 8.6 \times 10^4 \text{ s/day} \times C(t) \text{ }\mu\text{Ci/l} \times \bar{E} \text{ MeV/dis} \times 1.6 \times 10^{-6} \text{ ergs/MeV}}{1000 \text{ g/l} \times 100 \text{ ergs/g} \cdot \text{rad (1 rad/rem)}}$$

$$= 51.1 \bar{E} C(t) \text{ mrem/day} \quad (1)$$

where $C(t)$ is μCi per litre of urine

$$\bar{E} = 0.0057 \text{ MeV}$$

The dose (mrem) received between t_0 and t_n is:

$$D = \int_{t_0}^{t_n} R(\tau) d\tau = \int_{t_0}^{t_n} 51.1 \bar{E} C(\tau) d\tau$$

$$= \int_{t_0}^{t_n} 51.1 \bar{E} C_0 e^{\frac{-0.693\tau}{T}} d\tau$$

Where $C(t) = C_0 e^{\frac{-0.693}{T}t}$
 K_1 contains all conversion constants. $K_1 = 0.42 \text{ mrem/}\mu\text{Ci/l/day}$

$$= K_1 C_0 T \left[1 - e^{\frac{-0.693(t_n - t_0)}{T}} \right] \quad (2)$$

The infinity dose (mrem) is:

$$D_\infty = \lim_{t \rightarrow \infty} K_1 C_0 T \left[1 - e^{\frac{-0.693(t_n - t)}{T}} \right] = K_1 C_0 T \quad (3)$$

Output

D is added to MRQ, MRY and MRL each time data are run. If a quarter date comes between t_n and t_{n+1} , the dose (D) is calculated in two parts. One part is added to MRPQ (MRPY) and the remaining part is added to MRQ (MRY). See Appendix A for calculations for the case when a quarter date is crossed.

D_n is not added to any quantity, but is printed to show the projected dose if no further exposure occurred after the last sample day (t_n). Thus, MRPQ and MRPY reflect the total dose received in the previous quarter and year. MRQ, MRY, and MRL reflect the dose received to the last sample date for the respective time periods.

The printout will list separately those personnel and their corresponding previous quarter doses when the sample dates have crossed the quarter. This will facilitate updating the Personnel Dosimetry Report which is usually updated on a quarterly basis for tritium exposures.

If more than one quarter date is crossed in a Group 1 or 1a situation, the code will not assign the correct dose for MRPQ or MRPY. All dose calculations will be incorrect for the Group 2 situation if more than one quarter date is crossed. The maximum dose for D, D_n , MRQ, MRY, MRPQ, and MRPY is 9999 mrem, and the maximum for MRL is 99999 mrem.

Only one set of data for an individual may be run at a time. All data are entered by cards, and all output is sorted by personnel ID numbers. A typical running time for 60 individuals is 0.03 minutes, and the storage space required is 11514874940₁₀ plus the data input file size.

After each computer run, a new data card is generated which has blanks in the spaces for C_n , t_n , and t_e . Only these spaces need attention before the next run. If the exposure group must be changed, a new card must be made. When the year is crossed, the card will be changed to the new year.

See Appendix B for an example of the printout.

Error Printouts

An error printout will occur if the exposure group is not entered (Group = 0) or if $t_n = t_e$ (NDAY = ODAY).

If $C_0 - C_n = 0$ the card will be updated, but dose (D) will appear on the printout.

If t_0 is not entered, it is assumed that there are no new data to be processed and the error statement printout will show "No New Sample Day," although it is not actually an error. This feature allows one to calculate doses for those individuals with new bioassay data without having to sort those individuals' cards from the whole group. If new data are acquired, it need only be entered in the appropriate spaces on the card.

For all error printouts, the name, ID number, C_0 , C_n , t_0 , t_n will be printed with the type of error.

GROUP 1

No exposure has occurred between sample dates.

The effective half-life will be calculated. If $T > 12$ days or $T < 4$ days, the assumption that no exposure has occurred between t_0 and t_n is incorrect, and an error printout will occur ($T < 0$, $T < 4$, or $T > 12$, whichever is appropriate). If $4 < T < 12$, D and D_0 will be calculated by using the newly calculated T which will also be entered on the new computer card and printout.

If $C_n = 0$, the total integrated dose from t_0 (D_0) will be assigned.

If $C_0 = 0$ and $C_n > 0$, the assumption that no exposure occurred between t_0 and t_n is incorrect and an error printout will occur (OLEV or NLEV = 0).

The half-life (T) is calculated as follows:

The slope of the line in the above figure is equal to the decay constant (λ).

$$\lambda = \frac{\ln C_0 - \ln C_n}{t_n - t_0} = \frac{\ln C_0/C_n}{t_n - t_0}$$

Since

$$\lambda = \frac{0.693}{T}, \quad T = \frac{0.693(t_n - t_0)}{\ln C_0/C_n} \quad (4)$$

GROUP 1a

A known exposure has occurred, and the probable day (t_e) is known.

An effective half-life is not calculated in this case.

The concentration (C_e) that resulted from a tritium exposure on day (t_e) is calculated as shown below.

If $C_n = 0$, the assumption that an exposure has occurred between t_0 and t_n is incorrect and an error printout will occur (EXP > 0 and NLEV = 0).

$$C_e = C_n \frac{0.693(t_n - t_e)}{T}$$

$$D_1 = K_1 C_0 T \left[1 - e^{-\frac{0.693(t_e - t_0)}{T}} \right]$$

$$D_2 = K_1 C_n T \left[1 - e^{\frac{-0.693(t_n - t_0)}{T}} \right]$$

$$D_3 = D_1 + D_2$$

$$D_n = K_1 C_n T$$

GROUP 2

Chronic Exposure:

The effective half-life is calculated [Eq. (4)], and if $4 < T < 12$, the calculation of dose is made as in Group 1 [Eq. (2)]. The calculated T will be used in the dose calculation, and will be entered on the new computer card and printout. The printout will not change the type of exposure group; the new printout will still show the individual as a Group 2.

If $0 < T < 3.99$, an error in the urinalysis has probably occurred and an error printout will occur ($T/2 < 3.99$).

If $T \leq 0$ or $T > 12$, the assumption of a chronic exposure is confirmed, and the dose is calculated by using the average concentration of C_0 and C_n as shown below.

If an exposure date is entered for a Group 2 exposure, an error printout will occur since only a Group 1a may have an exposure date entered ($EXP > 0$ and $Group = 2$).

If C_0 or $C_n = 0$, 0.049 $\mu\text{Ci/l}$ is added to each so that the effective half life can be estimated. (The value 0.049 is used since it will be rounded off to 0 on the printout and concentration levels less than 0.1 $\mu\text{Ci/l}$ are entered as 0). Depending upon the estimated value of T, either an error printout ($T_{1/2} < 3.99$) occurs or the dose is calculated as given above. This is done to give the best estimate of the dose (D) when $C_0 \neq 0$ and $C_n = 0$. E is calculated as:

$$D = \int_0^{t_n - t_0} 51.1 \bar{E} C(\tau) d\tau$$

$$= \int_0^{t_n - t_0} 51.1 \bar{E} \frac{C_0 + C_n}{2} d\tau$$

$$= K_2 \frac{C_0 + C_n}{2} (t_n - t_0) \quad \text{where } K_2 = 0.29 \text{ (mrem/}\mu\text{Ci/l-days)}$$

$$D_{\infty} = K_1 C_n T$$

Appendix A

If the quarter comes between t_o and t_n , the dose (D) is calculated as:

D_o = dose in the previous quarter (year)

D_n = dose in the present quarter (year)

Q = the quarter date (90, 181, 273, 366 days)

$$D = D_o + D_n$$

For Group 1:

$$D_o = 0.42 C_o T \left[1 - e^{-\frac{0.693(Q - t_o)}{T}} \right]$$

$$D_n = 0.42 C_o T e^{-\frac{0.693(Q - t_o)}{T}} \left[1 - e^{-\frac{0.693(t_n - Q)}{T}} \right]$$

If $C_n = 0$

$$D_o = 0.42 C_o T \left[1 - e^{-\frac{0.693(Q - t_o)}{T}} \right]$$

$$D_n = 0.42 C_o T - D_o$$

For Group 1a:

if $t_e < Q < t_n$

$$D_o = 0.42 C_o T \left[1 - e^{-\frac{0.693(t_e - t_o)}{T}} \right]$$

$$+ 0.42 C_e T \left[1 - e^{-\frac{0.693(Q - t_e)}{T}} \right]$$

$$D_n = 0.42 C_e T e^{-\frac{0.693(Q - t_e)}{T}} \left[1 - e^{-\frac{0.693(t_n - Q)}{T}} \right]$$

if $t_o < Q < t_e$

$$D_o = 0.42 C_o T \left[1 - e^{\frac{-0.693(Q - t_o)}{T}} \right]$$

$$D_n = 0.42 C_o T e^{\frac{-0.693(Q - t_o)}{T}} \left[1 - e^{\frac{-0.693(t_e - Q)}{T}} \right] \\ + 0.42 C_e T \left[1 - e^{\frac{-0.693(t_n - t_e)}{T}} \right]$$

For Group 2:

$$D_o = 0.29 \left[\frac{C_n - C_o}{t_n - t_o} \left(\frac{Q - t_o}{2} \right) + C_o \right] (Q - t_o)$$

$$D_n = 0.29 \left[\frac{C_n - C_o}{t_n - t_o} \left(\frac{Q - t_n}{2} - t_o \right) + C_o \right] (t_n - Q)$$

Appendix B

ERROR STATEMENT

```

*****      SMITH B      123457
              OLD SAMPLE LEVEL =      10      NEW SAMPLE LEVEL =      10
              OLD SAMPLE DAY      100      NEW SAMPLE DAY      100
  
```

123457 SMITH B

ERROR IS T1/2 > 12

```

*****      SMITH C      123458
              OLD SAMPLE LEVEL      10      NEW SAMPLE LEVEL =      20
              OLD SAMPLE DAY      100      NEW SAMPLE DAY      110
  
```

123458

ERROR IS T 1/2 > 0

```

*****      SMITH B      123460
              OLD SAMPLE LEVEL      100      NEW SAMPLE LEVEL =      10
              OLD SAMPLE DAY      100      NEW SAMPLE DAY      110
  
```

123460 SMITH B

ERROR IS T 1/2 < 4

```

*****      SMITH F      123461
              OLD SAMPLE LEVEL =      00      NEW SAMPLE LEVEL =      20
              OLD SAMPLE DAY      100      NEW SAMPLE DAY      110
  
```

123461 SMITH F

ERROR IS OLEV OR NLEV = 0

```

*****      SMITH K      123466
              OLD SAMPLE LEVEL =      10      NEW SAMPLE LEVEL =
              OLD SAMPLE DAY      100      NEW SAMPLE DAY      130
  
```

123466 SMITH K

ERROR IS EXP > 0 AND NLEV = 0

ID	NAME	BLDG	MREM PREV	MREM QUAR	MREM YEAR	LAST SAMPLE DAY	MICRO CURIES LITRE	MREM QUAR	MREM YEAR	MREM LIFE	MREM INF	T 1/2	GROUP	MREM/ SAMPLE
11111	JONES A	101	1234	12345	74-120	5.1	70	945	3034	88	19	9	1	22
11112	JACKS A	102	1989	12345	74-100	225.0	945	945	3034	6834	945	10	2	2834

THE FOLLOWING PERSONS HAVE CROSSED THE QUARTER

12:38:45U 04/21/76

ID	BLDG	NAME	LAST QTR.
11112	102	JACKS A	1989
12113	101	JACKS B	114
12114	101	JACKS C	123

6000

100-1000

62-0000000-120

مذاهب الفقه

[illegible]


```

61 C      EX = GRUP * EXPOSURE GROUP (1 OR 2)
62 C      OLD = MONTH PREVIOUS QUARTER
63 C      MRS = MRS RECEIVED SINCE PREVIOUS SAMPLE
64 C      OLYR = TOTAL PREM. PREVIOUS YEAR
65 C
66 C      VARIABLES USED AS COUNTERS AND POINTERS ARE:
67 C          I I1 ID0 IDW IDWP IWP J KV LEN M
68 C
69 C
70 C      LINE 77 TO LINE 209
71 C      THIS LOCATION'S METHOD (USING LOCAL SYSTEM CALLS) OF
72 C      SETTING UP I/O FILES. DATA IS READ IN, COUNTED, SORTED
73 C      AND WRITTEN OUT TO A NEW FILE.
74 C
75 C
76 C      CREATE DROP FILE
77 C
78 C      CALL CLC (* J1,J2)
79 C      J2 = J1 + 2525258
80 C      IS = J2 * 2525258
81 C      TPP = ((SRTRIT7) SHL,18) UN, J2
82 C      FROST (1018,1,TPP,0,ER1)
83 C      CALL INIO
84 C      IOR = IDW * IDWP * IWP = 0
85 C      KV = 9
86 C      I = IS = 1
87 C      BETA = 25HTYPE FILE NAME AND RJET *
88 C      CALL MESSAGE (SND,0,3,1,FIN)
89 C      CALL MESSAGE (GET,0,2,1,FIN)
90 C      MASTER = BETA(1)
91 C      BCDOCT (BETA(2),J3,7,3)
92 C      TP = 62600000414270707070B
93 C      J3 = J3 + 120B
94 C      J4 = J1X + J1B
95 C      J5 = J2X + J1B
96 C      TP = (TP,UN,(J4,SHL,42),UN,(J5,SHL,36))
97 C
98 C      IOD 5 = INPUT (MASTER) (OLD CARDS)
99 C      IOD 6 = DOTRIX
100 C      IOD 7 = OUTPUT (TP4) (NEW CARDS)
101 C      IOD 8 = PRINTER (PRNT)
102 C
103 C      IF (BETA(1).EQ.EOM) GO TO 1
104 C      TP4 = 8RTRIT-OUT
105 C
106 C      22 NUOUT = (MASTER,SHL,6).INT.(7777777777777777700B).UN,1R*
107 C      INFO(1) = 4RTRIX
108 C
109 C      GENERATE AN INSTRUCTION FILE FOR TRIX
110 C      TO WORK ON. IN THIS CASE, SORT THE INCOMING FILE BY ID
111 C      NUMBER AND CREATE A NEW DATA FILE.
112 C
113 C      INFO(2) = 0
114 C
115 C      INITIALIZE TRIX
116 C      (DATA MANIPULATION ROUTINE)
117 C
118 C      FROST (22B,0,0,0,INFO,ER8)
119 C
120 C      SEND MESSAGE TO TRIX

```

```

12 C
13 INFO(1) = 2RAC
14 FROST (15B,0,3,1,INFO,ER8)
15 C
16 (ALL - CFF (BY ID NUMBER)
17 C
18 INFO(1) = 4REORT
19 INFO(2) = EOL
20 INFO(3) = MASTER
21 INFO(4) = EOL
22 INFO(5) = NUOUT
23 INFO(6) = EOL
24 INFO(7) = 4R 1-6
25 INFO(8) = EOL
26 INFO(9) = EOFL
27 C
28 CREATE FILE FOR TRIX COMMANDS
29 C
30 ACCESS (1,6RDOTRIX,6,0,20,ER4)
31 SETIO (6,6,INFO,6,413B)
32 REIO (6,1,0)
33 C
34 CLOSE FILE
35 C
36 ACCESS (19,6RDOTRIX,6,1,0,ER4)
37 INFO(1) = 10HRD(DOTRIX)
38 INFO(2) = EOL
39 FROST (15B,0,3,2,INFO,ER8)
40 FROST (17B,0,0,20,INFO,E6)
41 E7 INFO(1) = 3REND
42 INFO(2) = EOL
43 FROST (15B,0,3,2,INFO,ER8)
44 FROST (17B,0,0,20,INFO,E4)
45 C
46 OPEN THE NEW SORTED DATA FILE, GET IT'S SIZE
47 AND USE IT TO CREATE A NEW OUTPUT FILE OF THE SAME SIZE.
48 THIS NEW OUTPUT FILE IS TO BE PUNCHED AND REUSED AS INPUT
49 FOR THE NEXT RUN.
50 C
51 E5 ACCESS (3,NUOUT,5,0,0,ER5)
52 MSIZE = BETA(2).INT.7777777B
53 ACCESS (1,TP4,7,0,MSIZE+10,ER3)
54 INFO(1) = EOFL
55 INFO(2) = INFO(5) = 0
56 INFO(3) = 7RBOX T90
57 INFO(4) = 9RTRIT-DATA
58 SETIO (7,5,INFO,7,413B)
59 SZ = MSIZE + 2
60 REIO (7,1,SZ)
61 RDSIZE = 800
62 IF (MSIZE - RDSIZE) , 19
63 SETIO (5,MSIZE,1A,5,412B)
64 GO TO 20
65 19 SETIO (5,RDSIZE,1A,5,412B)
66 MSIZE = MSIZE - RDSIZE
67 C
68 DESTROY DOTRIX
69 C
70 20 FROST (201B,6,6RDOTRIX,0,ER4)
71 INFO(1) = 4RTRIX

```

```

181      FROST (22B,1,0,0,INFO,FIN)
182
183      C
184      GENERATE THE PRINTER FILES. ONE WILL BE SENT TO THE
185      RJET PRINTER AUTOMATICALLY, THE OTHER WILL RESIDE ON
186      DISK AS A BACKUP.
187
188      C
189      ACCESS (1,4PRNT,9,0,300004B,ER6)
190      ACCESS (1,5PRINT,8,0,300004B,ER6)
191      SETIO (9,5,INFO,5,413B)
192      SETIO (9,1,77777B)
193      SETIO (8,5,INFO,8,413B)
194      REIO (8,1,77777B)
195      DO 21 I = 1,800
196      21  I(A(I)) = 0
197      30  REIO (5,1,IDR)
198      LEN = (IOD(2,5).INT.3777776B)
199      IDR = IDR + LEN
200      I1 = -8
201      MSIZE = MSIZE - LEN
202      IF (IOD(4,5).EQ.EOF1) E0FTST,
203
204      C
205      SET UP TO READ REMAINING CARDS
206
207      C
208      SETIO (5,MSIZE,IA,5,412B)
209
210      C
211      CODE BEGINS LOOP HERE
212
213      C
214      32  I = I + KV
215      ADA = 0.
216      D1 = D2 = PREV = C = 0.
217      MRQTR = MRYR = MRLF = 0.
218      OLOTR = OLDYR = 0.
219      IF (I - (LEN-1)) .47
220      IF (I21(1).NE.EOF1) GO TO 33
221      I1 = I - KV
222      GO TO 47
223      33  M = .LOC.INFO(1)
224      MM = .LOC.IPRNT(40)
225      IDO = MM - M
226      DO A33 M = 1,IDO
227      A33 INFO(M) = 0.
228
229      C
230      ALL VALUES ARE READ AS INTEGER BECAUSE
231      OF BEING BIT-CONFIGURED.
232
233      C
234      NULIFE = LIFE(1)
235      NSLEV = NSL(1).SHL.18.UN.NSL1(1)
236      OSLEV = OS1(1)
237      KK(1) = OSLEV
238      KK(2) = OSDAY(1)
239      KK(3) = LIFE(1)
240      KK(4) = NSDAY(1)
241      KK(5) = NSLEV
242      KK(6) = NULIFE
243      KK(7) = LSD(1)
244      KK(8) = INFO(1)
245      KK(9) = MRQ(1).SHL.6.UN.MRQ1(1)
246      KK(10) = MRY(1)

```

```

241 KK(1) = MXL(1)
242 KK(2) = EX(1)
243 KK(13) = GOLD(1), SH, 6, UN, OOLD1(1)
244 KK(14) = OLYR(1)
245
246 C
247 C
248 C
249 C
250 C
251 C
252 C
253 C
254 C
255 C
256 C
257 C
258 C
259 C
260 C
261 C
262 C
263 C
264 C
265 C
266 C
267 C
268 C
269 C
270 C
271 C
272 C
273 C
274 C
275 C
276 C
277 C
278 C
279 C
280 C
281 C
282 C
283 C
284 C
285 C
286 C
287 C
288 C
289 C
290 C
291 C
292 C
293 C
294 C
295 C
296 C
297 C
298 C
299 C
300 C

```

CONVERT TO FLOATING NUMBERS
 EFLT (KK(1),OLEV,3,7)
 EFLT (KK(2),ODA,3,7)
 EFLT (KK(3),OLIFE,3,7)
 EFLT (KK(4),NDA,3,7)
 EFLT (KK(5),NLEV,3,7)
 EFLT (KK(6),OLIFE,3,7)
 EFLT (KK(7),EXP,3,7)
 EFLT (KK(8),INF,3,7)
 EFLT (KK(9),MQTR,3,7)
 EFLT (KK(10),MRYR,3,7)
 EFLT (KK(11),MRLF,3,7)
 EFLT (KK(12),GRUP,3,7)
 EFLT (KK(13),OLOTR,3,7)
 EFLT (KK(14),OLDYR,3,7)
 IF (NDA.LE.0.) GO TO R13
 IF (GRUP.EQ.0.) GO TO R1
 TO INSURE MQTR NOT GOING NEGATIVE, ADD .00001
 MQTR = MQTR + .00001
 ICND = 0
 QEND = 0.
 CHECK FOR CASE 11 - NO 1/2 LIFE CALC.
 IF ((EXP.GT.0.).AND.(GRUP.F0.2.)) GO TO R12
 IF (NLA.EQ.ODA) GO TO R2
 IF ((EXP.GT.0.).AND.(NLEV.EQ.0.)) GO TO R3
 CHECK FOR TIME SPAN OF NDA - ODA (CROSSING THE QUARTER)
 DO 35 N = 1,4
 IF ((NDA.GE.AQTR(N)).AND.(ODA.LT.AQTR(N))) QEND = AQTR(N)
 35 CONTINUE
 IF ((EXP.EQ.0.).AND.(QEND.EQ.0.)) ID0 = 1
 IF ((EXP.EQ.0.).AND.(QEND.NE.0.)) ID0 = 2
 IF ((EXP.NE.0.).AND.(QEND.NE.0.)) ID0 = 3
 IF ((EXP.NE.0.).AND.(QEND.EQ.0.)) ID0 = 4
 IF ((OLEV.EQ.0.).AND.(NLEV.EQ.0.)) GO TO E37
 IF (GRUP.EQ.2.) GO TO KASE2
 IF (NDA - ODA) NEXT1, R2
 IF ((OLEV.EQ.0.).AND.(EXP.NE.0.)) GO TO NEXT
 IF ((OLEV.EQ.0.) GO TO R4
 IF ((OLEV.EQ.NLEV).AND.(EXP.GT.0.)) GO TO NEXT
 IF (NLEV-0.) 34
 D2 = 0.42 * OLEV * OLIFE
 IF (QEND.NE.0.) GO TO A35
 GO TO A37
 A35 D3 = 0.42 * OLEV * OLIFE
 D1 = D3 * (1 - EXP(-.693 * (QEND - ODA) / OLIFE))
 D2 = D3 - D1
 D2 = D1 / 10.
 D2 = D2 / 10.

```

301      INF = (0.42 * NLEV * OLIFE) / 10.
302      OLQTR = MRQTR + D1
303      MRQTR = D2
304      MRYR = MRYR + MRQTR + D1
305      MRLF = MRLF + MRQTR + D1
306      IF (NDA - ODA) B37,R2,B37
307 C
308 C
309 C      CALC NEW 1/2 LIFE
310
311 34 GO TO (36,36,NEXT,NEXT) ID0
312 36 A = NDA - ODA
313   IF (OLEV.EQ.NLEV) GO TO R7
314   B = (A) * .693
315   D = OLEV/NLEV
316   E = LOG(D)
317   IF (E.EQ.0.) GO TO R7
318   C = B/E
319   IF (C.LT.0.) GO TO R5
320   IF (C.LT.4.) GO TO R6
321   IF (C.GT.12.) GO TO R7
322 C
323 C      NEW 1/2 LIFE
324
325 NEXT OLIFE = C
326 PREV = OLEV
327 GO TO (38,D36,A38,38) ID0
328 A38 PREV = NLEV * (EXPF (-.693 * (NDA - EXP) / OLIFE))
329   IF (EXP.EQ.0.) GO TO D38
330   IF (QEND.GE.EXP) GO TO B38
331   IF (QEND.LE.EXP) GO TO C38
332 C
333 C      QUARTER ENDED AND HAD EXPOSURE DAY BEFORE
334
335 B38 IF (QEND - 365.) B39,B39
336 PREV = NLEV * (EXPF (-.693 * (NDA - EXP) / OLIFE))
337 GO TO E39
338 B39 PREV = NLEV * (EXPF (-.693 * ((QEND - EXP) + NDA) / OLIFE))
339 E39 DOLD = 0.42 * OLEV * OLIFE * (1 - EXPF (-.693 * (EXP - ODA) / OLIFE))
340 DOLD = DOLD + 0.42 * PREV * OLIFE * (1 - EXPF (-.693 * (QEND - EXP) / OLIFE))
341 OLQTR = MRQTR + (DOLD / 10.)
342 DNEW = 0.42 * PREV * OLIFE * (EXPF (-.693 * (QEND - EXP) / OLIFE))
343 INF = (0.42 * OLIFE * NLEV) / 10.
344 IF (QEND - 365.) D39, ,
345 QEND = 1
346 D39 DNEW = DNEW * (1 - EXPF (-.693 * (NDA - QEND) / OLIFE))
347 MRQTR = DNEW / 10.
348 D1 = DOLD / 10.
349 D2 = DNEW / 10.
350 IF (NDA - ODA) E38,R2,
351 MRYR = MRYR + MRQTR + D1
352 MRLF = MRLF + MRQTR + D1
353 GO TO B37
354 C
355 C      QUARTER ENDED AND HAD EXPOSURE DAY AFTER
356
357 C38 DOLD = 0.42 * OLEV * OLIFE * (1 - EXPF (-.693 * (QEND - ODA) / OLIFE))
358 OLQTR = (DOLD / 10.) + MRQTR
359 DNEW = 0.42 * OLEV * OLIFE * (EXPF (-.693 * (QEND - ODA) / OLIFE))
360 IF (QEND - 365.) C39, ,
361 QEND = 1.

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```

361 338 PREV = PREV * (EXP(-.693 * (NDA - EXP) / OLIFE))
362 DNEW = DNEW * (1 - EXP(-.693 * (EXP - QEND) / OLIFE))
363 DNEW = DNEW * 0.42 + PREV * OLIFE * (1 - EXP(-.693 * (NDA - EXP) / OLIFE))
364 MROTR = DNEW / 10.
365 D1 = DOLD / 10.
366 D2 = DNEW / 10.
367 INF = (0.42 * NLEV * OLIFE) / 10.
368 IF (NDA - ODA) E38, R2.
369 MRMYR = MRMYR + MROTR * D1
370 MRMLF = MRMLF + MROTR * D1
371 GO TO B37
372
373 C C C
374 QUARTER INJED - 1/4 NO EXPOSURE DAY
375
376 338 DOLD = 0.42 * DLEV * OLIFE * (1 - EXP(-.693 * (QEND - ODA) / OLIFE))
377 DNEW = (DOLD / 10.) + MROTR
378 DNEW = 0.42 * OLIFE * OLIFE * (EXP(-.693 * (QEND - ODA) / OLIFE))
379 IF (QEND - 365.) A39,
380 QEND = 1
381 A39 DNEW = DNEW * (1 - EXP(-.693 * (NDA - QEND) / OLIFE))
382 MROTR = DNEW / 10.
383 D1 = DOLD / 10.
384 D2 = DNEW / 10.
385 INF = (0.42 * NLEV * OLIFE) / 10.
386 IF (NDA - ODA) E38, R2.
387 MRMYR = MRMYR + MROTR * D1
388 MRMLF = MRMLF + MROTR * D1
389 GO TO B37
390 E38 OLDYR = MRMYR + D1
391 MRMYR = D2
392 MRMLF = MRMLF + MROTR * D1
393 GO TO B37
394 F36 KK(1) = YR(1)
395 KK(1) = KK(1) + 1
396 IZ3(1) = IZ3(1) .INT.777777777777777700003.UN.(KK(1).INT.7777B)
397 GO TO D37
398 38 IF (NLEV EQ 0.) GO TO R4.
399 IF (EXP) 37, 37.
400
401 C C
402 CALC. D1
403 PREV = NLEV * (EXP(-.693 * (NDA - EXP) / OLIFE))
404 D1 = 0.42 * OLEV * OLIFE
405 D1 = D1 * (1 - EXP(-.693 * (EXP - ODA) / OLIFE))
406 37 IF (EXP = 0.) E37, E37
407 EXP = ODA
408
409 C C C
410 CALC. D2
411 E37 D2 = 0.42 * PREV * OLIFE
412 D2 = D2 * (1 - EXP(-.693 * (NDA - EXP) / OLIFE))
413
414 C C
415 A37 XD = 0.42 * NLEV * OLIFE
416
417 C C C
418 INF IS INFDO5
419 INF = XD / 10.
420 D1 = D1 / 10.
421 D2 = D2 / 10.

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```

421 C
422      MRQTR IS MRQ
423 C
424      MRQTR = MRQTR + D2 + D1
425 C
426      MRYSR IS MRY
427 C
428      MRYR = MRYR + D2 + D1
429 C
430      MRLF IS MRL
431 C
432      C37 MRLF = MRLF + D2 + D1
433      IF (EXP) = B37
434      IF (QEND = 0.) F37,
435      OLOTR = MRQTR + D1
436      MRQTR = D2
437      F37 (F (NDA - ODA) ,R2,B37
438      MRYR = MRQTR
439 C
440      BUILD NEW CARDS FOR PUNCHING. CONVERT FLOATING
441      NUMBERS TO INTEGER ( FOR BIT-CONFIGURATION ).
442      FIGHT ADJUSTED.
443 C
444      B37 IF (NDA - ODA) F38,
445      D37 I24(1) = I25(1) = I26(1) = I27(1) = 000000000000000000B
446      I28(1) = 00B
447      INFO(1) = OLIFE + .5
448      INFO(2) = NDA
449      INFO(3) = NLEV
450      INFO(5) = INF + .5
451      INFO(6) = MRQTR + .5
452      INFO(7) = MRYR + .5
453      INFO(8) = MRLF + .5
454      INFO(10) = D1 + D2 + .5
455      INFO(12) = GRUP
456      INFO(13) = OLOTR
457      INFO(14) = OLOYR
458      DO A46 M = 1,14
459      KK(M) = 0
460      CONVI (INFO(M),KK(M),1,9)
461      J = 6
462      B46 J1 = KK(M).INT.77B
463      IF (J1,NE,00B) GO TO A46
464      KK(M) = KK(M).SHR.6.INT.777777777B
465      J = J + 6
466      IF (J - 30) B46,B46,
467      A45 CONTINUE
468 C
469      MERGE DATA AND STORE ON CARD IMAGES
470 C
471      I24(1) = KK(2).SHL.42.UN.KK(3).SHL.18.UN.(KK(6).SHL.54.INT.777777B)
472      I25(1) = (KK(6).INT.77B).SHL.54.UN.KK(7).SHL.30.UN.KK(8)
473      I26(1) = KK(1).SHL.48.UN.KK(5).SHL.24
474      I27(1) = KK(12).SHL.36.UN.(KK(13).SHL.54.INT.777777B)
475      I28(1) = (KK(13).INT.77B).SHL.54.UN.KK(10).SHL.30.UN.KK(14)
476 C
477      STORE CROSSED QUARTER DATA
478 C
479      IF (QEND = 0.) 32,
480      ISLM(15) = 0(1)

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481 ISLIM(1S+2) = NME(1),SHL.42,UN.(NME1(1),SHL.42,INT.777777777777777B)
482 ISLIM(1S+3) = (NME1(1),INT.7777777B),SHL.42,UN.(NME2(1),SHL.42)
483 ISLIM(1S+4) = GOLD(1),SHL.6,UN.GOLD1(1)
484 ISLIM(1S+5) = EDL
485 IS = 1S + 6
486 46 GO TO 32
487 C
488 C NEW YEAR
489 C
490 NLXT1 IF (ODM - 366.) , P7
491 QEND = 366
492 IF (EXP.NE.O.) GO TO NEXT2
493 IF (OLEV.EQ.O.) GO TO R4
494 C
495 C CALC 1/2 LIFE
496 C
497 NLXT5 ADA = ((366. - ODA) + NDA) * .693
498 IF (GRUP.EQ.2.) GO TO NEXT4
499 IF (OLEV.EQ.NLEV) GO TO R7
500 NLXT3 IF (NLEV.EQ.O.) GO TO A35
501 IF (OLEV.EQ.O.) GO TO 70
502 O = OLEV / NLEV
503 E = LOG1(D)
504 IF (E.EQ.O.) GO TO P7
505 C = ADA / E
506 IF (GRUP.EQ.2.) GO TO NEXT7
507 IF (C.LT.O.) GO TO R5
508 IF (C.LT.4.) GO TO R6
509 IF (C.GT.12.) GO TO R7
510 NLXT6 OLIFE = C
511 QEND = 366.
512 GO TO A39
513 NLXT4 IF (OLEV.EQ.NLEV) GO TO 70
514 IF (ADA.LE.O.) GO TO NEXT8
515 GO TO NEXT3
516 NLXT7 IF (C.LE.O.) GO TO 70
517 IF (C.GT.12.) GO TO 70
518 IF (C.LE.3.99) GO TO R9
519 OLIFE = C
520 IF (QEND - O.) D38,37,D38
521 NLXT8 ADA = (NDA - ODA) * .693
522 GO TO NEXT3
523 NLXT2 IF (EXP - ODA) C38,B38,B36
524 C
525 C SET UP FOR PRINTER
526 C
527 47 CALL HEAD
528 ICOUNT = 1
529 I = 1
530 SETIO (8,14,IPRNT,8,413B)
531 SETIO (9,14,IPRNT,9,413B)
532 DO A47 M = 1,16
533 A47 KK(M) = 0
534 C
535 C PRINTER OUTPUT
536 C
537 50 KK(I) = ID(I)
538 C
539 C FOR CONVENIENCE, MOVE DATA
540 C TO SHORTER NAMES

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542 C      KK(2) = NME(1), SHL 42, UN, (NM 1(1), SHL 42, UN, 77777777)
543      KK(3) = NMAY(1), INT 7777777, SHL 42, UN, 77777777
544      KK(4) = OSDAY(1)
545      KK(5) = OSL(1)
546      KK(5) = LIFE(1)
547      KK(7) = MRQ(1), SHL 6, UN, MRQ(1)
548      KK(8) = MRY(1)
549      KK(9) = MRL(1)
550      KK(10) = INECOS(1)
551      KK(11) = YR(1)
552      J2 = ((KK(11), INT 77B), SHL 6), UN, 1CB), SHL 4B
553      KK(12) = EX(1)
554      KK(13) = MRS(1)
555      KK(14) = DOLD(1), SHL 6, UN, DOLD(1)
556      KK(15) = DYVR(1)
557      KK(16) = NSDAY(1)
558      J1 = ((KK(11), INT 7700B), SHL 54)
559      IF (KK(16), NE, 0) GO TO 52
560      IPRNT(1) = KK(1), SHL 1B
561      IPRNT(2) = KK(2)
562      IPRNT(3) = KK(3)
563      IPRNT(4) = KK(13)
564      IPRNT(5) = KK(15), SHL 1B, UN, J1
565      IPRNT(6) = KK(4), SHL 30, UN, J2
566      IPRNT(6) = IPRNT(6), UN, KK(5), SHL 4B, INT 77 7B
567      IPRNT(7) = ((KK(5), INT 77DOB), UN, 1B), SHL 1B
568      IPRNT(8) = ((KK(5), INT 77B), SHL 4B
569      IPRNT(7) = IPRNT(7), UN, IPRNT(8), UN, KK(7), SHL 6
570      KK(9) = KK(9), SHL 4B
571      IPRNT(8) = KK(8), SHL 30, UN, (KK(9), INT 7777B)
572      IPRNT(9) = KK(8), INT 77777700000000C0D0B, UN, KK(10)
573      IPRNT(10) = KK(6), SHL 24
574      IPRNT(11) = KK(12), SHL 3B
575      IPRNT(12) = KK(13), SHL 30
576      IPRNT(13) = SOL
577      IPRNT(14) = EOL
578      REIO = 18, [DWP]
579      IDWP = [DWP + 14]
580      REIO = 9, [IDWP]
581      IDWP = IDWP + 14
582      ICOUNT = ICOUNT + 1
583      DO 51, I = 1, 14
584      51 IPRNT(I) = 0
585      IF (I, 1) RELEOF
586      IF (ICOUNT - 18) 50
587      CALL HEAD
588      ICOUNT = 1
589      GO TO 50
590
591 C      END OF PRINTER
592
593 C      END OF FILE CONDITION TEST
594
595 C      EOFST REIO (5, 1, DR)
596
597 C      IF ((OOF(4, 5), EQ, EOF)) RELEOF
598
599 C      LEN = ((OOF(2, 5), INT 370777B)

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607      IDW = IDW + LEN
608      SIZE = SIZE + LEN
609      IF (LEN) = 32
610      IN(4) = IN(4) + 0
611      INFO(2) = 78304.190
612      INFO(3) = 78304.190
613      WRITE NEW DECK
614      SETIO (7,1,1,7,413B)
615      REIO (7,1,1DWP)
616      IDW = IDW + 1
617      PUT ENDING ID ON NEW CARD FILE
618      SETIO (7,4,INFO,7,413B)
619      REIO (7,1,1DWP)
620      IDW = IDW + 4
621      INFO(3) = 78304.190
622      PUT ENDING ID ON PRINTER FILE
623      WRITE OUT CROSSED QUARTER DATA
624      IF (ISLIM) = 55,55,
625      IPRT(1) = TOP
626      SETIO (8,1,1,PRNT,8,413B)
627      SETIO (9,1,1,PRNT,9,413B)
628      REIO (8,1,1DWP)
629      REIO (9,1,1DWP)
630      IDWP = IDWP + 1
631      IWP = IWP + 1
632      IPRT(1) = 0
633      IPRT(3) = 10THE FOLLOW
634      IPRT(4) = 10HING PERSON
635      IPRT(5) = 10MS HAVE CRO
636      IPRT(6) = 10MSFO THE Q
637      IPRT(7) = 10QUARTER
638      IPRT(8) = EOL
639      CALL CLOCK (BETA(1),BETA(2))
640      IPRT(10) = BETA(1)
641      IPRT(11) = BETA(2)
642      IPRT(12) = IPRT(13) = EOL
643      IPRT(14) = " ID
644      IPRT(15) = " NAME "
645      IPRT(16) = "LAST QTR. "
646      IPRT(17) = IPRT(20) = EOL
647      SETIO (8,20,IPRT,8,413B)
648      REIO (8,1,1DWP)
649      IDWP = IDWP + 20
650      SETIO (9,20,IPRT,9,413B)
651      REIO (9,1,1DWP)
652      IWP = IWP + 20
653      SETIO (8,15,ISLIM,8,413B)
654      REIO (8,1,1DWP)
655      IDWP = IDWP + 15
656      SETIO (9,15,ISLIM,9,413B)
657      REIO (9,1,1DWP)
658      IWP = IWP + 15

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661 55 CONTINUE
662 SETIO (8,4,INFO,9,4133)
663 REIO (8,1,OWP)
664 IOWP = IOWP + 4
665 SETIO (9,4,INFO,9,4133)
666 REIO (9,1,IWP)
667 IWP = IWP + 4
668
669 SHINK FILE SIZE
670
671 FROST (12,OR,9,SRPRINT,IOWP,ER7)
672 FROST (12,OR,9,SRPRINT,IWP,ER7)
673
674 CLOSE FILES
675
676 ACCESS (19,TP4,7,1,IOW,FIN)
677 ACCESS (19,NUCJT,5,1,OR,FIN)
678 ACCESS (19,SRPRINT,9,0,IOW,FIN)
679 ACCESS (19,SRPRINT,8,1,IWP,FIN)
680
681 CHANGE NAME AND GIVE TO RJET
682
683 E2 CALL CHN (SRPRINT,TP)
684 CALL GIVE (TP,000002)
685
686 DESTROY + FILE
687
688 NONE FROST (4,1,0,0,0,0,DONE)
689 E6 IF (INFO.EQ.7777777777777777B) GO TO E7
690 GO TO FIN
691
692 E4 IF (INFO.EQ.7777777777777777B) GO TO E5
693 GO TO FIN
694
695 E3 IF (INFO.EQ.3RTP4) GO TO E2
696 IF (INFO.EQ.8RALL DONE) GO TO E2
697 IF (INFO.EQ.7777777777777777B) GO TO E2
698 GO TO FIN
699
700 FOR CHRONIC EXPOSURE (EX = 2)
701
702 KASE2 CONTINUE
703 T1 = D.
704 IF ((OLEV.EQ.0).OR.(NLEV.EQ.0.)) GO TO A60
705 B60 IF (NDA - ODA) 62,R2,
706 IF (NDA - O.) R2,R2,
707 IF (OEND - 0.) NEXT4
708 61 IF (OLEV - NLEV) 60, NEXT4
709 IF ((OLEV.LE.0.0001).OR.(NLEV.LE.0.0001)) GO TO 60
710
711 CALC. 1/2 LIFE
712
713 A = NDA - ODA
714 B = (A) * .693
715 D = OLEV / NLEV
716 E = LOGI (D)
717 IF (E.EQ.0.) GO TO 60
718 C = B / E
719 PREV = OLEV
720 IF (C.LE.0.) GO TO 60

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```

721 IF (C.GT.12.) GO TO 60
722 IF (C.LE.3.99) GO TO R9
723 OLIFE = C
724 IF (QEND - 0.) 70, 70
725 GO TO 37
726 D2 = 0.29 * ((OLEV + NLEV) / 2.) * (NDA - ODA)
727 GO TO A37
728 UEND = 366
729 GO TO NEXT5
730 A60 NLEV = NLEV + .00001
731 OLEV = OLEV + .00001
732 GO TO B60
733 C
734 C
735 C
736 70 IF (QEND.GE.365.) GO TO 75
737 ADA = NDA - ODA
738 81 KOLD = ((NLEV - OLEV) / ADA) * ((QEND - ODA) / 2)
739 KOLD = KOLD + OLEV
740 DOLD = KOLD * 0.29 * (QEND - ODA)
741 IF (T1 - 0.) , 82
742 83 KNEW = ((NLEV - OLEV) / ADA) * (((NDA + QEND) / 2) - ODA)
743 KNEW = KNEW + OLEV
744 DNEW = KNEW * 0.29 * (NDA - QEND)
745 D1 = DOLD / 10.
746 D2 = DNEW / 10.
747 OQTR = MRQTR + D1
748 MRQTR = D2
749 MRLF = MRLF + MRQTR + D1
750 INF = (0.42 * NLEV * OLIFE) / 10.
751 IF (T1 - 0.) , A78
752 B78 IF (QEND.GE.365.) GO TO 76
753 MRQTR = D2
754 MRYR = MRYR + MRQTR + D1
755 GO TO B37
756 A78 QEND = T1
757 NDA = BDA
758 GO TO B78
759 76 OLDYR = MRYR + D1
760 MRYR = MRQTR = D2
761 MRQTR = D2
762 GO TO F38
763 75 ADA = ((366. - ODA) + NDA)
764 DOLD = 0.29 * NLEV * (QEND - ODA)
765 T1 = QEND
766 QEND = 1.
767 DNEW = 0.29 * NLEV * (NDA - QEND)
768 IF (T1 - 0.) , 80
769 GO TO 81
770 80 QEND = T1
771 GO TO 81
772 82 BDA = NDA
773 NDA = NDA + QEND
774 GO TO 83
775 C
776 C
777 C
778 EPROR STATEMENTS
779 ER1 BETA = 23HCANNOT CREATE DROP FILE
780 M1 = 3
781 GO TO MSG

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781 ER2 BETA = 254 CANNOT WRITE OUTPUT FILE
782 M1 = 3
783 GO TO MSG
784 ER3 BETA = 254 CANNOT CREATE OUTPUT FILE
785 M1 = 3
786 GO TO MSG
787 ER4 BETA = 354 CANNOT WRITE MATRIX CREATE OR CLOSE
788 M1 = 4
789 GO TO MSG
790 ER5 BETA = 104 CANNOT CREATE NUOUT
791 M1 = 2
792 GO TO MSG
793 ER6 BETA = 244 CANNOT CREATE PRINT FILE
794 M1 = 3
795 GO TO MSG
796 ER7 BETA = 274 CANNOT CLOSING OUTPUT FILE
797 M1 = 3
798 GO TO MSG
799 ER8 BETA = 144 BAD FROST CALL
800 M1 = 2
801 GO TO MSG
802 FIN BETA = 114 BAD MESSAGE
803 M1 = 2
804 MSG CALL MESSAGE (SND,0,M1,1,FIN)
805
806 C LEAVE + FILE
807 C
808 C FINI FROST (4,0,0,0,0,0,FINI)
809 C
810 C
811 R1 INFO(2) = 10HGROUP = 0
812 GO TO R10
813 R2 INFO(2) = 10HNDAY = 0DA
814 INFO(3) = 1HY
815 GO TO R10
816 R3 INFO(2) = 10HEXP > 0 AN
817 INFO(3) = 10HD NLEV = 0
818 GO TO R10
819 R4 INFO(2) = 10HOLEV OR NL
820 INFO(3) = 10HEV = 0
821 GO TO R10
822 R5 INFO(2) = 10HT 1/2 < 0
823 GO TO R10
824 R6 INFO(2) = 10HT 1/2 < 4
825 GO TO R10
826 R7 INFO(2) = 10HT 1/2 > 12
827 GO TO R10
828 R8 INFO(2) = 10HODAY > 365
829 GO TO R10
830 R12 INFO(2) = 10HEXP > 0 AN
831 INFO(3) = 10HGROUP = 2
832 GO TO R10
833 R13 INFO(2) = 10HNO NEW SAM
834 INFO(3) = 10HPLE DAY
835 GO TO R10
836 R9 INFO(2) = 10HT 1/2 < 3
837 INFO(3) = 2H99
838 R10 INFO(1) = 10HERRCR IS
839 INFO(4) = EOL
840 INFO(5) = EOL

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901 IPRNT(1) = TOP
902 SETIO (8,1,IPRNT,8,413B)
903 REIO (8,1,1DWP)
904 1DWP = 1DWP + 1
905 SETIO (9,1,IPRNT,9,413B)
906 REIO (9,1,1WP)
907 1WP = 1WP + 1
908 DO 102 M = 1,40
909 102 IPRNT(M) = 0
910 IPRNT(4) = "ARMEM"
911 IPRNT(5) = "MREM"
912 IPRNT(6) = "LAST MIC"
913 IPRNT(7) = "EO"
914 IPRNT(7) = IPRNT(7).UN.0101010101010101B
915 IPRNT(11) = "PREV"
916 IPRNT(12) = "10H PREV S"
917 IPRNT(13) = "10HAMPLE CUR"
918 IPRNT(14) = "10H1ES MREM"
919 IPRNT(15) = "10H MREM M"
920 IPRNT(16) = "10HREM MREM"
921 IPRNT(19) = "MREM/"
922 IPRNT(19) = IPRNT(19).UN.0101010101B
923 IPRNT(20) = "10H ID"
924 IPRNT(21) = "10H NAME"
925 IPRNT(23) = "10HQUAR"
926 IPRNT(24) = "YEAR"
927 IPRNT(25) = "10HDAY LIT"
928 IPRNT(26) = "10HRE QUAR"
929 IPRNT(27) = "10H YEAR L"
930 IPRNT(28) = "10HIFE INF"
931 IPRNT(29) = "10H T 1/2"
932 IPRNT(30) = "10H GROUP"
933 IPRNT(31) = "SAMPLE"
934 IPRNT(31) = IPRNT(31).UN.01010101B
935 IPRNT(32) = IPRNT(33) = EOL
936 SETIO (9,33,IPRNT,9,413B)
937 REIO (9,1,1WP)
938 1WP = 1WP + 33
939 SETIO (8,33,IPRNT,8,413B)
940 REIO (8,1,1DWP)
941 1DWP = 1DWP + 33
942 DO 104 M = 1,40
943 104 IPRNT(M) = 0
944 RETURN HEAD
945 END

```