

INTERNAL REPORT #69

A DESCRIPTION OF THE RAW HOURLY
IMP DATA CONTAINED IN THE
RUSTxx TAPES

by

Steward R. Hartman

Space Radiation Laboratory

California Institute of Technology
Pasadena, California

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I INTRODUCTION

The RUSTxx (and the copies RASTxx) tapes contain the data set selected by the STRIP program using the overlay that also generated the data sent to the NSSDC. The time interval is one hour with coverage from the launch of IMP-7 until the present time. Orbit data at one hour intervals is also included on the tapes.

II DATA FORMAT AND HOW TO READ THE TAPES

The tapes are written in the IBM Fortran format on 9-trk, 1600 bpi drives

The DD cards needed to read the tapes are:

```
// FTnnF001 DD UNIT=(TAPE16,,DEFER),
// DISP=OLD,LABEL=(1,BLP,,IN), VOL=SER=RUSTxx,
// DCB=(RECFM=VBS,BUFNO=1,BLKSIZE=29844),
```

Each record of length BLKSIZE contains ten hours of data. One tape contains 515 days of data. The program to read the tapes and generate the catalogue had an IO COUNT=14 and TIME=18 seconds for each tape. The tapes have an overlap of 15 days. Table I lists the inclusive coverage for each RUSTxx tape. Consult the most recent catalogue to determine the exact data coverage.

TABLE I

Coverage of RUSTxx Tapes

Tape	YR.DAY	DAY#	HOUR#
RUST 01	72.270	1	1
	74.053	515	12360
RUST 02	74.039	500	12001
	75.188	1015	24360
RUST 03	75.174	1001	24001
	76.323	1515	36360
RUST 04	76.309	1501	36001
	78.092	2015	48360
RUST 05	78.078	2001	48001
	79.227	2015	60360

The two ways of reading the data with a Fortran READ instruction are either into individual arrays or into one array with equivalences to the individual arrays. The dimensions of the arrays are:

```

IMPLICIT INTEGER *4(H)
INTEGER *2      H2(32),H5(32),J2(32),J5(32)
INTEGER *4      HC(24),HRE(120),HRT(120),HR(8),
                JC(24),JRE(120),JRT(120),JR(8)
REAL *4         RH(68),RJ(68)

```

The contents of these arrays are fully described in Section III.

To read the data into the individual arrays use:

```

READ(mm,END=ii)  NHOUR,
                H2,H5,HC,HRE,HRT,HR,RH,
                J2,J5,JC,JRE,JRT,JR,RJ

```

NHOUR is the hour number of the data. NHOUR=1 is 72.270.00.

NHOUR is always present. If a section of the data is missing it is zero filled. The data is broken into the following four sections:

IMP-7 Particle Data	H2,H5,HC,HRE,HRT
IMP-7 Orbit Data	HR,RH
IMP-8 Particle Data	J2,J5,JC,JRE,JRT
IMP-8 Orbit Data	JR,RJ

The second method to read the data involves equivalences as follows:

```

INTEGER*4    IN(745)
EQUIVALENCE  (IN(1), NHOOR),
(IN(2),H2(1)), . . . . . { see Table II for a listing
                           of equivalences)
READ(mm,END=ii) IN

```

TABLE II

List of Equivalences

IN()	Equivalenced to
1	NHOOR
2	H2(1)
18	H5(1)
34	HC(1)
58	HRE(1)
178	HRT(1)
298	HR(1)
306	RH(1)
374	J2(1)
390	J5(1)
406	JC(1)
430	JRE(1)
550	JRT(1)
670	JR(1)
678	RJ(1)

III - Contents of Arrays

Arrays H2,H5,J2,J5 contain the bookkeeping data in the Experiment Status Record (see Section III-C, p14-15 of IR #49). H2 is for KEY=2, H5 is for KEY=5. Consult IR #49 for descriptions of the array contents. Array elements 1 through 32 are in one-to-one correspondence with bytes 12 through 75 of the Experiment Status Record.

The date and time are contained in the following array elements:

<u>Array Element</u>	<u>Contents</u>
19	Year (72=1972)
13	Day (Jan 1 = 001)
17	Hour (GMT 0 to 23)
18	Min (GMT 0 to 59)

The arrays HRE, HRT, JRE, JRT contain the rate information (see Section III-E, p16-17 of IR #49). HRE, JRE are the Rate Count arrays and HRT, JRT are the Accumulation Time (in msec) arrays. Table III is the listing of the contents of the rate arrays.

TABLE III

The rate positions in HRE, HRT, JRE and JRT arrays are:

<u>Rate Type</u>	<u>Rate Number</u>	
PLO-n	1+n	$0 \leq n \leq 7$
EHI-n	9+n	
D2H-n	17+n	
PEN-n	25+n	
ELO-n	33+n	
PHI-n	41+n	
D5-n	49+n	
D11-n	57+n	
DØ*-n	65+n	
DØ1*-n	73+n	
DØ-n	81+n	
ADC-n	89+n	
D2H	97	
PEN	98	
HAZ	99	
D2	100	
D5	101	
D11	102	
D8	103	
D9	104	
D5H	105	
DØ*	106	
DØ1*	107	
D6	108	
D7	109	
DØ	110	
ADC	111	
D1	112	
D3	113	
D4	114	
ELO	115	
PLO	116	
PHI	117	
EHI	118	
D1Ø	119	
NEUT	120	

Arrays HR and JR are bookkeeping data for the orbit information. They contain the following information:

Array element	Contents
1	Data Flag (=0 bad data, =1 good data)
2	Year
3	Day
4	Hour
5	Minute
6	Ascending Node Number
7	Zero fill
8	Zero fill

Arrays RH and RJ contain the orbit information listed in Table IV. See Internal Report #49, Section III-B, p10-13 for more information on the Orbit data.

TABLE IV
Orbit Information

1	GSE-r		Radial - KM
2	GSE- θ	}	Degrees
3	\emptyset		
4	GSE-X	}	Km
5	Y		
6	Z		
7	GSM-X	}	Km
8	Y		
9	Z		
10	GSM-R		Geomagnetic-Earth-Radii
11	GSM- θ	}	Degrees
12	\emptyset		
13	GEI-X	}	Km
14	Y		
15	Z		
16	GEI- θ	}	Degrees
17	\emptyset		
18	Long	}	Geocentric
19	Lat		
20	Long	}	Geomagnetic
21	Lat		
22	Long	}	Geodetic
23	Lat		
24	Height above spheroid		Km

TABLE IV - Orbit Information - Cont'd.

25	Rt Asc	} Celestial Inertial	
26	Dec		
27	Rt Asc	} Velocity Vector in Celestial Inertial	
28	Dec		
29	Rt Asc	} Spin Vector in Celestial Inertial	
30	Dec		
31	Magnitude of velocity		km/sec
32	Delta time		Seconds
33	Spin Period		Seconds
34	Sat-Moon distance		km
35	Sat-Moon distance parallel to GEI X.-axis		km
36	Sat-Earth-Sun angle		Degrees
37	Sat-Earth-Moon angle		
38	GEI-X	} Sun AU	
39	Y		
40	Z		
41	Long	} sub solar point in GEI	
42	Lat		
43	Long	} sub solar point in GM	
44	Lat		
45	GSE-X	} Moon	km
46	Y		
47	Z		
48	GSM-X		
49	Y		
50	Z		

TABLE IV - Orbit Information - Cont'd

51	GSE	} Transformation Matrix
52	to	
53	GSM	
54		
55		
56		
57		
58		
59		

60	GEI	} Transformation Matrix
61	to	
62	GSE	
63		
64		
65		
66		
67		
68		

Arrays HC and JC contain the event counts corresponding to the overlays. Tables V and VI are a listing of the IMP-7 and IMP-8 overlays respectively.

IV - Catalogue Description

The catalogue is a listing of the coverage of the data contained on the RUSTxx tapes. A blank means that that section of data is missing.

The mnemonics are:

blank	both IMP-7 and IMP-8 missing
H	IMP-7 only
J	IMP-8 only
S	both

The time factor is the percentage of each day for which data exists as determined by the Neutral Rate Accumulation Time. The orbit data corresponds to the first hour of the day for which orbit data exists.

