X-565-67-349

NASA TM X-55878

A PROGRAM FOR LISTING OF ORB3A TAPES

HENRY G. LINDER

JULY 1967

NASA

GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND

X-565-67-349

A PROGRAM FOR LISTING OF ORB3A TAPES

Henry G. Linder

July 1967

GODDARD SPACE FLIGHT CENTER
Greenbelt, Maryland

CONTENTS

ILLUSTRATIONS

A PROGRAM FOR LISTING OF ORB3A TAPES

Henry G. Linder

I. INTRODUCTION

Purpose

The Program for Listing of ORB3A Tapes provides a capability to check orbit numbers and orbit start and stop times by listing them on a computer generated printout. The ORB3A orbit tapes are checked for correct record format and for correct parity. Error exits are provided in the tape read routine that give appropriate diagnostic messages to the user in case of read errors.

This program has proven to be an aid in setting up production runs of orbit attitude programs.

II. OPERATING INSTRUCTIONS

Requirements

This program is executed as a normal job on a Univac 1107 or 1108 computer with an EXEC II system. As illustrated by the process flow diagram, Figure 1, it utilizes a minimum of two tape drives, the card reader, and the printer. An additional tape transport should be provided for swapping, if more than one orbit tape is to be listed.

Input

Input consists of the following:

1. A run deck including a program control card
2. The program tape
3. ORB3A orbit tape(s)

Run Deck—The run deck consists of EXEC II control cards and program parameter cards. Figure 2 shows the typical setup of the run deck.

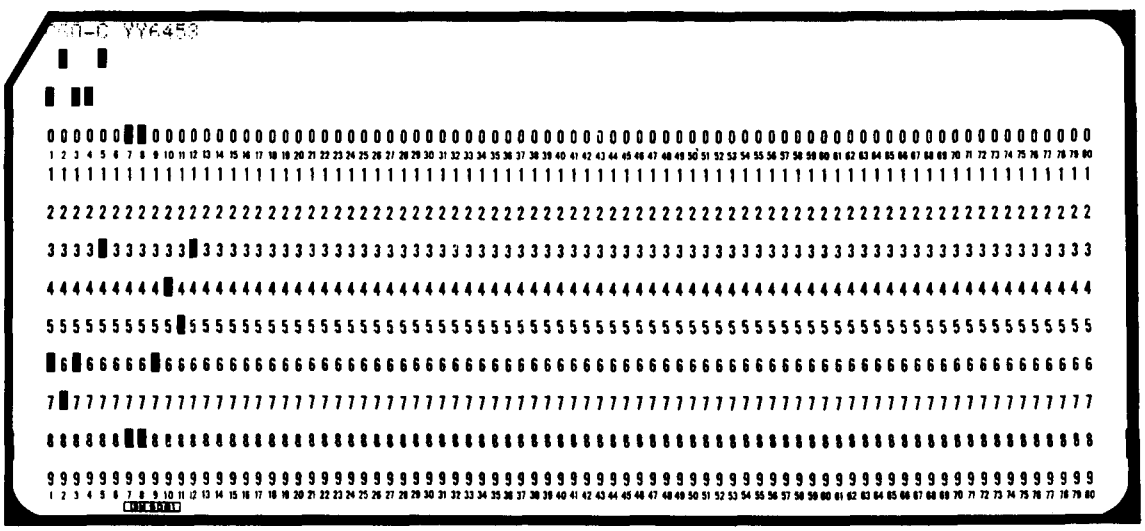
The first program parameter card contains the number of orbit tapes to be listed. The format is as follows:

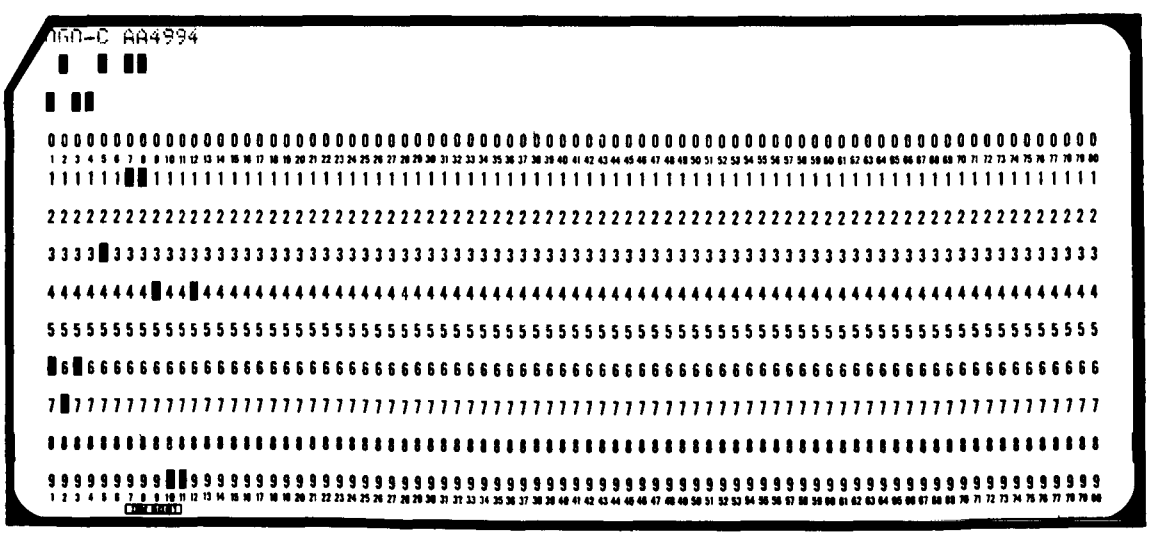
Column	Description	Type	Comments
1-5	Number of input tapes	I5	If blank, one tape is assumed

The cards following the first parameter card contain the name of the satellite, and the physical orbit tape number for each tape. The format is as follows:

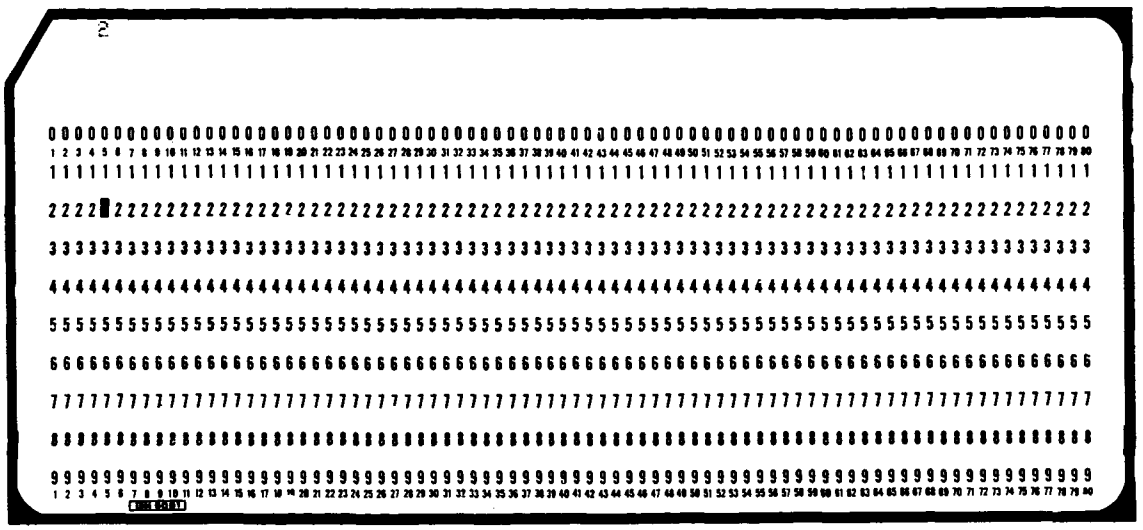
Column	Description	Type	Comments
1-6	Satellite Name	A6	Up to six characters for the name
7-12	Tape Number	A6	Up to six characters

Example of program parameter cards:





Example of program parameter cards (continued):



Output

A sample of the printed output is shown in Figures 3A, 3B, and 3C.

III. PROGRAM DESCRIPTION

The execution of the program begins with the main routine REDORB. It reads the program parameter cards and initializes internal program variables. The tape read buffer subroutine is initialized by calling READA which specifies the following arguments: the logical tape transport, the buffer area to be used by the routine, the length of the record, and the tape re-read option to be followed in case of read error. READA also reads one record into the specified buffer. The call READB performs the transfer of the buffer record into the data area and initiates the reading of the next physical record into the buffer area. The first record is a label record and the appropriate label information is printed out. The date, day of year, and the start and stop time of the satellite orbit data are printed after printing the identification of the satellite and printing of the physical orbit tape number. The subroutine MILSEC converts seconds of day into hours, minutes, and seconds. The next physical record is called by the subroutine READB and the program begins searching data record after data record for an ascending node crossing item. Each ascending node crossing signifies the beginning of a new orbit. At each ascending node crossing the following items are printed: orbit number, date, day of year, orbit start time, and orbit end time. Orbit start time and orbit end time are converted by subroutine

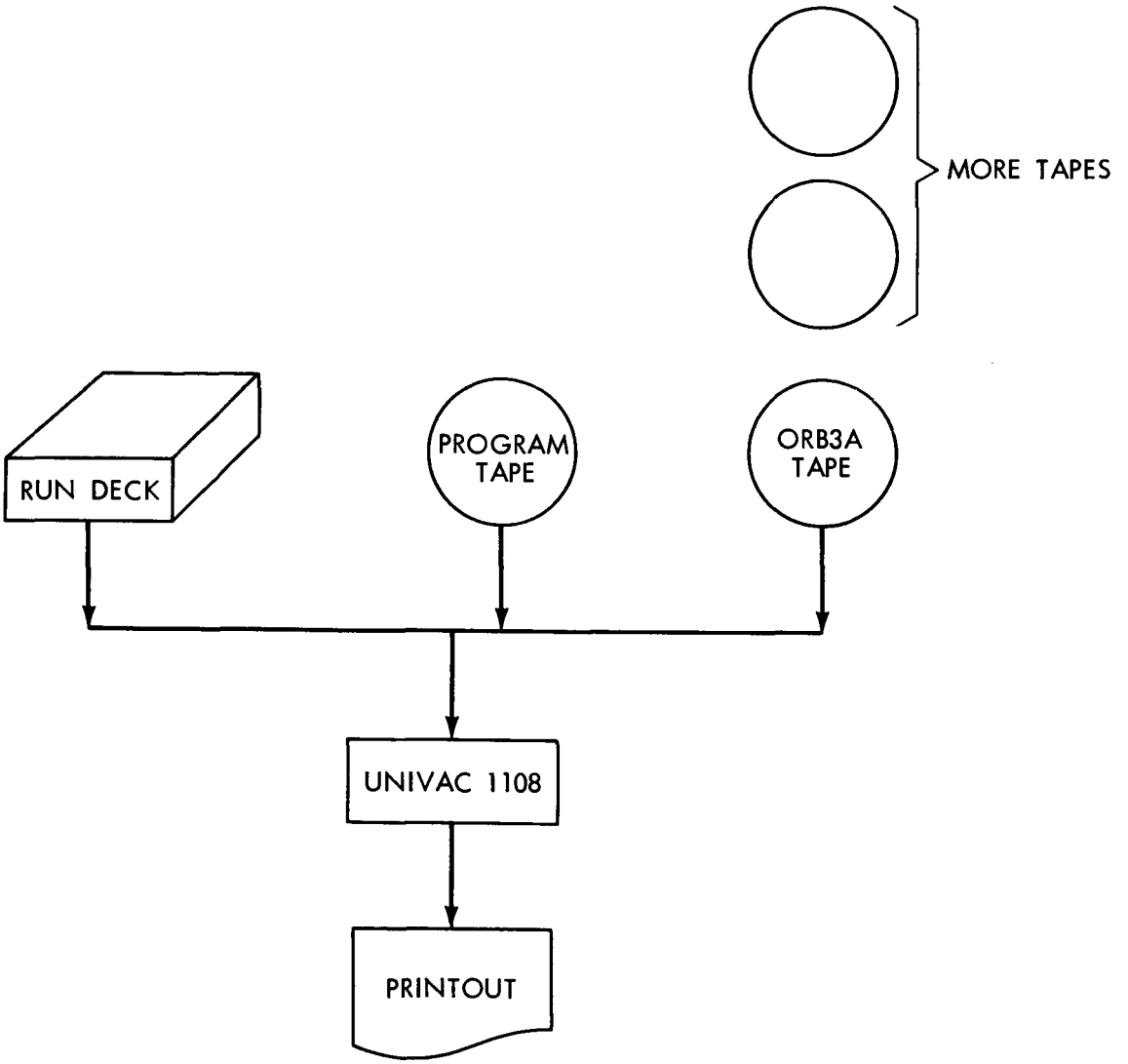


Figure 1. Process Flow Diagram

MILSEC from seconds of day to hours, minutes, and seconds. The program repeats the above steps for each orbit until it encounters an end of data mark signifying the end of data on the tape. The program continues by swapping to a new orbit tape, if more than one tape is to be listed, otherwise the program stops by exiting. The previous orbit tape is rewound after swapping is performed by subroutine SWAP.

The printed output is listed on consecutively numbered pages for proper identification.

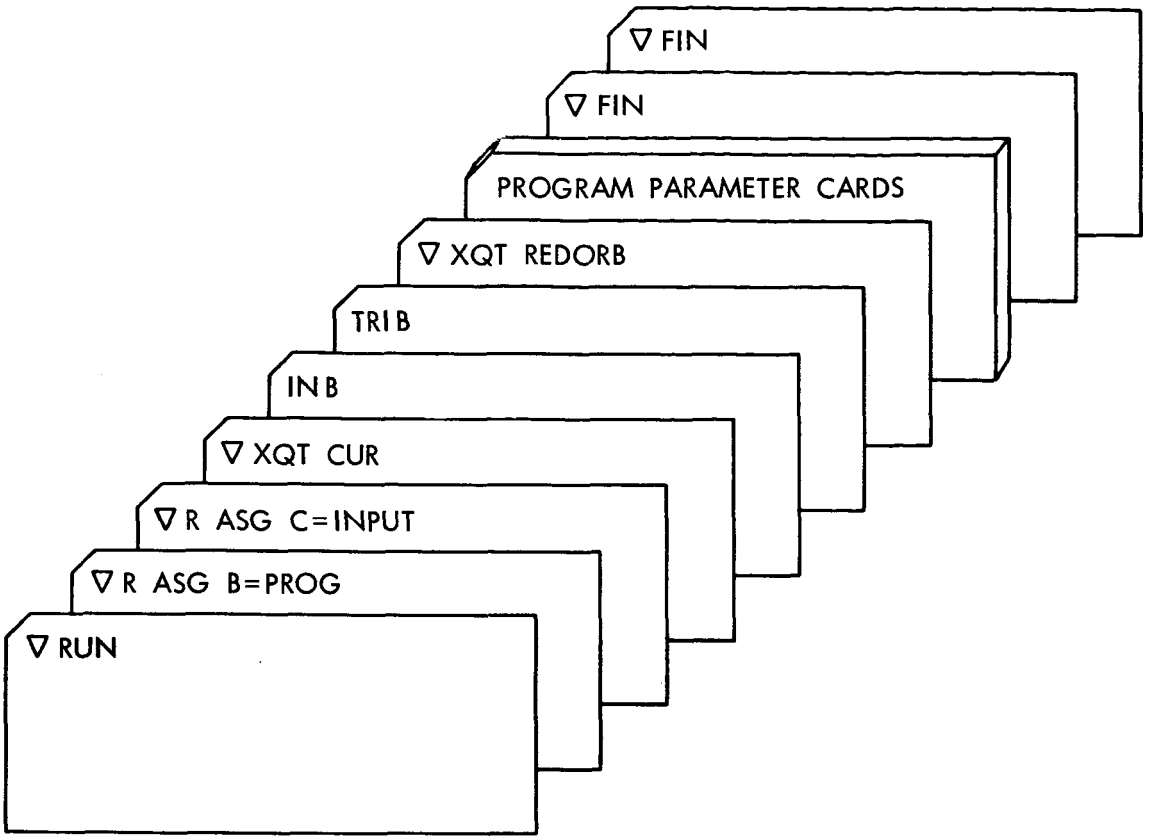


Figure 2. Run Deck Structure

A listing of the main program and the subroutines is enclosed as Figures 4 through 6. The flow chart for the main routine is included as Figure 7. The format of the ORB3A tape is given in Figure 8.

IV. CONCLUSIONS

The above described program has found extensive use in setting up production runs of the attitude orbit program. The ORB3A orbit tapes were checked for readability while the program listed the start and stop times of orbits that had to be correlated with housekeeping data from decom runs.

PAGE 1

SATELLITE OGO-C ID 65811 0
ORBIT TAPE NO.AA4994

START TIME OF SATELLITE DATA

DATE	DAY OF YEAR	SEC OF DAY	HR	MIN	SEC
651014	287	48000	13	20	0.

END OF SATELLITE DATA

DATE	DAY OF YEAR	SEC OF DAY	HR	MIN	SEC
651112	316	0	0	0	0.

ORBIT NO.	START TIME					STOP TIME			
	DATE	DAY OF YEAR	HR	MIN	SEC	DAY	HR	MIN	SEC
*****	651014	287	13	20	0.	287	14	17	0.
1	651014	287	14	17	49.	287	16	2	0.
2	651014	287	16	2	16.	287	17	46	0.
3	651014	287	17	46	44.	287	19	31	0.
4	651014	287	19	31	11.	287	21	15	0.
5	651014	287	21	15	39.	287	23	0	0.
6	651014	287	23	0	6.	288	0	44	0.
7	651015	288	0	44	33.	288	2	29	0.
8	651015	288	2	29	0.	288	4	13	0.
9	651015	288	4	13	28.	288	5	57	0.
10	651015	288	5	57	55.	288	7	42	0.
11	651015	288	7	42	22.	288	9	26	0.
12	651015	288	9	26	50.	288	11	11	0.
13	651015	288	11	11	17.	288	12	55	0.
14	651015	288	12	55	44.	288	14	40	0.
15	651015	288	14	40	12.	288	16	24	0.
16	651015	288	16	24	39.	288	18	9	0.
17	651015	288	18	9	6.	288	19	53	0.
18	651015	288	19	53	34.	288	21	38	0.
19	651015	288	21	38	1.	288	23	22	0.
20	651015	288	23	22	28.	289	1	6	0.
21	651016	289	1	6	56.	289	2	51	0.
22	651016	289	2	51	23.	289	4	35	0.
23	651016	289	4	35	50.	289	6	20	0.
24	651016	289	6	20	18.	289	8	4	0.
25	651016	289	8	4	45.	289	9	49	0.
26	651016	289	9	49	12.	289	11	33	0.
27	651016	289	11	33	39.	289	13	18	0.
28	651016	289	13	18	7.	289	15	2	0.
29	651016	289	15	2	34.	289	16	47	0.
30	651016	289	16	47	1.	289	18	31	0.
31	651016	289	18	31	29.	289	20	15	0.
32	651016	289	20	15	56.	289	22	0	0.
33	651016	289	22	0	23.	289	23	44	0.
34	651016	289	23	44	51.	290	1	29	0.
35	651017	290	1	29	18.	290	3	13	0.
36	651017	290	3	13	45.	290	4	58	0.
37	651017	290	4	58	12.	290	6	42	0.
38	651017	290	6	42	40.	290	8	27	0.
39	651017	290	8	27	7.	290	10	11	0.
40	651017	290	10	11	34.	290	11	56	0.
41	651017	290	11	56	1.	290	13	40	0.
42	651017	290	13	40	29.	290	15	24	0.
43	651017	290	15	24	56.	290	17	9	0.
44	651017	290	17	9	23.	290	18	53	0.
45	651017	290	18	53	51.	290	20	38	0.

Figure 3A. Sample of Printed Output

ORBIT No.	START TIME					STOP TIME			
	DATE	DAY OF YEAR	HR	MIN	SEC	DAY	HR	MIN	SEC
46	651017	290	20	38	18.	290	22	22	0.
47	651017	290	22	22	45.	291	0	7	0.
48	651018	291	0	7	12.	291	1	51	0.
49	651018	291	1	51	40.	291	3	36	0.
50	651018	291	3	36	7.	291	5	20	0.
51	651018	291	5	20	34.	291	7	5	0.
52	651018	291	7	5	1.	291	8	49	0.
53	651018	291	8	49	29.	291	10	33	0.
54	651018	291	10	33	56.	291	12	18	0.
55	651018	291	12	18	23.	291	14	2	0.
56	651018	291	14	2	50.	291	15	47	0.
57	651018	291	15	47	18.	291	17	31	0.
58	651018	291	17	31	45.	291	19	16	0.
59	651018	291	19	16	12.	291	21	0	0.
60	651018	291	21	0	39.	291	22	45	0.
61	651018	291	22	45	7.	292	0	29	0.
62	651019	292	0	29	34.	292	2	14	0.
63	651019	292	2	14	1.	292	3	58	0.
64	651019	292	3	58	28.	292	5	42	0.
65	651019	292	5	42	56.	292	7	27	0.
66	651019	292	7	27	23.	292	9	11	0.
67	651019	292	9	11	50.	292	10	56	0.
68	651019	292	10	56	17.	292	12	40	0.
69	651019	292	12	40	44.	292	14	25	0.
70	651019	292	14	25	12.	292	16	9	0.
71	651019	292	16	9	39.	292	17	54	0.
72	651019	292	17	54	6.	292	19	38	0.
73	651019	292	19	38	33.	292	21	23	0.
74	651019	292	21	23	0.	292	23	7	0.
75	651019	292	23	7	28.	293	0	51	0.
76	651020	293	0	51	55.	293	2	36	0.
77	651020	293	2	36	22.	293	4	20	0.
78	651020	293	4	20	49.	293	6	5	0.
79	651020	293	6	5	17.	293	7	49	0.
80	651020	293	7	49	44.	293	9	34	0.
81	651020	293	9	34	11.	293	11	18	0.
82	651020	293	11	18	38.	293	13	3	0.
83	651020	293	13	3	5.	293	14	47	0.
84	651020	293	14	47	32.	293	16	31	0.
85	651020	293	16	31	60.	293	18	16	0.
86	651020	293	18	16	27.	293	20	0	0.
87	651020	293	20	0	54.	293	21	45	0.
88	651020	293	21	45	21.	293	23	29	0.
89	651020	293	23	29	48.	294	1	14	0.
90	651021	294	1	14	16.	294	2	58	0.
91	651021	294	2	58	43.	294	4	43	0.
92	651021	294	4	43	10.	294	6	27	0.
93	651021	294	6	27	37.	294	8	12	0.
94	651021	294	8	12	4.	294	9	56	0.
95	651021	294	9	56	31.	294	11	40	0.

Figure 3B. Sample of Printed Output

ORBIT NO.	START TIME					STOP TIME			
	DATE	DAY OF YEAR	HR	MIN	SEC	DAY	HR	MIN	SEC
96	651021	294	11	40	59.	294	13	25	0.
97	651021	294	13	25	26.	294	15	9	0.
98	651021	294	15	9	53.	294	16	54	0.
99	651021	294	16	54	20.	294	18	38	0.
100	651021	294	18	38	47.	294	20	23	0.
101	651021	294	20	23	14.	294	22	7	0.
102	651021	294	22	7	42.	294	23	52	0.
103	651021	294	23	52	9.	295	1	36	0.
104	651022	295	1	36	36.	295	3	21	0.
105	651022	295	3	21	3.	295	5	5	0.
106	651022	295	5	5	30.	295	6	49	0.
107	651022	295	6	49	57.	295	8	34	0.
108	651022	295	8	34	24.	295	10	18	0.
109	651022	295	10	18	52.	295	12	3	0.
110	651022	295	12	3	19.	295	13	47	0.
111	651022	295	13	47	46.	295	15	32	0.
112	651022	295	15	32	13.	295	17	16	0.
113	651022	295	17	16	40.	295	19	1	0.
114	651022	295	19	1	7.	295	20	45	0.
115	651022	295	20	45	34.	295	22	30	0.
116	651022	295	22	30	1.	296	0	14	0.
117	651023	296	0	14	28.	296	1	58	0.
118	651023	296	1	58	56.	296	3	43	0.
119	651023	296	3	43	23.	296	5	27	0.
120	651023	296	5	27	50.	296	7	12	0.
121	651023	296	7	12	17.	296	8	56	0.
122	651023	296	8	56	44.	296	10	41	0.
123	651023	296	10	41	11.	296	12	25	0.
124	651023	296	12	25	38.	296	14	10	0.
125	651023	296	14	10	5.	296	15	54	0.
126	651023	296	15	54	32.	296	17	38	0.
127	651023	296	17	38	59.	296	19	23	0.
128	651023	296	19	23	27.	296	21	7	0.
129	651023	296	21	7	54.	296	22	52	0.
130	651023	296	22	52	21.	297	0	36	0.
131	651024	297	0	36	48.	297	2	21	0.
132	651024	297	2	21	15.	297	4	5	0.
133	651024	297	4	5	42.	297	5	50	0.
134	651024	297	5	50	9.	297	7	34	0.
135	651024	297	7	34	36.	297	9	19	0.
136	651024	297	9	19	3.	297	11	3	0.
137	651024	297	11	3	30.	297	12	47	0.
138	651024	297	12	47	57.	297	14	32	0.
139	651024	297	14	32	24.	297	16	16	0.
140	651024	297	16	16	51.	297	18	1	0.
141	651024	297	18	1	18.	297	19	45	0.
142	651024	297	19	45	46.	297	21	30	0.
143	651024	297	21	30	13.	297	23	14	0.
144	651024	297	23	14	40.	298	0	59	0.
145	651025	298	0	59	7.	298	2	43	0.

Figure 3C. Sample of Printed Output

```
@ ELT REDORB,1,670719, 44550

000001                DIMENSION BUFFER (500),DATA(253),IDATA(253)
000002                READ 150,NOTAPE
000003           150  FORMAT(I5)
000004                IF (NOTAPE.EQ.0) NOTAPE=1
000005                ITAPE=1
000006              2 ITEM=0
000007                IFLAG=0
000008                IPAGE=1
000009                READ 1,SAT,TAPNO
000010            1   FORMAT(2A6)
000011                CALL READA(2,BUFFER,253,-5)
000012                CALL READB(NOREC,DATA,$100,$200)
000013           C  LABEL RECORD
000014                DO 5 I=2,15
000015            5   IDATA(I-1)=DATA(I)
000016           C  PRINT  HEADING
000017                PRINT 4,IPAGE,SAT,IDATA(2),IDATA(3),TAPNO
000018            4   FORMAT(5H1PAGE,I3/40X,10HSATELLITE ,A6,6X,2HID,2I7 /40X,
000019               1 14HORBIT TAPE NO.,A6)
000020                PRINT 6
000021            6   FORMAT(10X,28HSTART TIME OF SATELLITE DATA,10X,
000022               1 21HEND OF SATELLITE DATA/
J00023               2                2(5X,4HDATE,2X,11HDAY OF YEAR,2X,10HSEC OF DAY,
000024               3 2X,10HHR MIN SEC))
000025                CALL MILSEC(IDATA(6)*1000 ,IDAY ,IHOUR ,IMIN, SEC )
000026                CALL MILSEC(IDATA(9)*1000 ,IDAYS,IHOURS,IMINS,SECS)
000027                PRINT 10, IDATA(4),IDATA(5),IDATA(6),IHOUR,IMIN,SEC,IDATA(7),
```

Figure 4A. Listing of Main Program REDORB

```
000028              1 IDATA(8),IDATA(9),IHOURS,IMINS,SECS
000029           10   FORMAT (2(4X,I6,5X,I3,7X,I7,4X,I2,I4,F5.0))
000030                ILINE=7
000031           14   CALL READB (NOREC,DATA,$100,$200)
000032                IF (IFLAG.NE.0) GOTO 17
000033                I=1
000034                IF (DATA(I+1).EQ.2.0) GO TO 28
000035                DATA (22)=1000000
000036                GO TO 29
000037           28   IFLAG=1
000038                GO TO 29
000039           17   DO 15 I=1,211,21
000040                IF (DATA(I+1).EQ.2.0) GO TO 25
000041                IF (DATA(I+1).GT.7.0)GOTO 100
000042           15   CONTINUE
000043                ISTOP=(DATA(215)+0.001)*1000
000044                ISDAY=DATA(214)
000045                ITEM=ITEM+11
000046                GO TO 14
000047           25   IF (I.EQ.1) GO TO 27
000048                ISTOP=(DATA(I-17)+0.001)*1000
000049                ISDAY=DATA(I-18)
000050           27   CALL MILSEC( ISTOP,DUM,IHOUR,IMIN,SEC)
000051                PRINT 30,ISDAY,IHOUR,IMIN,SEC
000052           30   FORMAT(1H+,48X,2I3,I4,F5.0)
000053                ITEM=0
000054                ILINE=ILINE+1
000055                IF (ILINE.LT.53) GO TO 31
000056                ILINE=3
```

Figure 4B. Listing of Main Program REDORB

```
000057                    IPAGE =IPAGE+1
000058                    PRINT 11,IPAGE
000059              11    FORMAT(5H1PAGE,I3)
000060              29    PRINT 12
000061              12    FORMAT(10HORBIT NO.,20X,10HSTART TIME,10X,9HSTOP TIME/15X,
000062                 1  4HDATE,2X,11HDAY OF YEAR,2X,10HHR MIN SEC,5X,14HDAY HR MIN SEC)
000063              31    NORBIT=DATA(I+21)
000064                    ISTART=(DATA(I+4)+0.001)*1000
000065                    ISTDAY=DATA(I+3)
000066                    IDATE=DATA(I+2)
000067                    CALL MILSEC(ISTART,DUM,IHOUR,IMIN,SEC)
000068                    PRINT 35,NORBIT,IDATE,ISTDAY,IHOUR,IMIN,SEC
000069              35    FORMAT(1X,I5,4X,I10,5X,I3,6X,I2,I4,F5.0)
000070                    IF (IFLAG.NE.0) GO TO 14
000071                    IFLAG=1
000072                    GO TO 17
000073             100    IF(NOTAPE.EQ.ITAPE) GO TO 500
000074                    ITAPE=ITAPE+1
000075                    CALL SWAP(2)
000076                    GO TO 2
000077              200   PRINT 201
000078             201    FORMAT(29H1***TAPE READ ERROR RETURN***)
000079             500    REWIND 2
000080                    CALL EXIT
000081                    END
  10.  LIST READA
```

Figure 4C. Listing of Main Program REDORB

```
@ ELT READA,1,670419, 44541

000001          R1  EQU  0101
000002          R2   EQU 0102
000003          R3  EQU  0103
000004          B11 EQU  11
000005          A0  EQU  12
000006          A1  EQU  13
000007          A2  EQU  14
000008          A3  EQU  15
000009          A4  EQU  16
000010          A5  EQU  17
000011          S1   EQU 015
000012          S2   EQU 014
000013          H1   EQU 2
000014          H2   EQU 1
000015          M    EQU 14
000016          $(1).
000017          READA*  L       R3,NMNP
000018                  L       A3,*0,B11       UNIT NUMBER
000019                  L       A4,*3,B11       BUFFER FLAG
000020                   S      A4,BFLAG
000021                  L       A3,NTAB$,A3     LOGICAL UNIT
000022                  TNG,M   A3,6
000023                  J       ERRR2
000024                  JZ      A4,RDNT         NOT BUFFERED
000025                  S,H2    A3,CSTA
000026                  L,M     A4,*1,B11       BUFFER ADDRESS
000027                  S,H2    A4,XW1
```

Figure 5A. Listing of Subroutine READA

```
000028                  S,H2    A4,ACSS
000029                  L       A4,*2,B11       BUFFER SIZE
000030                  S,H1    A4,ACSS
000031                  L,M     A5,5,B11
000032                  S,H2    A5,EXIT
000033          TAPR    L,M     A4,2            SAY TRANSMITTING
000034                  S,S1    A4,STB
000035                  LMJ     B11,TRF$        INITIATE TRANSFER
000036          CSTA    +       ENDA,$-$
000037          ACSS    +       $-$,$-$
000038          EXIT    J       $-$
000039          ENDA    SZ,S1   STB             SAY BUFFER READY
000040                  S,S2    A0,STB          SAVE STATUS REPORT
000041                  SSL     A1,18
000042                  AN,H1   A1,ACSS         COMPUTE N(WORDS READ)
000043                  SNA,H2  A1,STB
000044                  J       0,B11
000045          ERRR2   SLJ     NERR$
000046                  +       4
000047          READB*  L       R3,NMN
000048                  L,M     A5,5,B11
000049                  S,H2    A5,EXIT
000050                  TNZ,H2  CSTA
000051                  J       RDNW            NOT BUFFERED
000052                  TZ,S1   STB
000053                  J       $-1
000054                  TZ,S2   STB
000055                  J       EXCP            STATUS-EXCEPTION
000056          DATA    L,M     A2,*1,B11
```

Figure 5B. Listing of Subroutine READA

```
000057                A       A2,XNCR
000058                L       A1,XW1          BUFFER LOC
000059                L,H2    R1,STB          COUNT
000060                S       R1,*0,B11
000061                BT      A2,0,*A1        INPUT FROM BUFFER
000062                J       TAPR            READ NEXT
000063          EXCP  L,S2    A0,STB          STATUS CODE
000064                TE,M    A0,2
000065                J       ERRR3
000066          ABNM  LN      A0,A0           END OF FILE
000067                S       A0,*0,B11
000068              J         2,B11         . JUMP TO EOF EXIT, ARG. 3 IN READB
000069          ERRR3   L,M   A3,3,B11
000070                  S,H2  A3,EXIT3
000071                  S     A2,TSTAT
000072                  L,S1  A2,TSTAT
000073                  TE,14 A2,044
000074                  J     C1
000075                  PSRINT MESG1,5,60
000076                  J     SWITCH
000077          C1      TE,14  A2,060       END OF TAPE OR LOAD POINT
000078                  J     C2
000079                  PSRINT MESG2,5,60
000080                L       12,(-500)
000081                  S     12,*0,11
000082                  J     EXIT3         NO RECOVERY
000083          C2      TE,14 A2,065
000084                  J     C3
000085                  PSRINT MESG3,3,60
```

Figure 5C. Listing of Subroutine READA

```
000086                  J       SWITCH
000087          C3      TE,14   A2,070
000088                  J       C4
000089                  L,8     A4,TSTAT
000090                  AND,14  A4,010
000091                  JZ      A5,CC1
000092                  P$RINT  MESG4,10,60
000093                  J       DATA            TEMPORARY CONTINUATION
000094          EXIT3   J       $-$
000095          C4      P$RINT  MESG7,8,100
000096                  S       A2,MESG8
000097                  P$RINT  MESG8,1,10
000098                  J       SWITCH
000099          CC1     J       DATA            TEMPORARY CONTINUATION
000100          SWITCH  TN      BFLAG
000101                  J       DATA            ACCEPT BLOCK AS IS
000102                  P$RINT  MESG6,9,60
000103                  L,H2    A5,EXIT
000104                  S,H2    A5,BFLAG
000105                  L,14    A5,DETOUR
000106                  S,H2    A5,EXIT
000107                  J       TAPR
000108          DETOUR  L,H2    A5,BFLAG
000109                  S,H2    A5,EXIT
000110                  J       READB
000111          RDNT    S,H2    A3,CSTB         READ NOT BUFFERED
000112                  S,H2    A3,CSTC
000113                  SZ,H2   CSTA
000114                  L       A4,*2,B11       SET NMAX
```

Figure 5D. Listing of Subroutine READA

```
000115                  S,H1    A4,ACSB
000116                  J       5,B11
000117          RDNW    L,M     A4,*1,B11       LOC(DATA)
000118                  S,H2    A4,ACSB
000119                  L,M     A4,*0,B11       LOC(COUNT)
000120                  S,H2    A4,STCT
000121                  LMJ     B11,TRF$        READ
000122          CSTB    +       0,$-$
000123          ACSB    +       $-$,$-$
000124                  LMJ     B11,TCHK$       CHECK
000125          CSTC    +       ERRR,$-$
000126                  +       ABNM,$-2
000127                  SSL     A1,18           COMPUTE COUNT
000128                  AN,H1   A1,ACSB
000129          STCT    SNA     A1,$-$
000130                  J       EXIT
000131          ERRR    L       R3,NMN          ERROR
000132                  L,H2    B11,EXIT
000133                  AN,M    B11,1
000134                  SLJ     NERR$           ERROR EXIT
000135                  +       0
000136          NMNP    'READA'
000137          NMN     'READB'
000138          $(2).
000139          TSTAT    RES    1
000140          BFLAG    RES    1
000141          XNCR    +       01000000
000142          Xw1     +       1,$-$
000143          STB     RES     1
```

Figure 5E. Listing of Subroutine READA

```
000144          MESG1   'PARITY ERROR IN TAPE BLOCK'
000145          MESG2   'LOAD POINT OR END OF TAPE'
000146          MESG3   'TAPE HASH IN BLOCK'
000147          MESG4   'CHARACTER COUNT TO BE IGNORED, ANOTHER ATTEMPT WILL BE MADE'
000148          MESG5   'CHARACTER COUNT ERROR IN TAPE BLOCK'
000149          MESG6   'DATA BLOCK WILL Bt DICARDED, NEXT BLOCK WILL BE READ'
000150          MESG7   'UNDEFINED ERROR IN TAPE BLOCK,TAPE STATUS IS'
000151          MESG8   +     0
000152          SWAP*   L,14  12,2,11
000153                  S,1   12,EXIT2
0u0154                  L     12,*0,11
000155                  L     13,NTAB$,12
000156                  S,1    13,CSTD
000157                  LMJ     11,TSWAP$
000158          CSTD    +     0,$-$
000159          EXIT2   J     $-$
000160                  END.
  11.  LIST MILSEC
```

Figure 5F. Listing of Subroutine READA

```
@ ELT MILSEC,1,670419, 44542

000001          MILSEC*  L      13,*0,11
000002                   L,14   12,0
000003                   DI     12,(86400000)
000004                   S      12,*1,11     DAYS IN 12
000005                   L,14   12,0
000006                   DI     12,(3600000)
000007                   S      12,*2,11
000008                   L,14   12,0
000009                   DI     12,(60000)
000010                   S      12,*3,11
000011                   L,14   14,155
000012                   LCF    14,13
000013                   FM     15,(1.000000*-03)  SEC IN 15
000014                   S      15,*4,11
000015                   J      6,11
000016                   END

    END CUR
```

Figure 6. Listing of Subroutine MILSEC

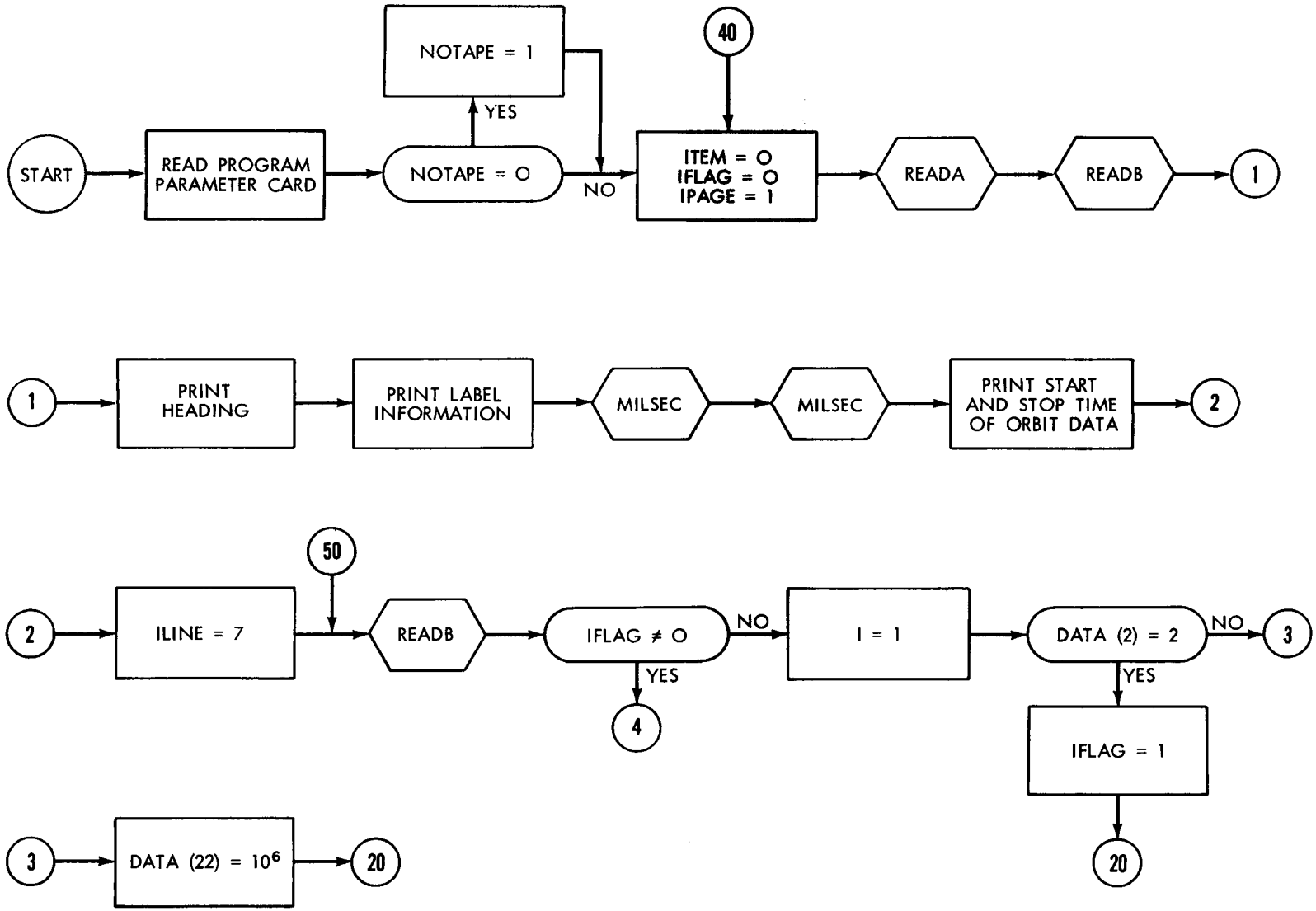


Figure 7A. Flow Diagram of REDORB

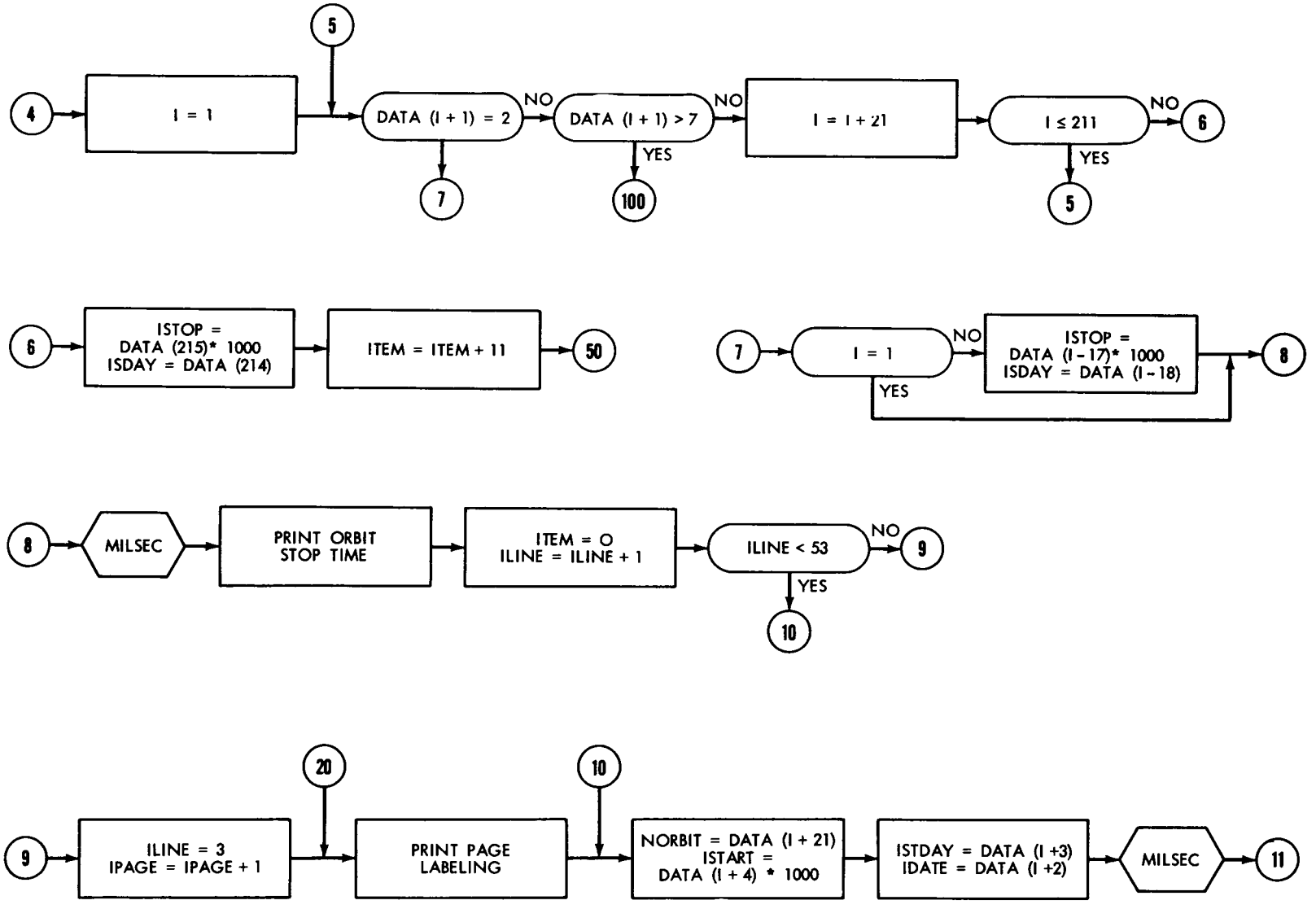


Figure 7B. Flow Diagram of REDORB

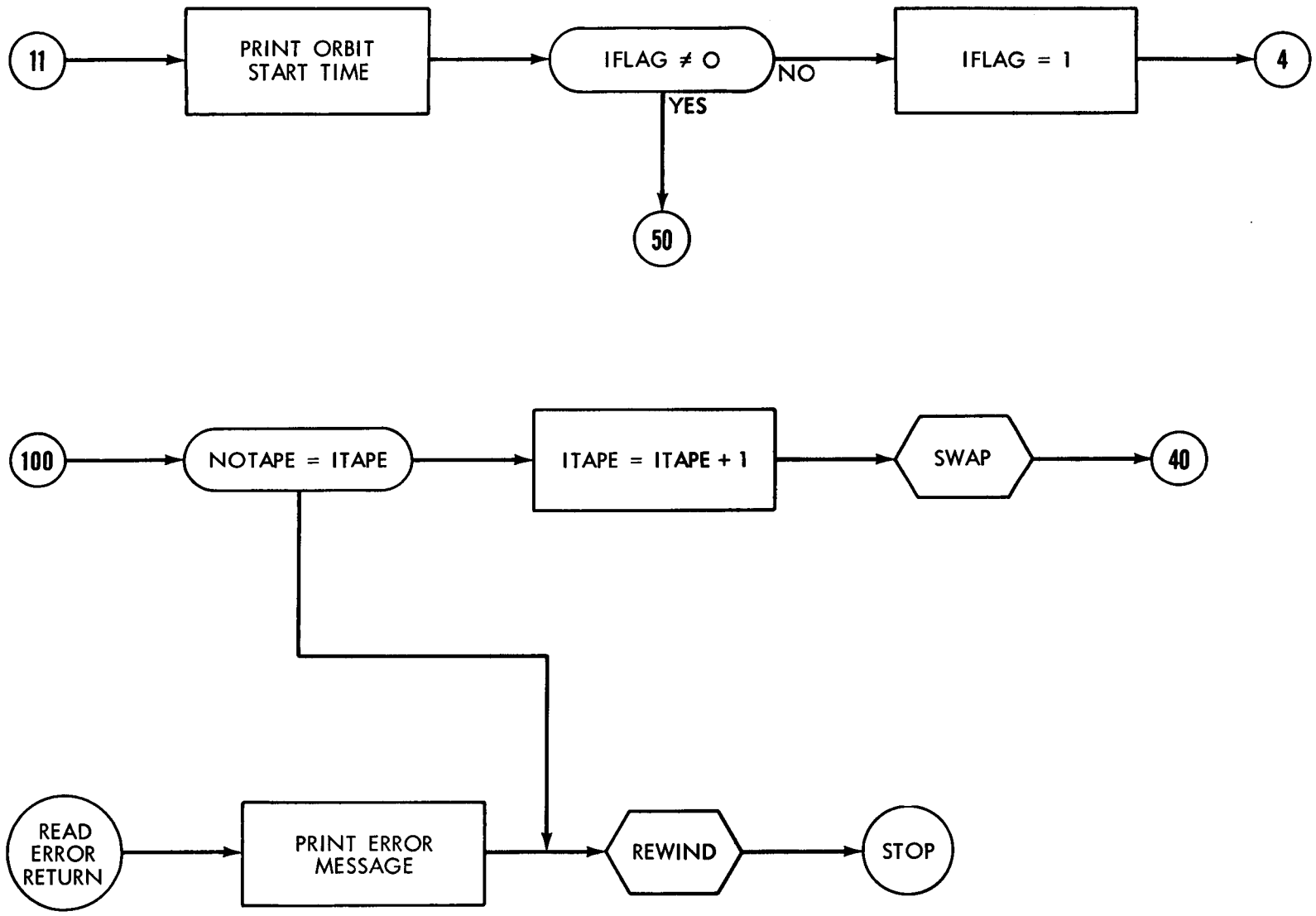


Figure 7C. Flow Diagram of REDORB

Title Binary Record Format

Word No.	Form	Remarks
0	Fixed Pt.	Fortran data record size indicator = 000375010001 octal. This indicates a total data word count of 253 words.
1	Floating Pt.	Form of data identification = 76799361
2-3	Floating Pt.	Satellite identification
4	Floating Pt.	Date — U. T. Start Time of Satellite Data
5	Floating Pt.	Day Count of Year — U. T. Start Time of Satellite Data
6	Floating Pt.	Seconds of Day — U. T. Start Time of Satellite Data
7	Floating Pt.	Date — U. T. End Time of Satellite Data
8	Floating Pt.	Day Count of Year — U. T. End Time of Satellite Data
9	Floating Pt.	Seconds of Day — U. T. End Time of Satellite Data
10	Floating Pt.	= Δt in seconds, if tape has equal intervals = 0, if tape has unequal intervals
11	Floating Pt.	No. of data items in data record = 12 (includes a special type of item as item no. 12)
12	Floating Pt.	No. of words per data item = 21
13	Floating Pt.	No. of words per data item that are a function of time (these words follow the time words consecutively) = 16
14	Floating Pt.	No. of words in data record = 256
15	Floating Pt.	Spare
16-26	Floating Pt.	Run identification data
27	Floating Pt.	Date — Coordinate System Reference Data Time and Position
28	Floating Pt.	Day Count of Year — Coordinate System Reference Data Time and Position
29	Floating Pt.	Apparent Sideral Time in radians — Coordinate System Reference Data Time and Position
30-40	Floating Pt.	Some of these are used for harmonics
41	Floating Pt.	Date — Epoch
42	Floating Pt.	Day Count of Year — Epoch
43	Floating Pt.	Seconds of Day — Epoch
44	Floating Pt.	Semi-major axis, a (km) — Epoch
45	Floating Pt.	Eccentricity, e (ratio) — Epoch
46	Floating Pt.	Inclination, I (deg.) — Epoch
47	Floating Pt.	Right ascension of ascending node, Ω (deg.) — Epoch

Figure 8. Orbit 3A Tape Format

Word No.	Form	Remarks
48	Floating Pt.	Rate of change of R. A. of ascending node, (deg. /day)
49	Floating Pt.	Argument of perigee, $\overline{\omega}$ (deg.)
50	Floating Pt.	Rate of change of argument of perigee, $\dot{\omega}$ (deg/day)
51	Floating Pt.	Period, P (min.)
52	Floating Pt.	Rate of change of period, $\dot{P}$ (min. /day)
53-253	Floating Pt.	Some of these are used for elements, drags, etc.
254	Fixed Pt.	Check sum of words in word no. 1-253
255	Fixed Pt.	Same as word 0

Data Binary Record Format

Word No.	Form	Remarks	
0	Fixed Pt.	Fortran data record size indicator = 000375010001 octal. This indicates a total data word count of 253 words.	
1	Floating Pt.	Type of data item indicator = 1 regular satellite data item = 2 ascending node crossing data item = 3 north point data item = 4 descending node data item = 5 south point data item = 6 sunlight entrance data item = 7 sunlight exit data item	
2	Floating Pt.	Day of data	
3	Floating Pt.	Day Count of Year	Time of Data Item
4	Floating Pt.	Second of Day	
5	Floating Pt.	X	Satellite Position Vector in km.
6	Floating Pt.	Y	
7	Floating Pt.	Z	
8	Floating Pt.	X	Satellite Velocity Vector in km. /sec.
9	Floating Pt.	Y	
10	Floating Pt.	Z	
11	Floating Pt.	Longitude (deg.)	Geodetic Position
12	Floating Pt.	Latitude (deg.)	
13	Floating Pt.	Height above spheroid (km.)	

Figure 8 (Continued). Orbit 3A Tape Format

Word No.	Form		Remarks
14	Floating Pt.	SX	
15	Floating Pt.	SY	Solar Vector in A.U.
16	Floating Pt.	SZ	
17	Floating Pt.	L (earth radii)	McIllwain L Parameter
18	Floating Pt.	B (Gauss)	Magnetic Field Strength
19	Floating Pt.	Right ascension (deg.)	Real Field Coord. in
20	Floating Pt.	Declination (deg.)	an Inertial System
21	Floating Pt.	Ascending node crossing no. (pass no.)	
22-231	Floating Pt.	10 other satellite data items	
232	Floating Pt.	= 99 (may be considered type of data indicator)	
233	Floating Pt.	Year of Data	
234	Floating Pt.	= 999 if no ascending node item occurred. = % of orbit in sunlight if an ascending node item occurred in this record	
235-252		Spares in last item	
253		Spare in record	
254	Fixed Pt.	Check sum of data words in word no. 1-253	
255	Fixed Pt.	Same as word 0	

The last valid data item is followed by an item of 9's. If the last valid data item fills a record, a record follows which contains 9's in words 1-21. 9's are equal to 99999999 in floating point. Following the sentinel item record are 2 sentinel records containing 99999999 in word 1. Words 0, 254, and 255 follow the same format as that of regular data records. An EOF ends the tape.

NOTES:

Longitude is positive east of Greenwich, negative west.

Northern latitudes are positive, southern latitudes are negative.

Fortran record size indicator = 000375010001 octal in each record on this tape. This indicates a total word count per record of 253 words.

Date of data = day + 100 (months + year (100)). (Example: Feb. 10, 1962 at 2 hours is recorded as 620210 in date of data, 41 in day count of year and 7200 in seconds of day).

Reference day data of apparent sidereal time is obtained from "The American Ephemeris and Nautical Almanac" for the given year.

Figure 8 (Continued). Orbit 3A Tape Format