REPORT UAG-67

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for
Solar-Terrestrial Physics

IONOSPHERIC D-REGION PROFILE DATA BASE

A collection of computer-accessible experimental profiles of the D and lower E regions

AUGUST 1978

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IONOSPHERIC D-REGION PROFILE DATA BASE

A collection of computer-accessible experimental profiles of the D and lower E regions

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ABSTRACT. A collection of some 700 experimental electron density profiles of the D and lower E regions of the ionosphere has been digitized and made computer-retrievable. The collection includes most of the profiles published in the journal or report literature. The data are available in the form of three computer files that give the conditions under which each profile was obtained, a full list of references from which the experimental data were extracted, and the digitized profiles themselves.

PART I. EXPLANATION

Introduction

This report describes a collection of about 700 experimental electron density profiles of the D and lower E regions of the ionosphere. The collection is largely that given by Davis and Berry [1977], apart from a few deletions and about 100 additions, and represents the results of a search through the published journal and report literature. The main difference between the present work and that of Davis and Berry [1977] is that the present collection has been made computer-accessible, including a trace-back to the original journal or article diagram.

The information pertaining to the profiles is all contained either in one of three computer files or in Table 2 of this report. The computer files DB1, DB2, and DB3 contain data describing, respectively, the circumstances of each experiment, the list of journal or report references from which the profiles were extracted, and the digitized data. These files are discussed in detail in the next section. Each file may be readily updated as more data become available.

Because it is intended that the data should be readily accessible by computer, listings of several useful computer programs are given in the appendices. These programs may be used to select all those profiles satisfying specified conditions; check updated versions of DB1 and DB3; find all profiles passing through a specified height or density, and calculate the corresponding density or height and slope at the given point; mass plot any given set of digitized profiles; calculate the percentage distribution of the profiles with respect to a given parameter; and arrange the profiles in increasing order of a given parameter.

The present collection of profiles includes most of those that are readily available in the published literature. The distribution is far from random, especially in geographical location, because a few stations such as Ottawa are responsible for many profiles. See Table 4 in Part II. The distributions with respect to the descriptive parameters of DB1 have been obtained using the program HISTDB of Appendix E, and are given in that appendix.

It is intended that this data base be updated regularly in order to correct the inevitable errors as they are noticed, to delete profiles classed as unreliable by the original experimenter, and to add new profiles as they become available.

Copies of files DB1, DB2, and DB3, as well as copies of the programs described in the appendices, are available on computer magnetic tape from World Data Center A for Solar-Terrestrial Physics. Address requests and inquiries to R.O. Conkright, NOAA, D63, Boulder, CO 80303.

Description of Files

Each of the experimental profiles was retrieved from diagrams in the literature and then digitized using a Hewlett-Packard digitizer, taking sufficient data points to allow a reliable reconstruction of each profile. The digitized data, with each curve identified by a unique three-digit number, have been collected in file DB3; a sample excerpt is included in Table 1. The sequence of curves

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in this file is more or less random, corresponding to the order in which the profiles were extracted from the literature. The curve identification numbers, themselves, are also random, although they generally increase chronologically. Curves with numbers >800 were introduced by the present author; lower numbers are given to data collected by Davis and Berry [1977].

File DB1, which is tabulated in full in Table 5, Part II, provides index information concerning each profile. Files DB1 and DB3 are related via the unique curve identification numbers. The columns of Table 5 and their computer formats are as follows:

COLUMN	FORMAT	PARAMETER
A.	I5	Curve identification number
B.	I3	Year
C.	I3	Month
D.	I3	Day
E.	I3, I2	Local time (hours, minutes)
F.	I4	Monthly average sunspot number
G.	F6.1	Latitude of station
H.	F6.1	East longitude of station
I.	I2	Method of observation 1. Partial reflection 2. Rocket 3. Wave interaction 4. LF-VLF reflection 5. Other, e.g., incoherent scatter
J.	I2	Magnetic index 1. Quiet (approx. $A_p \leq 25$) 2. Disturbed
K.	I3	Collision frequency profile (see Table 2)
L.	I4	Reference number (see list of references, Part III)
M.	A5	Figure number in reference
N.	I3	Special case parameter (see Table 3)

The "method of observation" and "magnetic index" classifications listed above are very coarse. For example, "partial reflection" could be subdivided into differential absorption and differential phase experiments. However, such subdivisions are left to those readers requiring them.

In some cases, the month number or day number is given as zero. This indicates that the given profile is an average profile over the year or month. Note that not all average profiles can be so identified--averages over several days or hours are represented by average day or hour numbers.

File DB2 (see Part III) contains a full list of the references from which electron density or collision frequency profiles were obtained. Files DB1 and DB2 can be associated with each other by use of the reference number (column L of DB1). The references are ordered alphabetically.

Accuracy of Electron Density Profiles

Electron density profiles are subject to errors from different sources. At the very least, there are errors associated with the experimental method itself. Although there are no reliable estimates of these uncertainties, estimates for near-optimum conditions have been given by Thrane [1974]. However, Thrane's estimates for the incoherent scatter technique are not applicable to the Arecibo profiles given by Ioannides and Farley (ref. 73). The uncertainties associated with the CW propagation methods have been discussed by Belrose and Segal [1974], and those associated with uncalibrated rocket probe measurements by Oyama and Hirao [1976]. A comparison of the different techniques and their probable errors has also been made by Sechrist [1974].

Some of the profiles given here have undoubtedly been discarded or revised by the experimenter in subsequent work. No attempt has been made to search the literature for all such cases.

There also are errors introduced by the digitization process. However, all digitized profiles have been checked at two densities, and any digitizing errors are expected to be much less than the experimental errors.

Collision Frequency Profiles

Column K of Table 5 (Part II) lists the number of the profile of collision frequency versus height. Table 2 identifies each of these collision frequency profile numbers by giving the journal or report reference (with figure or page number) from which the profile was extracted. Within Table 2, numbers in parentheses denote page numbers; letters in parentheses denote seasons.

Each electron density profile has associated with it a collision profile that could be (a) the profile assumed by the authors in reducing their observational data, (b) the profile deduced by the authors in a parallel study, or (c) the profile that could reasonably be associated with the particular electron density profile.

All methods of observation do not require a prior or assumed knowledge of the collision profile. Some methods can use an assumed profile in lieu of one that could have been deduced by those methods. Again, some authors do not describe the profile they have used in their analysis. For these reasons, and because of the possible alternatives given above, the listed collision profiles have not been digitized, and their association with electron density profiles should be treated with caution. Special attention should be given to collision profile 20, which has been associated with most rocket profiles.

Many of the collision profiles listed, including profile 20, have been calculated assuming proportionality between the most probable collision frequency, ν_m, and the atmospheric gas pressure as determined from an atmospheric model. The basis of this method is given by Thrane and Piggott [1966]. These authors also point out the need to introduce an effective collision frequency, ν_{eff}, which should be permitted to vary from $3/2\nu_m$ to $5/2\nu_m$ [see also Belrose and Segal, 1974]. Collision profiles so calculated show the normal seasonal and latitudinal changes included in the model atmosphere. It is not clear that all authors have considered the collision profile correctly in their density determinations.

When there is any doubt about the collision frequency profile to be associated with a particular electron density profile, the above procedure is recommended. Although in some cases this will mean that the collision and density profiles are no longer consistent with the raw observational data, the errors so introduced probably are not significant.

It should be noted that the assumed proportionality between ν_m and the gas pressure has recently been questioned by Dickinson et al. [1976], who found that a proportionality between ν_m and gas density better fits their measured seasonal variations of ν_m.

Profiles Obtained Under Special Conditions

Over 100 of the present profiles have been obtained under unusual ionospheric conditions. For example, profiles 922, 518, and 523 were obtained during sudden ionospheric disturbances. These particular profiles are characterized by a "special case parameter" of 4, and may be easily retrieved using that parameter.

Thirteen special cases have been identified and these are described in Table 3. Note that the descriptions are those given by the individual authors, and some are equivalent or have the same causal mechanism.

Because it is the time from the onset of a special event, rather than the local time, that often is important, it is recommended that the special case parameter be treated mainly as a flag to indicate a special event. The original journal should then be referred to, especially as this will usually help to identify an appropriate undisturbed profile in files DB1 and DB3.

Acknowledgments

The author wishes to acknowledge the willing cooperation of Mr. R.M. Davis, Jr., and Mr. L.A. Berry of the Institute for Telecommunication Sciences, N.T.I.A. All profiles were digitized by Mr. M. Martinez, NOAA/EDS.

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DICKINSON, P. H. G., J. E. HALL and F. D. G. BENNETT	1976	"Rocket measurements of electron concentration in the lower ionosphere at two European stations," *J. Atmos. Terr. Phys.*, 38, 163-173.
OYAMA, K.-I. and K. HIRAO	1976	"Inaccuracies in electron density measurements due to surface contamination of Langmuir probes," *Planet. Space Sci.*, 24, 87-89.
SECHRIST, C. F., Jr.	1974	"Comparisons of techniques for measurement of D-region electron densities," *Radio Science*, 9, No. 2, 137-149.
THRANE, E. V.	1974	"Ionospheric profiles up to 160 km: A review of techniques and profiles," in *Methods of Measurements and Results of Lower Ionosphere Structure*, K. Rawer, Ed. (Akademi-Verlag, Berlin), 3-22.
THRANE, E. V. and W. R. PIGGOTT	1966	"The collision frequency in the E- and D-regions of the ionosphere," *J. Atmos. Terr. Phys.*, 28, 721-737.

Table 1. Part of the File DB3, showing the first seven digitized profiles. The three-digit numbers appearing by themselves on a line are the curve identification numbers. The paired entries are, respectively, log density (per cc) and the height (in km).

NOTE: The last log density point is always followed by 0.00. The extraneous 0.00 value at the 13th position in each line is an artifact of the digitizing program. The formats are 12F6.2 for the digitized points and I4 for the curve numbers. The file is terminated by a curve identification number of 9999.

```
 257
  1.28 63.84  1.92 65.16  2.31 66.15  2.65 67.48  2.91 69.31  2.97 71.15  0.00
  2.93 73.49  3.06 76.67  3.08 79.34  3.08 81.52  3.17 83.19  3.34 84.36  0.00
  3.60 85.52  3.81 86.85  4.03 88.18  4.20 88.85  4.39 90.51  4.59 92.85  0.00
  4.69 93.52  4.80 95.02  4.93 96.19  5.10 97.18  5.17 98.69  0.00
 459
  2.01 63.01  2.07 63.99  2.14 65.21  2.21 66.32  2.29 68.02  2.35 69.72  0.00
  2.38 71.06  2.42 72.51  2.45 73.72  2.50 74.82  2.53 75.31  2.55 76.40  0.00
  2.58 77.37  2.62 78.22  2.64 78.71  0.00
 460
  2.22 63.05  2.26 64.01  2.30 65.10  2.31 66.42  2.33 67.26  2.35 68.35  0.00
  2.37 69.07  2.36 70.39  2.36 71.22  2.38 72.07  2.39 72.91  2.44 73.88  0.00
  2.49 75.09  2.54 75.58  2.58 76.31  2.63 76.92  2.67 77.76  2.73 78.62  0.00
  0.00
 461
  1.48 60.96  1.67 62.33  1.78 63.08  1.87 63.82  1.98 64.94  2.06 65.92  0.00
  2.14 66.66  2.18 67.03  2.24 68.37  2.27 68.98  2.28 70.55  2.28 71.75  0.00
  2.29 72.96  2.32 74.17  2.35 75.02  2.44 76.01  2.52 76.87  2.61 77.86  0.00
  2.66 78.35  2.69 78.84  0.00
 203
  1.40 80.17  1.81 81.47  2.12 83.10  2.14 86.30  2.15 89.11  2.31 91.24  0.00
  2.36 92.39  2.39 93.52  2.57 94.35  2.70 95.53  2.93 96.75  3.16 97.60  0.00
  3.15 98.72  0.00
 130
  1.24 64.79  1.39 68.42  1.53 72.89  1.66 76.60  1.85 79.26  2.05 82.09  0.00
  2.31 84.25  2.47 85.74  0.00
 132
  1.80 64.15  1.92 65.37  2.00 68.56  2.08 70.43  2.23 73.10  2.37 74.86  0.00
  2.55 77.01  2.75 79.57  2.94 82.12  3.16 85.21  3.38 87.64  3.56 89.54  0.00
  3.67 90.75  0.00
```

Table 2. Journal reference and figure number for each collision frequency profile. NOTE: Journal reference numbers are identified on pp. 12-20, Part III. Below, numbers in parentheses denote pages rather than figures; letters in parentheses denote seasons.

Coll. profile	Reference	Figure	Coll. profile	Reference	Figure
1	136	1a	29	23	6
2	136	1b	30	151	(171)
3	31A	2(E)	31	72	6
4	26	1	32	63	16
5	26	1	33	154	3-1
6	55	15	34	126	6
7	147	222	35	18	5
8	10	3	36	62	3
9	45	1	37	131	3
10	150	3.14(S)	38	42	14
11	23	6	39	24	1
12	5	1	40	40	(167)
13	146	5(S)	41	133	1
14	74	1(S)	42	50	4
15	81	1(S)	43	30	7
16	51	4	44	156	5.1
17	145	2(S)	45	-	-
18	136	1c	46	81	1(W)
19	136	1c	47	145	2(W)
20	148	4	48	-	-
21	56	3	49	49	3.1
22	76	1	50	-	-
23	9	1	51	-	-
24	113	(7)	52	36	2(S)
25	83	13	53	36	2(E)
26	74	1(W)	54	36	2(W)
27	149	4(S)	55	146	5(E)
28	149	4(W)	56	146	5(W)

Table 3. Phenomena corresponding to the "special case" parameter listed in column N of Table 5. NOTE: The descriptions are those given by the individual authors and some are equivalent or have the same causal mechanism.

Parameter	Physical Description
1	Solar eclipse
2	Solar flare
3	Solar X-ray event
4	Sudden ionospheric disturbance
5	Winter anomaly day
6	Midlatitude particle precipitation
7	Solar proton event/solar cosmic ray event
8	Polar cap absorption
9	Auroral absorption
10	Daytime absorption event
11	Polar substorm
12	Polar radio blackout
13	Auroral arc conditions

PART II. INDEXES TO PROFILES

Table 4 gives the distribution of the profiles by observation station, ordered by absolute value of the latitude. Table 5 is a complete listing of the index to the profiles as given in file DB1. The order in this is chronological — any other order may be generated using the program SORTDB described in Appendix F. For column identifications, see page 2.

Table 4. Distribution of experimental profiles by station. Only those stations with five or more profiles are included.

LATITUDE	LONGITUDE	STATION	NUMBER
8.6	76.9	THUMBA	14
18.5	293.2	ARECIBO	5
-19.3	17.7	TSUMEB	14
-30.5	151.5	ARMIDALE	14
-32.0	308.0	CASSINO	8
35.2	25.0	CRETE	24
37.1	353.3	ARENOSILLO	9
37.9	284.5	WALLOPS I.	56
40.1	271.8	URBANA	24
40.8	282.1	UNIVERSITY PARK	82
42.4	287.7	QUABBIN RESERVOIR	5
45.4	284.1	OTTAWA	80
48.8	44.5	VOLVOGRAD	5
51.5	359.4	ENGLAND	9
52.1	357.7	MALVERN	5
57.4	352.6	SOUTH UIST	29
58.8	265.8	CHURCHILL	47
60.0	11.1	KJELLER	17
64.9	212.1	COLLEGE	6
65.3	212.1	CHENA	55
-69.0	39.0	SYOWA	5
69.3	16.0	ANDOYA	22
69.5	19.3	LAVANGADALEN	6
69.7	19.0	TROMSO	7
74.7	265.1	RESOLUTE BAY	17

Table 5. Complete chronological listing of the File DB1. The parameters of each column are described on page 1 of Part I.

A	B	C	D	E	F	G	H	I	J	K	L	M	N
526	48	7	0	6 0	140	40.0	0.0	4	1	15	81	4	0
525	48	7	0	8 0	140	40.0	0.0	4	1	15	81	4	0
524	48	10	8	1540	135	52.2	.1	4	2	9	84	2	0
523	48	10	8	1559	135	52.2	.1	4	2	9	84	2	4
1	49	7	0	0 0	108	51.5	359.4	4	1	41	133	2	0
2	49	7	0	315	108	51.5	359.4	4	1	41	133	2	0
3	49	7	0	325	108	51.5	359.4	4	1	41	133	2	0
4	49	7	0	335	108	51.5	359.4	4	1	41	133	2	0
558	49	7	0	345	108	51.5	359.4	4	1	41	133	2	0
6	49	7	0	340	108	51.5	359.4	4	1	41	133	2	0
5	49	7	0	4 0	108	51.5	359.4	4	1	41	133	2	0
7	49	7	0	430	108	51.5	359.4	4	1	41	133	2	0
8	52	5	6	12 0	52	-33.9	151.2	1	1	6	55	17	0
9	52	5	11	12 0	52	-33.9	151.2	1	1	6	55	17	0
491	54	10	0	11 0	8	-26.2	28.0	3	1	42	50	4	0
551	54	10	19	12 0	8	31.0	358.0	5	1	28	110	1	0
10	57	4	0	12 0	174	40.0	0.0	4	1	9	45	5	0
13	57	7	0	0 0	191	40.0	0.0	4	1	9	45	7	0
14	57	7	0	12 0	191	52.4	358.8	4	1	8	10	7	0
12	57	7	4	1216	191	58.8	265.8	2	2	7	14	9	9
15	57	12	0	0 0	200	40.0	0.0	4	1	9	45	7	0
16	58	11	26	21 0	181	69.7	19.0	3	1	31	72	6	12
562	59	8	18	2120	151	69.7	19.0	3	1	31	72	9	12
17	59	8	21	1130	151	69.7	19.0	1	1	31	72	6	12
18	59	8	22	1230	151	69.7	19.0	1	1	31	72	6	12
19	59	8	26	1240	151	69.7	19.0	1	1	31	72	6	12
20	59	8	26	2120	151	69.7	19.0	3	1	31	72	11	12
21	59	8	31	1355	151	69.7	19.0	1	1	31	72	6	12
22	59	9	17	1237	146	58.8	265.8	2	1	11	23	14	0
23	60	3	27	730	122	60.0	11.1	3	1	7	13	5	0
24	60	3	27	830	122	60.0	11.1	3	1	7	12	5	0
25	60	3	27	930	122	60.0	11.1	3	1	7	13	5	0
26	60	3	27	1030	122	60.0	11.1	3	1	7	13	5	0
27	60	3	27	1130	122	60.0	11.1	3	1	7	13	5	0
28	60	3	27	12 0	122	60.0	11.1	3	1	7	13	9	0
697	60	3	27	1230	122	60.0	11.1	3	1	7	13	5	0
698	60	3	27	1330	122	60.0	11.1	3	1	7	13	5	0
29	60	3	27	1430	122	60.0	11.1	3	1	7	13	5	0
30	60	3	27	1530	122	60.0	11.1	3	1	7	13	5	0
699	60	3	27	1630	122	60.0	11.1	3	1	7	13	5	0
31	60	8	28	12 0	102	60.0	11.1	1	1	7	13	9	0
32	60	9	22	1532	98	39.7	140.1	2	1	20	144	1	0
33	60	11	27	12 0	88	60.0	11.1	3	1	7	13	9	0
34	61	2	20	12 0	75	45.4	284.1	1	1	11	14	4	0
35	61	2	21	12 0	75	45.4	284.1	1	1	11	14	4	0
36	61	2	22	12 0	75	45.4	284.1	1	1	11	14	4	0
37	61	3	7	12 0	69	45.4	284.1	1	1	11	25	5	0
38	61	3	8	12 0	69	45.4	284.1	1	1	11	25	5	0
40	61	5	1	1040	60	45.4	284.1	1	1	11	23	14	0
41	61	6	0	12 0	56	45.4	284.1	1	1	11	14	9	0
42	61	7	14	11 0	53	45.4	284.1	1	1	11	14	9	9
567	61	7	18	1550	53	45.4	284.1	1	2	11	14	9	9
43	61	8	17	22 6	52	37.9	284.5	2	1	20	123	5	0
44	61	9	20	1351	52	-31.2	136.3	4	1	36	62	4	0
927	61	10	20	745	51	45.4	284.1	1	1	11	22	19	0
928	61	10	20	9 0	51	45.4	284.1	1	1	11	22	19	0
929	61	10	20	10 0	51	45.4	284.1	1	1	11	22	19	0
930	61	10	20	11 0	51	45.4	284.1	1	1	11	22	19	0
931	61	10	20	12 0	51	45.4	284.1	1	1	11	22	19	0
45	61	10	27	435	51	37.9	284.5	2	1	20	24	14	0
46	61	11	0	12 0	50	45.4	284.1	1	1	11	19	10	0
47	61	12	0	12 0	49	45.4	284.1	1	1	11	15	3.6	0
50	61	12	0	12 0	49	45.4	284.1	1	1	11	19	10	0
48	61	12	18	12 0	49	45.4	284.1	1	1	20	92	8	5
49	61	12	18	12 0	49	45.4	284.1	1	1	11	92	8	0
499	61	12	19	12 0	49	45.4	284.1	1	1	11	20	4	0
500	61	12	20	12 0	49	45.4	284.1	1	1	11	20	4	0
501	61	12	21	12 0	49	45.4	284.1	1	1	11	20	4	0
51	62	1	0	12 0	45	45.4	284.1	1	1	11	19	10	0
484	62	2	18	915	42	64.9	212.1	5	1	28	104	6	9
486	62	2	18	1055	42	64.9	212.1	5	1	28	104	6	9
485	62	2	21	8 5	42	64.9	212.1	5	1	28	104	6	9
487	62	2	23	140	42	64.9	212.1	5	1	28	104	6	9
559	62	2	23	440	42	64.9	212.1	5	1	28	104	6	9
560	62	2	23	825	42	64.9	212.1	5	1	28	104	6	9
54	62	3	0	12 0	40	45.4	284.1	1	1	11	15	3.6	0
922	62	3	1	1147	40	45.4	284.1	1	1	11	14	8	4
495	62	3	8	12 0	40	45.4	284.1	1	1	11	20	4	0
492	62	3	9	12 0	40	45.4	284.1	1	1	11	20	4	0
494	62	3	22	12 0	40	45.4	284.1	1	1	11	20	4	0
493	62	3	23	12 0	40	45.4	284.1	1	1	11	20	4	0
496	62	3	30	12 0	40	45.4	284.1	1	1	11	20	4	0
55	62	6	0	12 0	38	45.4	284.1	1	1	11	19	10	0
503	62	6	13	12 0	38	45.4	284.1	1	1	11	20	4	0
504	62	6	18	12 0	38	45.4	284.1	1	1	11	20	4	0
505	62	6	19	12 0	38	45.4	284.1	1	1	11	20	4	0
502	62	6	20	12 0	38	45.4	284.1	1	1	11	20	4	0
506	62	6	21	12 0	38	45.4	284.1	1	1	11	20	4	0
56	62	7	0	12 0	37	45.4	284.1	1	1	11	15	3.6	0
57	62	7	0	12 0	37	45.4	284.1	1	1	11	19	10	0
61	62	8	0	12 0	35	45.4	284.1	1	1	11	74	6	0
58	62	8	11	1450	35	60.0	11.1	1	1	31	70	5.3	0
59	62	8	15	050	35	-31.2	136.3	4	1	32	63	12	0
60	62	8	18	8 9	35	69.3	16.0	2	2	14	77	6	9
62	62	9	0	12 0	33	45.4	284.1	1	1	11	15	3.6	0
67	62	11	0	12 0	30	45.4	284.1	1	1	11	19	10	0
65	62	11	7	525	30	37.9	284.5	2	1	20	122	2.4	0
66	62	11	30	557	30	37.9	284.5	2	1	20	122	2.4	0
68	62	12	5	17 0	30	37.9	284.5	2	1	20	122	2.4	0
497	62	12	8	12 0	30	45.4	284.1	1	1	11	20	4	0
69	62	12	11	427	30	69.3	16.0	2	2	26	77	10	9
70	62	12	14	2152	30	69.3	16.0	2	2	26	77	10	9
498	62	12	18	12 0	30	45.4	284.1	1	1	11	20	4	0
71	63	2	27	1430	30	37.9	284.5	2	1	20	122	2.4	0
72	63	3	8	950	30	37.9	284.5	2	1	29	2	4	0
73	63	4	9	1530	29	37.9	284.5	2	1	29	5	4	0
74	63	4	12	030	29	37.9	284.5	2	1	20	37	1	0
947	63	7	20	15 3	28	58.8	265.8	2	1	1	125	13	1
948	63	7	20	1610	28	58.8	265.8	2	1	1	125	13	0
82	63	7	26	16 5	28	58.8	265.8	2	1	38	42	17	0
86	63	9	12	720	27	69.3	16.0	2	2	14	74	3	9
87	63	10	25	20 0	26	58.8	265.8	1	1	11	22	20	0
88	63	10	31	12 0	26	30.4	273.3	2	1	20	117	3	0
90	63	11	4	11 0	24	-30.5	151.5	3	1	34	126	9	0
151	64	0	0	0 0	12	58.8	265.8	2	1	11	19	16	0
521	64	0	0	15 0	0	37.9	284.5	2	1	20	86	5	0
94	64	1	0	1030	19	40.8	282.1	3	1	16	51	6	0
95	64	1	0	1130	19	40.8	282.1	3	1	16	51	6	0
93	64	1	0	12 0	20	40.8	282.1	3	1	16	51	5	0
96	64	1	0	1230	19	40.8	282.1	3	1	16	51	6	0
97	64	1	0	1330	19	40.8	282.1	3	1	16	51	6	0
98	64	2	18	12 0	18	40.8	282.1	3	1	16	51	5	0
101	64	3	0	8 0	15	69.3	16.0	2	1	26	74	3	0
561	64	3	0	0 0	15	69.5	19.3	1	1	14	64	2	0
550	64	3	0	0 0	14	40.0	0.0	4	1	45	45	3	0
107	64	3	0	0 0	10	40.0	0.0	4	1	9	45	7	0
108	64	3	0	6 0	14	40.0	0.0	4	1	9	45	3	0
109	64	3	0	8 0	14	40.0	0.0	4	1	9	45	3	0
105	64	3	0	645	15	74.7	265.1	1	1	11	22	5	0
102	64	3	0	10 0	15	69.5	19.3	1	1	14	64	2	0
110	64	3	0	10 0	14	40.0	0.0	4	1	9	45	3	0
103	64	3	0	12 0	15	69.5	19.3	1	1	14	64	2	0
104	64	3	0	12 0	15	74.7	265.1	1	1	11	22	5	0
111	64	3	0	12 0	14	40.0	0.0	4	1	9	45	3	0
99	64	3	12	358	15	69.3	16.0	2	2	26	74	3	9
100	64	3	15	344	15	69.3	16.0	2	2	26	74	3	9
112	64	4	16	16 5	13	37.9	284.5	2	1	20	92	1	0
127	64	6	0	12 0	10	40.0	0.0	4	1	9	45	4	0
113	64	6	22	1420	10	-30.5	151.5	3	1	34	126	9	0
114	64	6	22	1440	10	-30.5	151.5	3	1	34	126	9	0
115	64	6	22	1540	10	-30.5	151.5	3	1	34	126	9	0
116	64	6	24	1235	10	-30.5	151.5	3	1	34	126	9	0
106	64	7	0	0 0	11	74.7	265.1	1	1	11	22	5	0
120	64	7	0	0 0	10	74.7	265.1	1	1	11	22	5	0
121	64	7	0	12 0	10	74.7	265.1	1	1	11	22	5	0
117	64	7	15	3 0	10	37.9	284.5	2	1	20	91	1	0
118	64	7	15	420	10	37.9	284.5	2	1	20	91	2	0
553	64	7	15	430	10	37.9	284.5	2	1	20	19	12	0
119	64	7	15	525	10	37.9	284.5	2	1	20	91	5	0
122	64	8	0	6 0	10	69.5	19.3	1	1	14	64	1	0
123	64	8	0	12 0	10	69.5	19.3	1	1	14	64	1	0
126	64	8	0	12 0	10	40.0	50.0	4	1	15	81	2	0
124	64	8	0	17 0	10	69.5	19.3	1	1	14	64	1	0
125	64	8	26	12 0	10	37.9	284.5	2	1	20	35	8	0
129	64	9	0	12 0	10	60.0	11.1	1	1	1	136	8	0
128	64	9	1	1715	10	-30.5	151.5	3	1	34	126	9	0
473	64	9	1	1742	10	-30.5	151.5	3	1	34	126	9	0
474	64	9	1	1752	10	-30.5	151.5	3	1	34	126	9	0
130	64	10	0	645	10	35.2	25.0	3	1	18	136	4	0
131	64	10	0	810	10	35.2	25.0	3	1	18	136	4	0
132	64	10	0	935	10	35.2	25.0	3	1	18	136	4	0
133	64	10	0	11 0	10	35.2	25.0	3	1	18	136	4	0
134	64	10	0	1130	10	35.2	25.0	3	1	18	136	4	0
135	64	10	0	1230	10	35.2	25.0	3	1	18	136	4	0
136	64	10	0	13 0	10	35.2	25.0	3	1	18	136	4	0
137	64	10	0	14 0	10	35.2	25.0	3	1	18	136	4	0
138	64	10	0	15 0	10	35.2	25.0	3	1	18	136	4	0
139	64	10	0	16 0	10	35.2	25.0	3	1	18	136	4	0
140	64	10	0	17 0	10	35.2	25.0	3	1	18	136	4	0
141	64	10	7	18 4	10	37.9	284.5	2	1	20	123	11	0
142	64	10	8	523	10	37.9	284.5	2	1	20	123	12	0
143	64	10	27	12 0	10	58.8	265.8	2	2	11	140	3	9
144	64	10	27	12 0	10	58.8	265.8	2	2	11	140	3	9
145	64	11	19	1520	10	37.9	284.5	2	1	20	92	4	0
146	64	11	23	12 7	10	37.9	284.5	2	1	20	35	8	0
148	64	12	0	0 0	12	40.0	0.0	4	1	9	45	7	0
147	64	12	0	10 0	10	37.9	284.5	1	1	20	92	8	0
149	64	12	0	12 0	12	40.0	0.0	4	1	9	45	4	0
150	64	0	0	0 0	12	58.8	265.8	2	2	11	19	16	9
570	65	1	0	620	14	50.0	10.0	4	1	54	36	6	0

Table 5. Complete listing of the File DB1. (continued)

A	B	C	D	E	F	G	H	I	J	K	L	M	N
572	65	1	0	845	12	50.0	10.0	4	1	54	36	7	0
573	65	1	0	930	12	50.0	10.0	4	1	54	36	7	0
153	65	1	8	19 3	12	-30.5	151.5	3	1	34	126	9	0
154	65	1	8	1920	12	-30.5	151.5	3	1	34	126	9	0
155	65	1	8	1925	12	-30.5	151.5	3	1	34	126	9	0
156	65	1	8	1930	12	-30.5	151.5	3	1	34	126	9	0
152	65	1	8	1935	12	-30.5	151.5	3	1	34	126	9	0
157	65	1	8	1941	12	-30.5	151.5	3	1	34	126	9	0
158	65	2	6	12 0	12	74.7	265.1	1	1	11	68	2	7
159	65	2	8	12 0	12	74.7	265.1	1	1	11	68	2	7
160	65	2	11	12 0	12	74.7	265.1	1	1	11	68	2	0
173	65	3	0	730	13	-19.3	17.7	1	1	19	136	6	0
174	65	3	0	8 0	13	58.8	265.8	1	1	11	22	23	0
176	65	3	0	915	13	-19.3	17.7	1	1	19	136	6	0
177	65	3	0	11 0	13	-19.3	17.7	1	1	19	136	6	0
178	65	3	0	12 0	13	58.8	265.8	1	1	11	22	23	0
186	65	3	0	12 0	13	74.7	265.1	1	1	11	22	5	0
187	65	3	0	12 0	13	60.0	11.1	1	1	2	136	8	0
179	65	3	0	1350	13	-19.3	17.7	1	1	19	136	6	0
180	65	3	0	1435	13	-19.3	17.7	1	1	19	136	1	0
185	65	3	0	1510	13	45.4	284.1	1	1	11	27	4	0
181	65	3	0	1525	13	-19.3	17.7	1	1	19	136	6	0
182	65	3	0	16 0	13	-19.3	17.7	1	1	19	136	6	0
183	65	3	0	1650	13	-19.3	17.7	1	1	19	136	6	0
184	65	3	0	1827	13	-19.3	17.7	1	1	19	136	6	0
161	65	3	8	0 0	13	58.8	265.8	1	1	11	22	7	0
162	65	3	9	0 0	13	58.8	265.8	1	1	11	22	7	0
163	65	3	16	1151	13	-12.8	281.8	2	1	18	3	1A	0
164	65	3	18	141	13	-12.8	283.1	2	1	18	3	1B	0
165	65	3	18	1138	13	-12.8	282.0	2	1	18	3	1C	0
166	65	3	20	820	13	-12.9	282.0	2	1	18	89	2	0
167	65	3	20	12 4	13	-13.0	282.1	2	1	18	121	1	0
168	65	3	21	659	13	69.3	16.0	2	2	14	75	0	9
169	65	3	22	349	13	-13.0	282.2	2	1	18	121	3	0
175	65	3	22	720	13	-19.3	17.7	1	1	19	136	6	0
170	65	3	24	12 7	13	-11.4	281.6	2	1	18	3	1D	0
171	65	3	26	1113	13	-10.2	280.6	2	1	18	3	1E	0
172	65	3	27	20 0	13	-12.2	281.2	2	1	18	3	1F	0
191	65	4	0	0 0	14	-19.3	17.7	5	1	9	58	3	0
192	65	4	0	6 0	14	-19.3	17.7	5	1	9	58	3	0
571	65	4	0	725	14	50.0	10.0	4	1	53	36	6	0
574	65	4	0	830	14	50.0	10.0	4	1	53	36	6	0
193	65	4	0	9 0	14	-19.3	17.7	5	1	9	58	3	0
194	65	4	0	18 0	14	-19.3	17.7	5	1	9	58	3	0
195	65	4	0	12 0	14	60.0	11.1	1	1	2	136	8	0
188	65	4	5	846	14	-29.6	284.8	2	1	18	89	2	0
189	65	4	9	1418	14	-44.6	282.2	2	1	18	89	2	0
190	65	4	12	1214	14	-58.5	282.0	2	1	18	89	2	0
196	65	5	19	1433	15	-31.2	136.3	4	1	21	61	5	0
198	65	5	27	1759	15	58.8	265.8	1	1	11	22	30	0
199	65	5	27	1759	15	58.8	265.8	2	1	11	22	30	0
197	65	5	28	12 0	15	-35.0	173.0	1	1	21	56	4	0
200	65	5	30	1733	15	-35.0	175.0	2	1	21	80	3	0
92	65	6	0	12 0	15	-44.0	170.0	1	1	56	56	3	0
201	65	6	14	413	15	37.9	284.5	2	1	20	91	3	0
202	65	6	17	1641	15	37.9	284.5	2	1	20	92	2	0
203	65	6	22	23 0	15	37.9	284.5	2	1	20	124	3	0
552	65	6	26	11 0	15	58.8	265.8	1	1	48	30	18	0
204	65	6	26	12 0	15	45.4	284.1	1	1	11	29	6	0
575	65	7	0	525	16	50.0	10.0	4	1	52	36	3	0
576	65	7	0	733	16	50.0	10.0	4	1	52	36	3	0
211	65	9	0	910	17	35.2	25.0	1	1	19	66	2	0
212	65	9	0	1015	17	35.2	25.0	1	1	19	66	2	0
75	65	9	0	12 0	17	-44.0	170.0	1	1	55	56	4	0
213	65	9	0	12 0	17	35.2	25.0	1	1	19	66	2	0
214	65	9	0	1335	17	35.2	25.0	1	1	19	66	2	0
215	65	9	0	1445	17	35.2	25.0	1	1	19	66	2	0
216	65	9	0	1535	17	35.2	25.0	1	1	19	66	2	0
217	65	9	0	1645	17	35.2	25.0	1	1	19	66	2	0
205	65	9	1	617	17	37.9	284.5	2	1	20	67	2	0
206	65	9	11	12 0	17	35.2	25.0	1	1	18	136	5	0
207	65	9	11	1510	17	35.2	25.0	1	1	18	136	5	0
208	65	9	11	16 4	17	35.2	25.0	1	1	18	136	5	0
209	65	9	11	1612	17	35.2	25.0	1	1	18	136	5	0
210	65	9	15	1528	17	37.9	284.5	2	1	20	92	3	0
89	65	10	0	12 0	26	-44.0	170.0	1	1	55	56	2	0
218	65	11	10	2210	22	30.4	273.3	2	1	18	117	3	0
219	65	11	17	2320	22	30.4	273.3	2	1	18	117	3	0
91	65	12	0	0 0	21	74.7	265.1	1	1	35	18	6	0
83	65	12	0	1040	24	-44.0	170.0	1	1	13	56	1	0
220	65	12	15	12 0	24	37.9	284.5	2	1	20	90	1	0
267	66	0	0	0 0	50	40.0	50.0	4	1	15	81	2	0
221	66	1	10	12 0	28	37.9	284.5	2	1	20	90	1	5
222	66	2	22	1929	31	69.3	16.0	2	2	28	75	0	9
223	66	2	24	015	31	69.3	16.0	2	2	28	75	0	9
527	66	3	0	0 0	45	50.0	15.0	5	1	9	82	3	6
224	66	3	9	2320	34	69.3	16.0	2	2	2	75	0	9
225	66	3	10	2326	34	69.3	16.0	2	2	2	75	0	9
226	66	3	22	0 4	34	69.3	16.0	2	2	2	75	0	9
926	66	3	30	1155	34	45.4	284.1	1	1	11	19	29	0
227	66	4	7	23 1	37	37.9	284.5	2	1	20	67	2	0
228	66	5	15	1151	41	38.0	23.6	2	1	22	76	2	0
229	66	5	16	1530	41	35.2	25.0	1	1	19	134	8.1	0
230	66	5	20	10 0	41	36.8	21.9	2	1	2	78	3	0
246	66	5	20	11 0	41	38.0	23.6	2	1	19	65	2	1
234	66	5	20	1130	41	36.8	21.9	2	1	2	78	3	1
245	66	5	20	13 5	41	35.2	25.0	1	1	19	65	2	0
247	66	6	14	418	45	37.9	284.5	2	1	20	91	4	0
248	66	6	26	12 0	45	69.3	16.0	2	1	14	112	8	9
249	66	6	26	2247	45	69.3	16.0	2	2	11	105	1	0
250	66	7	15	12 0	50	74.7	265.1	1	1	11	68	4	0
938	66	7	17	12 0	50	74.7	265.1	1	1	11	68	4	7
253	66	9	28	12 0	63	58.8	265.8	2	2	11	34	28	10
254	66	9	28	12 0	63	58.8	265.8	2	2	11	34	28	10
255	66	10	20	1728	68	31.6	130.5	2	1	18	101	1	0
256	66	10	20	1734	68	31.6	130.5	2	1	18	101	1	0
808	66	11	00	1215	70	-32.0	308.0	1	1	11	155	17	0
257	66	11	5	955	70	-32.2	307.8	2	1	20	137	3	0
258	66	11	10	17 0	70	-32.2	307.8	1	1	11	143	3	0
259	66	11	10	1745	70	-32.2	307.8	1	1	11	143	4	0
809	66	11	12	1210	70	-32.0	308.0	1	1	11	155	17	1
944	66	11	12	1410	70	-32.0	308.0	2	1	56	89	4	1
943	66	11	12	16 0	70	-32.0	308.0	2	1	56	89	4	0
265	66	11	20	138	70	69.3	16.0	2	2	28	75	2	9
252	66	12	0	12 0	73	-43.6	172.8	1	1	13	7	3	0
266	66	12	13	12 0	73	32.3	253.5	2	1	20	60	6	0
275	67	1	28	21 5	91	-66.7	140.0	2	2	11	31	19.5	7
932	67	1	29	1030	91	-66.7	140.0	2	1	11	31	19.6	7
933	67	1	29	1210	91	-66.7	140.0	2	1	11	31	19.6	7
268	67	1	31	12 0	75	37.9	284.5	2	1	20	119	3	5
269	67	3	4	058	82	69.3	16.0	2	1	2	75	0	9
270	67	3	12	1857	82	8.6	76.9	2	1	20	106	1	0
271	67	3	12	1857	82	8.6	76.9	2	1	20	106	1	0
272	67	3	15	046	82	69.3	16.0	2	1	2	75	0	9
273	67	4	27	12 0	85	45.4	284.1	1	1	11	16	7	0
274	67	5	3	1220	87	45.4	284.1	1	2	11	16	7	0
549	67	5	21	311	87	52.1	357.7	5	1	8	132	3	0
276	67	7	0	12 0	92	-44.0	173.0	1	1	56	8	3	0
277	67	9	27	1432	95	40.0	9.0	2	1	18	130	6	0
278	67	10	7	1550	95	40.0	9.0	2	1	18	130	5	0
279	67	10	13	550	95	69.3	16.0	2	1	14	54	2	0
280	67	10	24	1314	95	18.5	292.8	2	1	18	118	13	0
281	67	10	27	1314	95	18.5	292.8	2	1	18	34	12	0
283	67	11	0	12 0	97	6.9	81.0	5	1	20	97	4	0
282	67	11	20	137	97	69.3	16.0	2	1	26	112	15	9
489	67	12	6	2221	101	67.9	20.3	2	1	28	141	8	0
286	67	12	7	9 0	102	40.8	282.1	3	1	25	116	3	0
466	67	12	7	15 0	102	40.8	282.1	3	1	25	116	3	0
287	67	12	14	9 0	102	40.8	282.1	3	1	25	116	3	0
467	67	12	14	15 0	102	40.8	282.1	3	1	25	116	3	0
284	67	12	29	13 0	101	40.8	282.1	3	1	25	83	16	0
285	67	12	30	12 0	101	45.4	284.1	1	1	11	83	16	0
361	68	0	0	12 0	103	51.5	359.4	4	1	8	135	6	0
520	68	0	0	15 0	100	37.9	284.5	2	1	20	86	5	0
939	68	1	0	9 0	103	40.8	282.1	3	1	25	83	11	0
940	68	1	0	11 0	103	40.8	282.1	3	1	25	83	11	0
313	68	1	0	12 0	103	40.8	282.1	3	1	25	83	12	0
941	68	1	0	13 0	103	40.8	282.1	3	1	25	83	11	0
942	68	1	0	15 0	103	40.8	282.1	3	1	25	83	11	0
289	68	1	1	12 0	103	45.4	284.1	1	1	11	83	16	0
290	68	1	2	12 0	103	45.4	284.1	1	1	11	83	16	0
291	68	1	5	11 0	103	40.8	282.1	3	1	25	83	16	0
288	68	1	8	15 0	102	40.8	282.1	3	1	25	116	3	5
292	68	1	15	12 0	103	45.4	284.1	1	1	11	16	17	0
920	68	1	16	1514	103	37.9	284.5	2	1	47	2	4	3
295	68	1	18	9 0	103	40.8	282.1	3	1	25	83	4	0
296	68	1	18	11 0	103	40.8	282.1	3	1	25	83	4	0
297	68	1	18	13 0	103	40.8	282.1	3	1	25	83	4	0
298	68	1	18	15 0	103	40.8	282.1	3	1	25	83	4	0
299	68	1	22	11 0	103	40.8	282.1	3	1	25	83	7	0
300	68	1	22	13 0	103	40.8	282.1	3	1	25	83	7	0
301	68	1	22	15 0	103	40.8	282.1	3	1	25	83	7	0
302	68	1	23	11 0	103	40.5	282.1	3	1	25	83	8	0
303	68	1	23	13 0	103	40.8	282.1	3	1	25	83	8	0
304	68	1	23	15 0	103	40.8	282.1	3	1	25	83	8	0
305	68	1	30	9 0	103	40.8	282.1	3	1	25	83	9	0
306	68	1	30	11 0	103	40.8	282.1	3	1	25	83	9	0
307	68	1	30	13 0	103	40.8	282.1	3	1	25	83	9	0
308	68	1	30	15 0	103	40.8	282.1	3	1	25	83	9	0
309	68	1	31	9 0	103	40.8	282.1	3	1	25	83	10	0
310	68	1	31	11 0	103	40.8	282.1	3	1	25	83	10	0
311	68	1	31	13 0	103	40.8	282.1	3	1	25	83	10	0
312	68	1	31	15 0	103	40.8	282.1	3	1	25	83	10	0
319	68	3	8	12 0	105	8.6	76.9	2	1	20	79	3	0
320	68	3	8	1755	105	8.6	76.9	2	1	20	79	3	0
321	68	3	22	1230	105	40.8	282.1	3	1	5	39	1C	0
322	68	3	22	1230	105	40.8	282.1	1	1	5	39	1C	0
323	68	3	25	945	105	45.4	284.1	1	1	11	127	D1	0
324	68	3	25	1010	105	45.4	284.1	1	1	11	127	D1	2
325	68	3	25	11 0	105	40.8	282.1	3	1	5	135	5	0

Table 5. Complete listing of the File DB1. (continued)

A	B	C	D	E	F	G	H	I	J	K	L	M	N
326	68	3	25	1130	105	40.8	282.1	3	1	5	39	1B	0
327	68	3	25	1130	105	40.8	282.1	1	1	5	39	1B	0
328	68	3	25	1230	105	40.8	282.1	3	1	5	39	1D	0
329	68	3	25	1230	105	40.8	282.1	1	1	5	39	1D	0
330	68	3	25	1430	105	40.8	282.1	3	1	5	39	1A	0
331	68	3	25	1430	105	40.8	282.1	1	1	5	39	1A	0
332	68	4	2	1030	107	40.8	282.1	3	1	5	39	1E	0
333	68	4	2	1030	107	40.8	282.1	1	1	5	39	1E	0
557	68	5	20	1920	108	52.1	357.7	5	1	8	69	4	0
913	68	5	20	1210	87	52.1	357.7	5	2	17	132	4	0
914	68	5	20	1740	87	52.1	357.7	5	2	17	132	4	0
569	68	5	21	2 0	108	52.1	357.7	5	1	8	69	4	0
556	68	5	21	1422	108	52.1	357.7	5	1	8	69	4	0
530	68	6	5	12 0	107	40.8	282.1	3	1	25	11	6	0
577	68	7	0	525	105	50.0	10.0	4	1	52	36	3	0
578	68	7	0	733	105	50.0	10.0	4	1	52	36	3	0
349	68	7	0	12 0	105	40.0	50.0	4	1	15	81	2	0
334	68	7	8	12 0	105	45.4	284.1	1	1	11	99	1	0
340	68	7	24	450	105	37.9	284.5	2	1	20	93	3A	0
341	68	7	24	530	105	37.9	284.5	2	1	20	93	3A	0
343	68	7	24	1235	105	37.9	284.5	2	1	20	93	3B	0
342	68	7	24	1636	105	37.9	284.5	2	1	20	93	3B	0
984	68	08	01	1030	105	57.2	352.9	2	1	30	151	1	0
934	68	8	7	12 0	105	57.4	352.6	2	1	17	33	2	0
347	68	8	29	1415	105	8.6	76.9	2	1	20	107	2	0
348	68	8	29	1415	105	8.6	76.9	2	1	20	107	2	0
63	68	10	21	1210	110	40.8	282.1	3	1	18	115	1	0
64	68	10	21	1239	110	40.8	282.1	3	1	18	115	1	2
353	68	10	24	2150	110	67.8	20.4	2	2	28	47	1	9
354	68	10	25	12 0	110	74.7	265.1	1	1	11	27	14	0
355	68	10	26	12 0	110	74.7	265.1	1	1	11	27	14	0
356	68	10	29	12 0	110	74.7	265.1	1	2	11	27	14	7
357	68	10	31	12 0	110	74.7	265.1	1	1	11	27	14	7
358	68	11	1	12 0	111	74.7	265.1	1	1	11	27	14	7
359	68	11	4	1230	111	-44.0	173.0	1	1	21	142	1	0
360	68	11	19	2 0	111	58.8	265.8	2	2	11	139	1	8
987	68	11	30	1358	111	57.2	352.9	2	1	30	151	2	0
548	68	12	5	12 0	110	57.2	352.7	2	1	47	32	1	5
988	68	12	05	1429	110	57.2	352.9	2	2	30	151	2	0
579	68	12	5	1430	110	57.4	352.6	2	2	47	33	6	5
566	69	1	9	1644	110	31.2	131.1	2	1	20	102	1	0
362	69	1	18	2024	110	69.3	16.0	2	2	28	47	1	9
363	69	1	31	12 0	110	37.9	284.5	2	1	20	85	4	0
364	69	2	6	12 9	110	37.9	284.5	2	1	20	85	4	0
365	69	2	25	1521	110	50.0	15.0	2	2	26	78	1	8
366	69	2	25	2237	110	50.0	15.0	2	2	26	78	1	8
952	69	3	12	12 0	108	-43.6	172.8	5	0	55	7	7	0
953	69	3	12	12 0	108	-43.6	172.8	1	2	55	7	7	0
367	69	3	20	12 0	108	45.4	284.1	1	1	11	16	11	0
369	69	4	13	2319	106	58.8	265.8	2	2	11	94	6	8
368	69	4	14	1528	106	58.8	265.8	2	2	11	94	6	8
370	69	4	17	16 0	106	37.9	284.5	1	1	20	85	4	0
371	69	6	19	10 6	106	57.2	352.7	2	1	23	9	3	0
983	69	06	19	1503	106	57.2	352.9	2	1	30	151	1	0
522	69	7	0	12 0	106	30.0	0.0	5	1	23	9	7	0
372	69	8	5	2136	106	58.8	265.8	2	1	11	4420.1		0
373	69	9	10	1546	105	37.9	284.5	1	1	20	85	4	0
995	69	09	30	2241	105	57.2	352.9	2	2	30	151	3	11
374	69	10	0	12 0	104	40.8	282.1	3	1	25	113	4.5	0
996	69	10	01	0420	104	57.2	352.9	2	2	30	151	3	11
923	69	11	1	0 0	105	58.8	265.8	1	1	11	1716.7		0
924	69	11	2	0 0	105	58.5	265.8	1	2	11	1716.7		0
925	69	11	2	4 0	105	58.8	265.8	1	2	11	1716.6		0
375	69	11	2	5 0	105	58.8	265.8	1	2	11	1716.6		8
376	69	11	2	6 0	105	58.8	265.8	1	2	11	1716.6		8
377	69	11	2	7 0	105	58.8	265.8	1	2	11	1716.6		8
378	69	11	2	8 0	105	58.8	265.8	1	2	11	1716.6		8
379	69	11	2	9 0	105	58.8	265.8	1	2	11	1716.6		8
380	69	11	2	1510	105	58.8	265.8	2	2	11	4420.4		8
381	69	11	3	0 0	105	58.8	265.8	1	2	11	1716.6		8
382	69	11	3	0 5	105	58.8	265.8	2	2	11	13827.5		8
804	69	11	03	0100	105	58.8	265.8	2	2	33	154	3-3	8
805	69	11	03	0628	105	58.8	265.8	2	2	33	154	3-3	8
383	69	11	3	657	105	58.8	265.8	2	2	11	4420.2		8
384	69	11	3	730	105	58.8	265.8	2	2	11	4420.3		8
385	69	11	3	752	105	58.8	265.8	2	2	11	13827.6		8
806	69	11	03	0805	105	58.8	265.8	2	2	33	154	3-3	8
386	69	11	3	1254	105	58.8	265.8	2	2	11	4420.5		8
387	69	11	4	0 0	105	58.8	265.8	1	2	11	1716.6		8
807	69	11	04	1343	105	58.8	265.8	2	1	33	154	3-3	8
388	69	11	4	1530	105	58.8	265.8	2	2	11	4420.6		8
389	69	11	4	1638	105	58.8	265.8	2	2	11	4420.7		8
390	69	11	4	17 8	105	58.8	265.8	2	2	11	13827.8		8
391	69	11	5	0 0	105	58.8	265.8	2	2	11	1716.6		0
528	69	11	12	1138	105	-32.2	307.8	2	1	18	11	5	0
945	69	11	18	1250	105	45.4	284.1	1	1	40	98	2	3
946	69	11	18	1430	105	45.4	284.1	1	1	40	98	2	0
490	69	11	26	2045	105	67.9	20.3	2	1	28	141	1	0
396	69	12	0	9 0	106	40.8	282.1	3	1	24	113	4.7	0
397	69	12	0	1038	106	40.8	282.1	3	1	24	113	4.7	0
398	69	12	0	12 0	106	40.8	282.1	3	1	24	113	4.3	0
401	69	12	0	12 0	60	40.0	50.0	4	1	46	81	2	0
399	69	12	0	1430	106	40.8	282.1	3	1	24	113	4.7	0
400	69	12	0	15 0	106	40.8	282.1	3	1	24	113	4.7	0
580	69	12	16	1343	105	57.4	352.6	2	2	47	33	6	5
403	70	1	0	12 0	106	40.8	282.1	3	1	25	113	4.4	0
402	70	1	2	1212	106	8.6	76.9	2	1	20	129	2	0
581	70	1	12	13 0	106	57.4	352.6	2	2	47	33	6	5
997	70	01	24	1427	106	39.6	9.2	2	1	30	151	4	0
404	70	2	0	12 0	106	40.8	282.1	3	1	25	113	4.4	0
405	70	3	1	10 3	106	45.4	284.1	1	1	11	98	3	0
406	70	3	1	10 9	106	45.4	284.1	1	1	11	98	3	3
407	70	3	1	1021	106	45.4	284.1	1	1	11	98	3	3
408	70	3	7	1045	106	37.9	284.1	2	1	20	88	2	0
409	70	3	7	13 9	106	40.8	282.1	3	1	11	114	2	1
412	70	3	7	1340	106	44.9	297.7	1	1	11	24	6	0
413	70	3	7	1340	106	44.9	297.7	2	1	11	24	6	0
410	70	3	7	1328	106	40.8	282.1	3	1	11	114	2	1
414	70	3	7	1413	106	40.8	282.1	3	1	11	114	2	1
415	70	3	7	15 4	106	44.9	297.7	2	0	11	28	6	1
416	70	3	7	15 4	106	44.9	297.7	1	0	11	28	6	1
417	70	3	11	1310	106	40.8	282.1	3	1	11	114	2	0
418	70	3	19	827	106	8.6	76.9	2	1	20	4	3	0
419	70	3	19	1017	106	8.6	76.9	2	1	20	4	3	0
420	70	3	19	15 9	106	8.6	76.9	2	1	20	4	3	0
519	70	3	27	12 0	106	88.6	76.9	2	1	20	128	1	0
421	70	5	22	545	106	45.4	284.1	1	1	11	40	4	0
422	70	5	22	810	106	45.4	284.1	1	1	11	40	12	0
423	70	5	22	1020	106	45.4	284.1	1	1	11	40	3	0
424	70	5	22	12 0	106	45.4	284.1	1	1	11	40	12	0
425	70	5	22	16 0	106	45.4	284.1	1	1	11	40	12	0
426	70	5	22	1750	106	45.4	284.1	1	1	11	40	12	0
427	70	6	24	755	105	40.8	282.1	3	1	5	52	3	0
428	70	6	24	755	105	45.4	284.1	1	1	4	52	3	0
429	70	6	26	1110	105	40.8	282.1	3	1	5	26	2	0
430	70	6	26	12 0	105	45.4	284.1	1	1	4	26	2	0
436	70	7	0	8 0	104	40.8	282.1	3	1	25	53	7	0
437	70	7	0	830	104	40.8	282.1	3	1	25	53	7	0
438	70	7	0	9 0	104	40.8	282.1	3	1	25	53	7	0
439	70	7	0	10 0	104	40.8	282.1	3	1	25	53	7	0
432	70	7	0	12 0	104	40.8	282.1	3	1	24	113	4.5	0
440	70	7	0	1230	104	40.8	282.1	3	1	25	53	7	0
431	70	7	0	1430	104	40.8	282.1	3	1	24	113	4.8	0
999	70	07	23	1356	104	39.6	9.2	2	1	30	151	4	0
435	70	8	0	12 0	101	40.8	282.1	3	1	25	113	4.5	0
433	70	8	4	13 5	101	69.3	16.0	2	1	27	135	7	0
434	70	8	10	040	101	67.8	20.4	2	1	27	47	1	0
441	70	9	0	12 0	97	40.8	282.1	3	1	24	113	4.5	0
582	70	9	18	1139	97	57.4	352.6	2	1	3	33	4	0
442	70	10	0	930	94	40.8	282.1	3	1	24	113	4.9	0
443	70	10	0	10 0	94	40.8	282.1	3	1	24	113	4.9	0
444	70	10	0	1038	94	40.8	282.1	3	1	24	113	4.9	0
447	70	10	0	12 0	94	40.8	282.1	3	1	24	113	4.5	0
448	70	10	0	12 0	96	40.8	282.1	3	1	25	53	5	0
445	70	10	0	1430	94	40.8	282.1	3	1	24	113	4.9	0
446	70	10	0	15 0	94	40.8	282.1	3	1	24	113	4.9	0
449	70	11	0	12 0	89	40.8	282.1	3	1	24	113	4.4	0
915	70	11	28	6 0	89	42.6	288.5	5	1	47	6	7	0
916	70	11	28	640	89	42.6	288.5	5	1	47	6	7	0
917	70	11	28	7 0	89	42.6	288.5	5	1	47	6	7	0
918	70	11	28	740	89	42.6	288.5	5	1	47	6	7	0
919	70	12	31	10 0	85	42.6	288.5	5	1	47	6	6	0
454	71	1	0	12 0	80	40.8	282.1	3	1	24	113	4.4	0
450	71	1	22	12 0	80	32.3	253.5	2	1	20	96	7	5
452	71	1	28	1040	80	8.6	76.9	2	1	20	108	6	0
453	71	1	28	1110	80	8.6	76.9	2	1	20	108	6	0
455	71	2	1	12 0	78	32.3	253.5	2	1	20	96	7	5
451	71	2	1	1215	78	32.3	253.5	2	1	20	96	7	0
565	71	3	27	750	74	45.4	284.1	1	1	40	41	11	0
456	71	3	27	930	74	45.4	284.1	1	1	11	41	11	0
457	71	3	27	12 0	74	45.4	284.1	1	1	11	41	11	0
458	71	3	27	1455	74	45.4	284.1	1	1	11	41	11	0
998	71	05	14	1359	68	39.6	9.2	2	1	30	151	4	0
981	71	06	26	1944	67	57.2	352.9	2	1	30	151	1	0
986	71	06	28	1225	67	57.2	352.9	2	1	30	151	1	0
534	71	8	8	935	65	40.1	271.8	1	1	20	43	3.7	0
535	71	8	8	1115	65	40.1	271.8	1	1	20	43	3.7	0
554	71	9	16	12 0	66	45.4	284.1	1	1	43	30	21	0
555	71	9	16	12 0	66	45.4	284.1	5	1	43	30	21	0
982	71	09	24	1726	66	57.2	352.9	2	1	30	151	1	0
532	71	10	9	850	66	40.1	271.8	1	1	20	43	3.3	0
810	71	10	13	0945	66	40.1	271.8	1	2	44	156	5.4	0
546	71	10	14	735	66	40.1	271.8	1	1	20	43	5.3	0
811	71	10	14	0910	66	40.1	271.8	1	1	44	156	5.5	0
583	71	10	14	1255	66	57.4	352.6	2	1	3	33	4	0
547	71	10	14	15 5	66	40.1	271.8	1	1	20	43	5.3	0
533	71	10	17	825	66	40.1	271.8	1	1	20	43	3.3	0
459	71	10	18	12 0	66	45.4	284.1	1	1	37	131	3	0
460	71	10	20	12 0	66	45.4	284.1	1	1	37	131	3	0
812	71	10	19	1002	66	40.1	271.8	1	1	44	156	5.6	0

Table 5. Complete listing of the File DB1. (continued)

A	B	C	D	E	F	G	H	I	J	K	L	M	N
813	71	10	19	1017	66	40.1	271.8	1	1	44	156	5.7	0
461	71	10	25	12 0	66	45.4	284.1	1	1	37	131	3	0
462	71	10	26	1147	66	45.4	284.1	1	1	39	28	1	0
814	71	10	28	1140	66	40.1	271.8	1	2	44	156	5.8	0
815	71	10	28	1415	66	40.1	271.8	1	2	44	156	5.9	0
463	71	10	29	12 0	66	45.4	284.1	1	1	39	28	1	0
816	71	11	04	1135	67	40.1	271.8	1	1	44	156	5.10	0
991	71	12	01	1334	69	57.2	352.9	2	1	30	151	2	0
992	71	12	03	1258	69	57.2	352.9	2	1	30	151	2	5
990	71	12	06	1403	69	57.2	352.9	2	1	30	151	2	0
989	71	12	07	1311	69	57.2	352.9	2	1	30	151	2	0
544	71	12	9	12 0	69	40.1	271.8	1	1	20	43	5.7	0
545	71	12	12	12 0	69	37.9	284.5	1	1	20	43	5.7	5
584	72	1	15	1215	71	57.4	352.6	2	2	51	33	8	0
540	72	1	19	11 9	71	37.9	284.5	1	1	20	435.12		0
541	72	1	19	1147	71	37.9	284.5	1	1	20	435.12		2
542	72	1	19	12 0	71	37.9	284.5	1	1	20	435.12		2
543	72	1	19	1218	71	37.9	284.5	1	1	20	435.12		2
537	72	1	31	1158	71	37.9	284.5	1	1	20	435.15		0
538	72	1	31	1212	71	37.9	284.5	1	1	20	435.15		0
508	72	1	31	1230	71	37.9	284.5	2	1	20	59	4	0
539	72	1	31	1230	71	37.9	284.5	1	1	20	435.15		0
531	72	1	31	1230	71	37.9	284.5	2	1	20	435.15		0
954	72	2	9	8 0	71	18.5	293.2	5	1	18	73	2	0
536	72	2	14	1212	71	37.9	284.5	1	1	20	434.28		0
955	72	3	4	711	72	18.5	293.2	5	1	18	73	5	0
507	72	4	7	12 8	73	8.6	76.9	2	1	20	120	1	0
951	72	4	11	1012	73	18.5	293.2	5	1	18	73	10	0
585	72	4	19	1133	73	57.4	352.6	2	1	3	33	2	0
515	72	4	26	1123	73	37.1	353.3	2	1	40	48	5A	0
516	72	5	5	1115	73	37.1	353.3	2	1	40	48	5A	0
482	72	5	14	213	73	-69.0	39.0	2	1	20	100	1	11
480	72	5	16	2 2	73	-69.0	39.0	2	1	20	100	1	11
586	72	5	17	1134	73	57.4	352.6	2	1	17	33	2	0
971	72	07	10	1432	70	40.1	271.8	1	1	10	150	4.1	1
972	72	07	11	1432	70	40.1	271.8	1	1	10	150	4.1	00
949	72	7	26	7 0	68	18.5	293.2	5	2	18	73	8	0
950	72	7	26	10 6	68	18.5	293.2	5	2	18	73	8	0
483	72	8	7	445	66	-69.0	39.0	2	1	20	100	1	11
481	72	8	11	4 1	66	-69.0	39.0	2	1	20	100	1	11
985	72	08	29	1312	65	57.2	352.9	2	1	30	151	1	0
993	72	08	30	2202	65	57.2	352.9	2	1	30	151	3	0
994	72	08	31	0002	65	57.2	352.9	2	1	30	151	3	0
509	72	10	13	1229	61	8.6	76.9	2	1	20	109	1	0
517	72	10	18	12 0	61	37.1	353.3	2	1	40	48	4A	0
518	72	10	25	12 8	61	37.1	353.3	2	1	40	48	4A	4
973	72	12	00	1200	55	40.1	271.8	1	1	10	46	4.16	0
587	72	12	1	1131	55	48.8	37.7	1	1	47	95	1	0
588	72	12	1	1159	55	55.8	37.7	3	1	47	95	1	0
589	72	12	1	1210	55	48.8	44.5	1	1	47	95	1	0
590	72	12	1	1536	55	48.8	44.5	2	1	47	95	1	0
591	72	12	1	16 0	55	48.8	44.5	1	1	47	95	1	0
464	72	12	5	12 0	55	37.9	284.5	2	1	20	464.14		0
974	73	01	00	1200	51	40.1	271.8	1	1	10	46	4.16	0
592	73	1	13	752	51	42.4	287.7	4	1	52	111	3	0
593	73	1	14	640	51	42.4	287.7	4	1	52	111	3	0
594	73	1	14	735	51	42.4	287.7	4	1	52	111	3	0
595	73	1	14	815	51	42.4	287.7	4	1	52	111	3	0
596	73	1	14	840	51	42.4	287.7	4	1	52	111	3	0
465	73	1	16	12 0	51	37.9	284.5	2	1	20	464.14		0
510	73	1	19	1149	51	37.1	353.3	2	1	40	48	5A	0
511	73	1	20	1138	51	37.1	353.3	2	1	40	48	5A	0
512	73	1	22	1138	51	37.1	353.3	2	1	40	48	5A	0
513	73	1	27	1143	51	37.1	353.3	2	1	40	48	5A	0
514	73	1	29	1245	51	37.1	353.3	2	1	40	48	5A	0
975	73	02	00	1200	46	40.1	271.8	1	1	10	46	4.17	0
597	73	2	22	13 4	46	57.4	352.6	2	2	47	33	4	0
598	73	2	23	1350	46	57.4	352.6	2	2	47	33	4	0
962	73	3	0	0 0	44	65.3	212.2	1	1	49	153	4.1	0
965	73	3	0	0 0	44	65.3	212.2	1	2	49	153	4.2	0
976	73	03	00	1200	44	40.1	271.8	1	1	10	46	4.17	0
960	73	3	0	12 0	44	65.3	212.2	1	1	49	153	4.1	0
963	73	3	0	12 0	44	65.3	212.2	1	2	49	153	4.2	0
961	73	3	0	18 0	44	65.3	212.2	1	1	49	153	4.1	0
964	73	3	0	18 0	44	65.3	212.2	1	2	49	153	4.2	0
966	73	3	24	21 0	44	65.3	212.2	1	2	49	153	4.3	0
967	73	3	24	2115	44	65.3	212.2	1	2	49	153	4.3	13
968	73	3	24	2135	44	65.3	212.2	1	2	49	153	4.3	13
969	73	3	24	2250	44	65.3	212.2	1	2	49	153	4.3	13
970	73	3	26	2238	44	65.3	212.2	1	2	49	153	4.7	13
977	73	04	00	1200	43	40.1	271.8	1	1	10	46	4.18	0
978	73	05	00	1200	41	40.1	271.8	1	1	10	46	4.18	0
979	73	06	00	1200	39	40.1	271.8	1	1	10	46	4.19	0
980	73	07	00	1200	37	40.1	271.8	1	1	10	46	4.19	0
488	73	8	23	354	36	-69.0	39.0	2	1	20	100	7	11
599	73	9	22	1820	35	36.0	140.0	2	1	3	103	5	0
600	74	4	1	2356	36	57.4	352.6	2	1	3	33	10	0
601	74	4	3	541	36	57.4	352.6	2	1	3	33	9	0
602	74	4	11	1337	34	65.3	212.2	2	1	49	49	4.2	0
603	74	4	11	2310	34	65.3	212.2	1	1	49	49	4.1	0
604	74	4	12	1325	34	65.3	212.2	2	1	49	49	4.2	0
605	74	4	12	21 0	34	65.3	212.2	1	1	49	49	4.1	0
902	74	4	15	1414	34	65.3	212.2	1	1	49	49	4.3	0
903	74	4	15	15 0	34	65.3	212.2	1	1	49	49	4.3	0
606	74	4	15	15 9	34	65.3	212.2	1	1	49	49	4.3	0
904	74	4	15	1529	34	65.3	212.2	1	1	49	49	4.3	0
607	74	4	15	16 0	34	65.3	212.2	1	1	49	49	4.4	0
608	74	4	15	1621	34	65.3	212.2	1	1	49	49	4.4	0
609	74	4	15	1920	34	65.3	212.2	1	1	49	49	4.5	0
912	74	4	15	1940	34	65.3	212.2	1	1	49	49	4.5	0
610	74	4	15	2240	34	65.3	212.2	1	1	49	49	4.6	0
611	74	4	15	2320	34	65.3	212.2	1	1	49	49	4.6	0
612	74	4	16	0 3	34	65.3	212.2	1	1	49	49	4.7	0
613	74	4	16	040	34	65.3	212.2	1	1	49	49	4.7	0
905	74	4	16	1421	34	65.3	212.2	1	1	49	49	4.3	0
906	74	4	16	1448	34	65.3	212.2	1	1	49	49	4.3	0
907	74	4	16	1632	34	65.3	212.2	1	1	49	49	4.4	0
908	74	4	16	17 0	34	65.3	212.2	1	1	49	49	4.4	0
614	74	4	16	20 0	34	65.3	212.2	1	1	49	49	4.5	0
615	74	4	16	2036	34	65.3	212.2	1	1	49	49	4.5	0
616	74	4	16	21 4	34	65.3	212.2	1	1	49	49	4.5	0
617	74	4	16	22 4	34	65.3	212.2	1	1	49	49	4.6	0
618	74	4	16	2245	34	65.3	212.2	1	1	49	49	4.6	0
619	74	4	16	23 7	34	65.3	212.2	1	1	49	49	4.6	0
620	74	4	16	2350	34	65.3	212.2	1	1	49	49	4.6	0
621	74	4	17	011	34	65.3	212.2	1	1	49	49	4.7	0
622	74	4	17	019	34	65.3	212.2	1	1	49	49	4.7	0
623	74	4	17	024	34	65.3	212.2	1	1	49	49	4.7	0
624	74	4	17	032	34	65.3	212.2	1	1	49	49	4.7	0
625	74	4	17	1 6	34	65.3	212.2	1	1	49	49	4.7	0
626	74	4	17	1432	34	65.3	212.2	1	2	49	49	4.3	0
627	74	4	17	1450	34	65.3	212.2	1	2	49	49	4.3	0
628	74	4	17	1456	34	65.3	212.2	1	2	49	49	4.3	0
629	74	4	17	1537	34	65.3	212.2	1	2	49	49	4.3	0
909	74	4	17	1552	34	65.3	212.2	1	1	49	49	4.4	0
910	74	4	17	16 7	34	65.3	212.2	1	1	49	49	4.4	0
911	74	4	17	17 2	34	65.3	212.2	1	1	49	49	4.4	0
630	74	4	17	2231	34	65.3	212.2	1	2	49	49	4.6	0
631	74	4	17	2247	34	65.3	212.2	1	2	49	49	4.6	0
632	74	4	17	23 1	34	65.3	212.2	1	2	49	49	4.6	0
900	74	4	18	1147	34	65.3	212.2	1	2	49	49	4.2	0
901	74	4	18	12 8	34	65.3	212.2	1	2	49	49	4.2	0
633	74	9	20	9 0	40	48.8	44.5	2	2	3	38	2	0
634	74	9	20	13 0	40	48.8	44.5	2	2	3	38	2	0
801	75	05	28	1526	17	-12.5	283.2	2	1	18	152	9.7	0
802	75	05	29	2336	17	-12.5	283.2	2	1	18	152	9.12	0
803	75	06	02	0011	16	-12.5	283.2	2	2	18	152	9.12	0
800	76	08	12	1054	14	37.9	284.5	2	1	3	152	3.9	0
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PART III. LITERATURE LISTING OF DATA SOURCES

This part is a complete listing of the file DB2, which contains all literature references from which electron density profiles or collision profiles have been obtained. The 1-3 digit number in columns 2-4 correspond to the reference numbers given in column L of Table 5 (the file DB1), and provide the link between the files DB1 and DB2.

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Appendix A "SELECT"

This appendix describes the use of the program SELECT, which can be used to bring together all of those profiles satisfying given conditions. This is achieved by specifying the lower and upper limits of the 12 identifying parameters described in the list on page 2. (The curve identification number and figure number are not considered because they have no physical significance.)

For example, all profiles obtained in the (northern) summer, between 1130 and 1230 LT (local time), at low sunspot number (≤50), at midlatitudes (20<latitude≤50), for magnetically quiet conditions, and for a normal undisturbed ionosphere, may be retrieved by inputting the following numbers in the appropriate format:

4876	All years from 1948 to 1976 are to be considered.
0508	All months from May to August, inclusive, are to be considered.
0031	All days of the month, including monthly average profiles (day=0), are to be considered.
11301230	All curves between 1130 and 1230 LT, inclusive, are to be considered.
000050	Sunspot numbers 0 to 50, inclusive, are to be considered.
2050	Latitude range from 20 to 50 degrees is to be considered.
000360	All longitudes are to be considered.
15	All methods (1 to 5) are to be considered.
11	Only magnetically quiet days are to be considered.
0156	All collision frequency profiles are to be considered.
001156	All literature references are to be considered.
00	Only undisturbed profiles are to be considered (i.e., no special cases).

The program also will retrieve any Southern Hemisphere data obtained during November-February, the local summer.

The program will print out the lines of DB1 corresponding to the profiles satisfying the given conditions and count the number of such profiles. It will then read the digitized data file, DB3, profile by profile, and write to the file TAPE7 the data for each curve satisfying the given conditions. The appropriate curves in DB3 are found by use of the curve identification numbers.

The use of SELECT on a CDC-6600 in an interactive mode is illustrated below. Note that the order of the profiles is different in DB1 and DB3.

```
/FTN,I=DSELECT,L=0
T
      .340 CP SECONDS COMPILATION TIME
/GET,TAPE5=DB1,TAPE6=DB3
/LGO
? 48760508003111301230000050205000036015110156001156OO
   55 62   6  0 1200  38  45    284   1 1 11  19         0
  503 62   6 13 1200  38  45    284   1 1 11  20         0
  504 62   6 18 1200  38  45    284   1 1 11  20         0
  505 62   6 19 1200  38  45    284   1 1 11  20         0
  502 62   6 20 1200  38  45    284   1 1 11  20         0
  506 62   6 21 1200  38  45    284   1 1 11  20         0
   56 62   7  0 1200  37  45    284   1 1 11  15         0
   57 62   7  0 1200  37  45    284   1 1 11  19         0
   61 62   8  0 1200  35  45    284   1 1 11  74         0
  127 64   6  0 1200  10  40      0   4 1  9  45         0
  126 64   8  0 1200  10  40     50   4 1 15  81         0
  125 64   8 26 1200  10  37    284   2 1 20  35         0
  204 65   6 26 1200  15  45    284   1 1 11  29         0
  228 66   5 15 1151  41  38     23   2 1 22  76         0
  978 70   5  0 1200  41  40    271   1 1 10  46         0
  979 70   6  0 1200  39  40    271   1 1 10  46         0
  980 70   7  0 1200  37  40    271   1 1 10  46         0

          THERE ARE  17 CURVES SATISFYING THE GIVEN CONDITIONS
     7.883 CP SECONDS EXECUTION TIME
/EDIT,TAPE7
 BEGIN TEXT EDITING.
? L;20
 125
  2.83 65.87   2.89 67.97   3.05 70.03   3.18 71.52   3.18 73.83   3.14 76.15
  3.11 77.89   3.06 80.22   3.08 81.75   3.05 83.49   3.22 84.20   3.62 85.41
  3.92 86.27   3.99 87.21   4.12 88.71   4.29 90.19   4.41 91.88   4.61 93.93
  4.83 95.78   4.91 96.52   4.89 96.91   4.94 97.85   5.00 98.60   5.00100.72
  5.03102.05   0.00  0.00   0.00  0.00   0.00  0.00   0.00  0.00   0.00  0.00
 228
  2.37 70.54   2.68 73.23   2.87 75.74   3.01 79.03   3.08 83.12   3.17 85.05
  3.39 85.61   3.75 85.96   3.97 88.27   4.17 90.78   4.51 92.88   4.74 94.22
  4.92 95.95   5.15 97.29   0.00  0.00   0.00  0.00   0.00  0.00   0.00  0.00
 126
   .13 45.89    .40 47.03    .79 49.33   1.24 52.50   1.45 54.83   1.72 58.93
  1.91 63.63   2.00 67.46   2.45 70.93   2.75 75.31   2.88 78.54   3.00 80.89
  3.39 84.07   3.75 86.97   4.14 90.45   4.50 93.34   0.00  0.00   0.00  0.00
 56
  1.68 53.66   1.79 57.06   1.86 58.82   1.98 60.48   2.16 62.16   2.27 64.26
  2.35 67.54   2.42 70.39   2.49 74.32   2.57 77.38   2.63 79.36   2.70 81.77
  2.76 82.87   2.85 84.20   0.00  0.00   0.00  0.00   0.00  0.00   0.00  0.00
 204
  1.15 48.83   1.47 50.70   1.80 54.56   1.89 56.74   2.00 60.68   2.12 61.74
? END
```

```
      PROGRAM SELECT(INPUT,OUTPUT,TAPE5,TAPE6,TAPE7)
C     PROG TO LIST OUT ALL D-REGION PROFILES WHICH SATISFY CERTAIN
C     SPECIFIED CONDITIONS.  THE CORRESPONDING DIGITIZED DATA
C     ARE THEN WRITTEN ON TO TAPE7
C..... TAPE 5 IS THE HEADER CARD FILE
C..... TAPE 6 IS THE DIGITIZED DATA FILE
      DIMENSION IP1(2Ø),IP2(2Ø),JP(2Ø),NUM(1ØØØ),HT(1ØØ),FLN(1ØØ)
C     READ IN (KEYBOARD) THE REQUIRED RANGES OF THE VARIOUS PARAMETERS
C        ORDER IS YEAR,MONTH,DAY,LOCAL TIME,S.S.NO.,LATITUDE,
C     LONGITUDE,METHOD,MAGNETIC INDEX,COLLISION FREQ PROFILE,LITERATURE
C     REFERENCE AND SPECIAL CASE PARAMETER
C     NOTE THAT THESE PARAMETERS COME IN PAIRS
      READ 2Ø,(IP1(I),IP2(I),I=1,12)
2Ø    FORMAT(6I2,2I4,2I3,2I2,2I3,4I1,2I2,2I3,2I2)
      IF(IP1(4).LE.IP2(4)) GO TO 4Ø
      PRINT 1Ø3
1Ø3   FORMAT(1ØX,*SORRY !!  PROG WILL NOT SEARCH ACROSS ØØØØLT*)
      STOP
4Ø    CONTINUE
C     READ IN ALL PROFILES AND SELECT THE REQUIRED ONES
      L=Ø
1Ø    CONTINUE
      READ(5,3Ø) KURVE,(JP(I),I=1,12)
      IF(KURVE.EQ.9999) GO TO 5Ø
3Ø    FORMAT(I5,3I3,I5,2I4,2X,I4,2X,2I2,I3,I4,5X,I3)
C     CHANGE THE SEASON FOR THE SOUTHERN HEMISPHERE
      LAT=JP(6)
      JP(6)=IABS(LAT)
      IM1=JP(2)
      IF(LAT.LT.Ø) JP(2)=JP(2)+6
      IF(JP(2).GT.12) JP(2)=JP(2)-12
      DO 1ØØ I=1,12
      IF(IP1(I).GT.JP(I).OR.IP2(I).LT.JP(I)) GO TO 1Ø
99    IF(I.NE.12) GO TO 1ØØ
      JP(6)=LAT
      JP(2)=IM1
      L=L+1
      NUM(L)=KURVE
      PRINT 3Ø,KURVE,(JP(K),K=1,12)
1ØØ   CONTINUE
      GO TO 1Ø
5Ø    NV=L
      PRINT 1Ø4,NV
1Ø4   FORMAT(/1ØX,*THERE ARE*,I4,* CURVES SATISFYING THE GIVEN CONDITION
     AS*)
C     READ IN THE DIGITIZED PROFILES ONE BY ONE AND SEE IF
C     EACH IS REQUIRED
55    READ(6,1Ø1) KURVE
1Ø1   FORMAT(I4)
      IF(KURVE.EQ.9999) STOP 11
      J1=-5
6Ø    J1=J1+6
      J2=J1+5
      READ(6,1Ø2) (FLN(J),HT(J),J=J1,J2)
1Ø2   FORMAT(12F6.2)
      IF(HT(J2).NE.Ø.) GO TO 6Ø
C     SEE IF THIS CURVE IS REQUIRED
      DO 7Ø I=1,NV
      IF(KURVE.NE.NUM(I)) GO TO 7Ø
      WRITE(7,1Ø1) KURVE
      WRITE(7,1Ø2) (FLN(J),HT(J),J=1,J2)
      GO TO 55
7Ø    CONTINUE
      GO TO 55
      END
```

Appendix B "CHECK"

This appendix describes the program CHECK, which can be used to cross-check the files DB1 and DB3 to insure that there is a curve number in DB1 corresponding to each curve number in the digitized data file, DB3, and vice versa.

If a curve identification number appears in DB3 and not DB1, the line 104 will be printed out; if the opposite is the case, line 105 will be printed out. If either message is printed out for a curve "K", and K definitely exists in the appropriate file, a check should be made for duplicate curve identification numbers.

Line 106 will be printed if the files are consistent.

```
      PROGRAM CHECK(INPUT,OUTPUT,TAPE5,TAPE6)
C     PROG TO CROSS-CHECK FILES DB1 AND DB3 FOR CURVE NUMBERS
      DIMENSION KURVE(1000),ED(10),H(10)
C**** TAPE5=DB1      TAPE6=DB3
      J=0
10    J=J+1
      READ(5,100) KURVE(J)
      IF(KURVE(J).NE.9999) GO TO 10
      NV=J-1
100   FORMAT(I5)
12    READ(6,102) KN
102   FORMAT(I4)
      IF(KN.EQ.9999) GO TO 25
15    READ(6,103) (ED(I),H(I),I=1,6)
      IF(H(6).NE.0.) GO TO 15
      DO 20 I=1,NV
      IF(KN.NE.KURVE(I)) GO TO 20
      KURVE(I)=-1
      GO TO 12
20      CONTINUE
      PRINT 104,KN
104   FORMAT(/10X,*THERE IS NO HEADER CARD FOR CURVE NUMBER*,I5)
      GO TO 12
25    DO 30 I=1,NV
      IF(KURVE(I).GT.0) PRINT 105,KURVE(I)
30    CONTINUE
103   FORMAT(12F6.2)
105   FORMAT(/10X,*THERE ARE NO DIGITIZED DATA FOR CURVE NO.*,I5)
      PRINT 106
106   FORMAT(/10X,*THERE IS FULL CORRESPONDENCE BETWEEN THE FILES*)
      END
```

Appendix C "PICK"

Program PICK may be used to select all of those profiles passing through a specified value of height or log density. If the density at some standard height, SH, is required, the standard log density value must be given as zero, and vice versa. The two parameters are read in from the keyboard in FORMAT (2F4.0).

Each digitized curve is then tested to see if it covers the specified density or height. If so, the corresponding density or height is then calculated by linear interpolation. The slope of the interpolating line, $dh/d(\log f_N)$, is also calculated. Corresponding values of curve identification number, height (or density), and slope are then written out on TAPE6, five sets of values per line.

Linear interpolation would appear to be sufficiently accurate in view of the fairly large experimental errors in the profiles.

```
      PROGRAM PICK(INPUT,OUTPUT,TAPE5,TAPE6)
C     PROG TO DETERMINE A SLOPE AND A HEIGHT OR DENSITY AT A GIVEN DENSITY
C     OR HEIGHT FOR THE D-REGION PROFILES
      DIMENSION FLN(100),H(100),ITEM(5),TEM1(5),TEM2(5)
C *** TAPE 5  =  DB3
C
C     LOG DENSITY OR HEIGHT AT WHICH THE OTHER IS REQUIRED
C     ONE OF THESE MUST BE ZERO ......
      READ 101,SED,SH
101   FORMAT(2F4.0)
C
      L=0
C     READ IN A CURVE NUMBER + DIGITIZED VALUES
10    READ(5,30) KURVE
30    FORMAT(I4)
      IF(KURVE.EQ.9999) STOP 11
      DO 13 I=1,100
      H(I)=0.
13    FLN(I)=0.
      J1=-5
12    J1=J1+6
      J2=J1+5
      READ(5,35) (FLN(J),H(J),J=J1,J2)
35    FORMAT(12F6.2)
      IF(H(J2).NE.0.) GO TO 12
C     COUNT THE NON-ZERO VALUES
      DO 15 I=1,100
      IF(H(I).EQ.0.) GO TO 16
15    CONTINUE
16    NV=I-1
C     IGNORE THE CURVE IF THE GIVEN POINT IS TOO HIGH
      IF(SH.GT.H(NV).OR.SED.GT.FLN(NV)) GO TO 10
C     IGNORE THE CURVE IF THE GIVEN POINT IS TOO LOW
      IF(SH.GT.0.AND.SH.LT.H(1)) GO TO 10
      IF(SED.GT.0.AND.SED.LT.FLN(1)) GO TO 10
C     INTERPOLATE TO FIND THE HEIGHT AT A GIVEN DENSITY OR V.V.
C     START LOOKING AT THE TOP OF THE PROFILE
      DO 20 I=1,100
      J=NV-I+1
C..   FOR A STANDARD DENSITY, START AT BOTTOM BECAUSE PROFILE
C     MAY BE NON-MONOTONIC
      IF(SH.EQ.0.) J=I
      IF(J.LE.1) GO TO 20
      IF(SH.EQ.0..AND.SED.GT.FLN(J-1).AND.SED.LE.FLN(J)) GO TO 19
      IF(SH.GT.H(J-1).AND.SH.LE.H(J)) GO TO 19
      GO TO 20
19    CONTINUE
C     USE LINEAR INTERPOLATION - ACCURATE ENOUGH
      SLOPE=FLN(J)-FLN(J-1)
C     PROTECT AGAINST VERTICAL CURVE
      HSED=0.
      SEDH=FLN(J)
      IF(SLOPE.EQ.0.) GO TO 20
      SLOPE=(H(J)-H(J-1))/SLOPE
      FINT=H(J)-SLOPE*FLN(J)
      HSED=SLOPE*SED+FINT
      SEDH=(SH-FINT)/SLOPE
20    CONTINUE
C     SAVE THE VALUES TO BE OUTPUT IN SETS OF 5
      L=L+1
      ITEM(L)=KURVE
      TEM1(L)=HSED
      IF(SH.NE.0.) TEM1(L)=SEDH
      TEM2(L)=SLOPE
      IF(SLOPE.GT.999.)    TEM2(L)=999.
      IF(SLOPE.LT.-99.)    TEM2(L)=-99.
      IF(L.EQ.5) WRITE(6,100) (ITEM(J),TEM1(J),TEM2(J),J=1,5)
100   FORMAT(5(I4,2F6.2))
      IF(L.EQ.5) L=0
C      RETURN FOR NEXT CURVE
      GO TO 10
      END
```

Appendix D "LEOGRAF"

It is sometimes convenient or illustrative to mass plot a group of profiles obtained under similar physical conditions. Such a plot can indicate an average profile and the range of density values obtained at a given height, and can also help to pick out profiles that differ significantly from the average profile.

Program LEOGRAF is a program that may be executed on a Tektronix 4014-1, using the Integrated Software Systems Corporation software package "DISSPLA". Other techniques may, of course, be used.

TAPE3 is a file containing a subset of the file DB3.

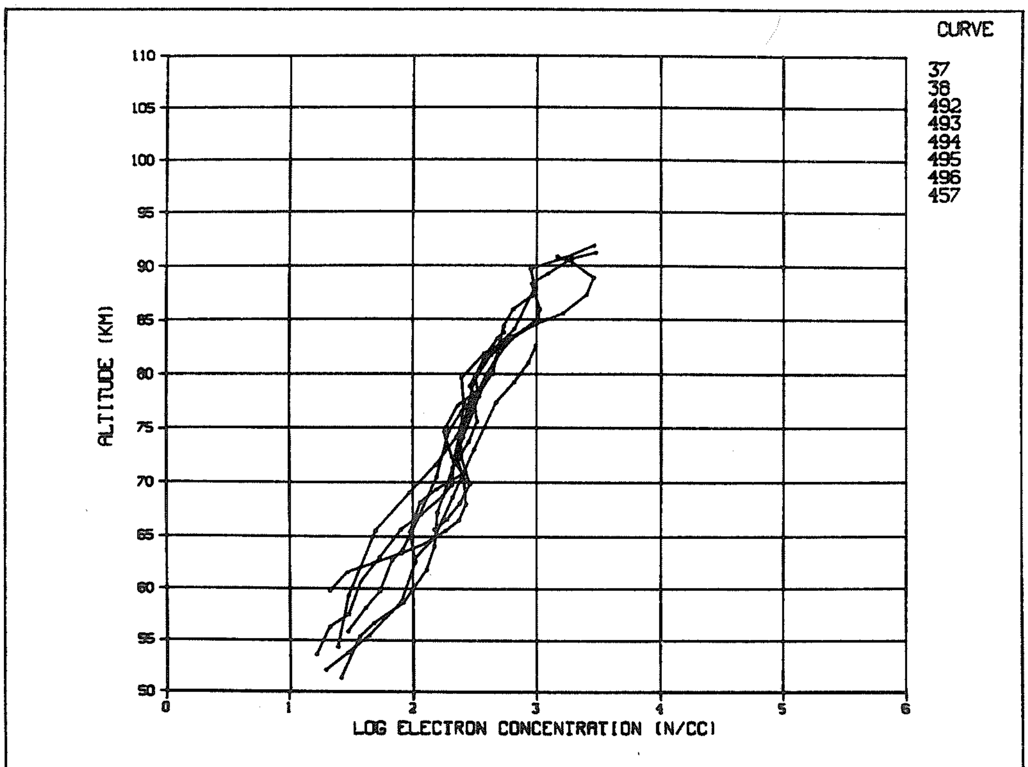
The following is a sample run of the programs SELECT and LEOGRAF. All profiles for March, April; 1130-1230 LT; medium sunspot number (40-80); midlatitude (20-50); and an undisturbed ionosphere have been selected and plotted.

```
      PROGRAM LEOGRAF(INPUT,OUTPUT,TAPE1=INPUT,TAPE2=OUTPUT,
     XTAPE3)
      COMMON A(2,6),X(1ØØ),Y(1ØØ)
      KPT=Ø
      PTX=8.25
      PTY=7.Ø
      M=Ø
      N=Ø
      CALL TEKTRN(46Ø)
      CALL BGNPL(Ø)
      CALL TITLE(" $",-1ØØ,"LOG ELECTRON CONCENTRATION (N/CC)$",
     X1ØØ,"ALTITUDE (KM)$",1ØØ,8.,7.)
      CALL YINTAX
      CALL XINTAX
      CALL YAXANG(Ø.Ø)
      CALL GRAF(Ø,1,6,5Ø,5,11Ø)
      CALL GRID(1,1)
      CALL SCLPIC(Ø.25)
      CALL MARKER(8)
      CALL MESSAG("CURVE",5,8.35,7.25)
4     CALL CURVENO(ICURV,N,PTY,PTX)
      IF(N.EQ.2) 2Ø,6
6     CALL INTNO(ICURV,PTX,PTY)
1Ø    CALL EPOINTS(N)
      CALL FILLUP(M,KPT,N)
      IF(X(M).EQ.Ø.ØØ) 15,4
15    CALL CURVE(X,Y,KPT,1)
      KPT=Ø
      M=Ø
      GOTO 4
2Ø    CALL ENDPL(Ø)
      CALL DONEPL
      END
      SUBROUTINE CURVENO(ICURV,N,PTY,PTX)
      READ(3,1ØØ) IPT
1ØØ   FORMAT(3X,R1)
      IF(EOF(3)) 2,3
2     N=2
      RETURN
3     IF(IPT.EQ.1R.) 4,5
4     BACKSPACE 3
      RETURN
5     BACKSPACE 3
      READ(3,1Ø1) ICURV
      PTY=PTY-.2Ø
      IF(PTY.LE.3.Ø) 7,1Ø
7     PTY=7.Ø
      PTX=PTX+.5
1Ø1   FORMAT(I4)
1Ø    RETURN
      END
      SUBROUTINE EPOINTS(N)
      COMMON A(2,6),X(1ØØ),Y(1ØØ)
      READ(3,1ØØ)((A(I,J),I=1,2),J=1,6)
      IF(EOF(3)) 5,1Ø
5     N=2
1Ø    RETURN
1ØØ   FORMAT(2X,6(F4.2,F6.2,2X))
      END
      SUBROUTINE FILLUP(M,KPT,N)
      COMMON A(2,6),X(1ØØ),Y(1ØØ)
1Ø    DO 15 K=1,6
      M=M+1
      X(M)=A(1,K)
      Y(M)=A(2,K)
      IF(X(M).EQ.Ø.ØØ) 12,14
12    RETURN
14    KPT=KPT+1
15    CONTINUE
      RETURN
      END
```

Operation of "SELECT"

```
/LGO
? 4876 3 4 13111301230 40 800050  03601511 156   115600
   37 61   3  7 1200  69  45   284   1 1 11  25        0
   38 61   3  8 1200  69  45   284   1 1 11  25        0
  495 62   3  8 1200  40  45   284   1 1 11  20        0
  492 62   3  9 1200  40  45   284   1 1 11  20        0
  494 62   3 22 1200  40  45   284   1 1 11  20        0
  493 62   3 23 1200  40  45   284   1 1 11  20        0
  496 62   3 30 1200  40  45   284   1 1 11  20        0
  457 71   3 27 1200  74  45   284   1 1 11  41        0

          THERE ARE    8 CURVES SATISFYING THE GIVEN CONDITIONS
/EDIT,TAPE7
 BEGIN TEXT EDITING.
? L;32
  37
  1.32 59.77   1.47 61.56   1.68 62.49   1.90 63.41   2.10 64.33   2.26 65.54
  2.37 66.45   2.43 67.93   2.41 70.28   2.35 72.32   2.40 74.10   2.48 76.47
  2.53 77.95   2.50 79.71   2.57 81.48   2.68 83.27   2.73 83.87   0.00  0.00
  38
  2.17 65.64   2.27 66.55   2.38 68.05   2.46 69.84   2.39 72.17   2.38 74.23
  2.50 77.79   2.59 79.88   2.67 81.37   2.77 82.88   2.90 84.09   0.00  0.00
 492
  1.39 54.32   1.48 59.32   1.70 65.53   1.98 69.07   2.18 71.61   2.35 74.19
  2.42 75.78   2.45 77.16   2.49 79.39   2.63 81.74   2.88 83.90   3.01 85.11
  3.02 85.95   2.96 88.33   3.09 89.27   3.28 90.67   3.47 91.22   0.00  0.00
 493
  1.29 52.07   1.47 53.76   1.64 55.47   1.90 58.73   2.02 62.52   1.98 65.46
  2.06 68.17   2.19 69.37   2.40 70.73   2.31 72.31   2.25 74.70   2.36 77.07
  2.50 78.27   2.64 80.02   0.00  0.00   0.00  0.00   0.00  0.00   0.00  0.00
 494
  1.22 53.61   1.32 56.31   1.48 57.46   1.58 60.71   1.73 63.02   1.90 65.60
  2.07 67.00   2.24 68.72   2.31 69.74   2.33 71.99   2.39 75.32   2.41 77.28
  2.39 79.60   2.57 81.86   2.80 83.47   2.99 84.57   3.21 85.62   3.40 87.30
  3.46 88.90   3.28 90.35   3.16 90.83   0.00  0.00   0.00  0.00   0.00  0.00
 495
  1.47 55.80   1.62 58.16   1.73 59.72   1.83 62.73   1.92 63.74   2.03 66.45
  2.19 70.51   2.29 74.69   2.39 76.55   2.54 78.33   2.65 80.18   2.73 84.36
  2.81 85.96   2.96 87.18   0.00  0.00   0.00  0.00   0.00  0.00   0.00  0.00
 496
  1.41 51.29   1.57 55.39   1.68 56.68   1.92 58.62   2.11 61.80   2.17 64.02
  2.20 67.17   2.32 71.33   2.45 73.72   2.52 75.64   2.49 78.00   2.46 78.92
  2.57 81.36   2.82 84.16   2.98 87.96   2.95 89.75   3.23 90.77   3.46 91.86
  0.00  0.00   0.00  0.00   0.00  0.00   0.00  0.00   0.00  0.00   0.00  0.00
 457
  2.01 62.81   2.17 64.84   2.32 68.63   2.49 73.02   2.67 77.42   2.82 79.25
  2.93 81.06   2.99 82.66   0.00  0.00   0.00  0.00   0.00  0.00   0.00  0.00
```



Appendix E "HISTDB"

Program HISTDB may be used to calculate the percentage distribution of the profiles with respect to year, month, local time, sunspot number, latitude, longitude, method, magnetic index, or special case parameter.

For example, giving the parameter IK the value 11 will show that 86 percent of profiles were obtained under magnetically quiet conditions and 13 percent during magnetically disturbed conditions ($A_p \gtrsim 25$). The percentages are rounded off and do not necessarily add up to 100 percent.

The program will recycle until a value IK=0 is read in. Southern Hemisphere data are analyzed as positive latitudes and as months corresponding to the same season in the Northern Hemisphere.

The results of running HISTDB with the file DB1 are given below. The parameter numbers are 2 = year, 3 = month, 5 = local time, 7 = sunspot number, 8 = latitude, 9 = longitude, 10 = method, 11 = magnetic index, and 15 = special case.

```
      PROGRAM HISTDB(INPUT,OUTPUT,TAPE5)
C     PROGRAM TO HISTOGRAM A GIVEN PARAMETER IN THE D-REGION HEADER CARD
C     FILE, DB1
C***** TAPE5 = DB1
      DIMENSION V(50),PAR(20),Y(50),VAL(800)
      DIMENSION IV(50),IY(50)
C     READ IN THE ORDER NUMBER OF THE PARAMETER TO BE ANALYSED
C...  2=YEAR, 3=MONTH, 5=LOCAL TIME, 7=SUNSPOT NUMBER, 8=LATITUDE,
C...  9=LONGITUDE, 10=METHOD, 11=MAGNETIC INDEX, 15=SPECIAL CASE
5     CONTINUE
      REWIND 5
      READ 10,IK
10    FORMAT(I2)
      IF(IK.EQ.0) STOP
      GO TO (40,20,30,40,50,40,70,80,90,100,110,40,40,40,150) IK
40    PRINT 300
300   FORMAT(5X,*THE PROGRAM WILL NOT HANDLE THIS CASE*)
      GO TO 5
C     ANALYSE BY YEAR 1945(1)1980
20    NV=36
      DO 21 I=1,NV
21    V(I)=45+I-1
      GO TO 200
C     ANALYSE BY MONTH
30    NV=12
      DO 31 I=1,NV
31    V(I)=I
      GO TO 200
C      ANALYSE BY LOCAL TIME
50    NV=24
      DO 51 I=1,NV
51    V(I)=I-1
      GO TO 200
C      ANALYSE BY SUNSPOT
C     ANALYSE BY SUNSPOT 0(20)200
70    NV=10
      DO 71 I=1,NV
71    V(I)=20*(I-1)
      GO TO 200
C     ANALYSE BY LATITUDE 0(10)90  ABSOLUTE VALUE
80    NV=9
      DO 81 I=1,NV
81    V(I)=10*(I-1)
      GO TO 200
C     ANALYSE BY LONGITUDE 0(15)360
90    NV=24
      DO 91 I=1,NV
91    V(I)=15*(I-1)
      GO TO 200
C     ANALYSE BY METHOD 1(1)5
100   NV=5
      DO 101 I=1,NV
101   V(I)=I
      GO TO 200
C     ANALYSE BY MAGNETIC INDEX 1(1)2
110   NV=2
      DO 111 I=1,NV
111   V(I)=I
      GO TO 200
C     ANALYSE BY SPECIAL CASE PARAMETER
150   NV=14
      DO 151 I=1,NV
151   V(I)=I-1
      GO TO 200
```

```
C     READ IN THE HEADER CARDS ONE BY ONE
200   K=0
210   READ(5,301) (PAR(I),I=1,15)
      IF(PAR(1).EQ.9999.) GO TO 250
301   FORMAT(F5.0,4F3.0,F2.0,F4.0,2F6.1,F2.0,F2.0,F3.0,F4.0,A5,F3.0)
C     CHANGE SOUTHERN HEMISPHERE SEASONS
      IF(PAR(8).GE.0.) GO TO 220
      PAR(3)=PAR(3)+6
      IF(PAR(3).GT.12) PAR(3)=PAR(3)-12
220   CONTINUE
      PAR(8)=ABS(PAR(8))
      PAR(5)=PAR(5)+PAR(6)/60.
      K=K+1
      VAL(K)=PAR(IK)
      GO TO 210
C
C     ALL DATA READ IN  ..  CALCULATE HISTOGRAM
250   CONTINUE
      KKKK=K/10
      CALL HISTGM(VAL,K,V,NV,Y)
      DO 260 I=1,NV
      IV(I)=V(I)
260   IY(I)=Y(I)
      PRINT 302,IK,K
302   FORMAT(1X,*PERCENTAGE DISTRIBUTION FOR PARAMETER*,I4,5X,
     A *SAMPLE SIZE =*,I4)
      PRINT 303,(IV(I),I=1,NV)
303   FORMAT(/1X,*LOWER LIMIT OF RANGE*,36I3)
      PRINT 304,(IY(I),I=1,NV)
304   FORMAT(21X,36I3)
C
C     RETURN FOR NEW PARAMETER
      GO TO 5
      END
      SUBROUTINE HISTGM(VAL,K,V,NV,Y)
C     S/R TO FIND THE PERCENTAGE DISTRIBUTION OF THE PARAMETER
C     VAL W.R.T. THE ARRAY V
      DIMENSION VAL(K),V(100),Y(NV)
      FK=K
      IF(K.LE.0) STOP11
      V(NV+1)=999.
      DO 10 I=1,NV
10    Y(I)=0.
      DO 50 I=1,K
      IFLAG=0
      VALI=VAL(I)
      DO 40 J=1,NV
      IF(VALI.GE.V(J).AND.VALI.LT.V(J+1)) GO TO 35
      GO TO 40
35    Y(J)=Y(J)+1
      IFLAG=1
40    CONTINUE
50    CONTINUE
      DO 60 I=1,NV
60    Y(I)=Y(I)/FK*100.+0.5
      IF(IFLAG.EQ.0) PRINT 100,K,VAL(K)
100   FORMAT(///*.....THE VALUE V(*,I3,*) =*,F10.2,
     A *    IS OUT OF RANGE*///)
      RETURN
      END
```

```
 GET,TAPE5=DB1
/LGO
? Ø1
    THE PROGRAM WILL NOT HANDLE THIS CASE
? Ø2
 PERCENTAGE DISTRIBUTION FOR PARAMETER   2     SAMPLE SIZE = 678

 LOWER LIMIT OF RANGE 45 46 47 48 49 5Ø 51 52 53 54 55 56 57 58 59 6Ø 61 62 63 64 65 66 67 68 69 7Ø 71 72 73 74 75 76 77 78 79 8Ø
                       Ø  Ø  Ø  1  1  Ø  Ø  Ø  Ø  Ø  Ø  Ø  1  Ø  1  2  4  5  2 1Ø 12  5  4 12  8  8  6  6  5  7  Ø  Ø  Ø  Ø  Ø  Ø
? Ø3
 PERCENTAGE DISTRIBUTION FOR PARAMETER   3     SAMPLE SIZE = 678

 LOWER LIMIT OF RANGE  1  2  3  4  5  6  7  8  9 1Ø 11 12
                      11  5 15 1Ø  5  4  9  4  8 11  9  8
? Ø4
    THE PROGRAM WILL NOT HANDLE THIS CASE
? Ø5
 PERCENTAGE DISTRIBUTION FOR PARAMETER   5     SAMPLE SIZE = 678

 LOWER LIMIT OF RANGE  Ø  1  2  3  4  5  6  7  8  9 1Ø 11 12 13 14 15 16 17 18 19 2Ø 21 22 23
                       6  1  1  2  2  2  2  3  4  4  5  8 29  5  5  7  3  3  1  2  1  2  2  2
? Ø6
    THE PROGRAM WILL NOT HANDLE THIS CASE
? Ø7
 PERCENTAGE DISTRIBUTION FOR PARAMETER   7     SAMPLE SIZE = 678

 LOWER LIMIT OF RANGE  Ø 2Ø 4Ø 6Ø 8Ø1ØØ12Ø14Ø16Ø18Ø
                      22 14 13 14  6 28  2  1  Ø  1
? Ø8
 PERCENTAGE DISTRIBUTION FOR PARAMETER   8     SAMPLE SIZE = 678

 LOWER LIMIT OF RANGE  Ø 1Ø 2Ø 3Ø 4Ø 5Ø 6Ø 7Ø 8Ø
                       2  5  Ø 21 35 16 18  3  Ø
? Ø9
 PERCENTAGE DISTRIBUTION FOR PARAMETER   9     SAMPLE SIZE = 678

 LOWER LIMIT OF RANGE  Ø 15 3Ø 45 6Ø 75 9Ø1Ø512Ø135150165180195210225240255270285300315330345
                       7 13  2  1  Ø  2  Ø  Ø  Ø  1  2  2  Ø  Ø  9  Ø  1  9 38  3  1  Ø  Ø  8
? 1Ø
 PERCENTAGE DISTRIBUTION FOR PARAMETER  1Ø     SAMPLE SIZE = 678

 LOWER LIMIT OF RANGE  1  2  3  4  5
                      39 32 18  7  5
? 11
 PERCENTAGE DISTRIBUTION FOR PARAMETER  11     SAMPLE SIZE = 678

 LOWER LIMIT OF RANGE  1  2
                      86 14
? 12
    THE PROGRAM WILL NOT HANDLE THIS CASE
? 13
    THE PROGRAM WILL NOT HANDLE THIS CASE
? 14
    THE PROGRAM WILL NOT HANDLE THIS CASE
? 15
 PERCENTAGE DISTRIBUTION FOR PARAMETER  15     SAMPLE SIZE = 678

 LOWER LIMIT OF RANGE  Ø  1  2  3  4  5  6  7  8  9 1Ø 11 12 13
                      82  2  1  1  Ø  2  Ø  1  4  5  Ø  1  1  1
? ØØ
   2Ø.3Ø3 CP SECONDS EXECUTION TIME
```

Appendix F "SORTDB"

Program SORTDB may be used to arrange the data given in file DB1 in increasing order of year, month, local time, sunspot number, latitude, longitude, method, magnetic index, or special case parameter.

For example, entering the value 07 when prompted by the READ6,IK instruction (or from a card) will cause the data to be arranged in increasing order of sunspot number. The rearranged data are written to the file TAPE6.

If there is more than one profile corresponding to the same sunspot number (or other parameter), the order within these profiles will be the same as in DB1, i.e., chronological.

The program will recycle until a value of zero is read in. Southern Hemisphere data are ordered by the absolute value of latitude.

```
      PROGRAM SORTDB(INPUT,OUTPUT,TAPE5,TAPE6)
C     PROG TO ARRANGE THE HEADER CARD FILE , DB1, IN INCREASING ORDER
C     OF ANY PARAMETER
C>>>  TAPE5 = DB1
C...   TAPE6 = OUTPUT
      DIMENSION IJ(800,16),KK(800),X(800),Y(800)
C     READ IN THE ORDER OF THE PARAMETER THAT IS TO BE ORDERED
C...  2=YEAR, 3=MONTH, 5=LOCAL TIME, 7=SUNSPOT NUMBER, 8=LATITUDE,
C...  9=LONGITUDE,10=METHOD,11=MAGNETIC INDEX,15=SPECIAL CASE
5     REWIND 5
      READ 6,IK
6     FORMAT(I2)
      IF(IK.EQ.0) STOP
      GO TO (7,8,8,7,8,7,8,8,8,8,8,7,7,7,8) IK
7     PRINT 300
300   FORMAT(5X,*THE PROGRAM WILL NOT HANDLE THIS CASE*)
      GO TO 5
8     CONTINUE
C     READ IN THE HEADER CARD FILE
      I=0
10    I=I+1
      READ(5,100) (IJ(I,J),J=1,7),FLAT,FLON,(IJ(I,J),J=10,15)
100   FORMAT(I5,4I3,I2,I4,2F6.1,2I2,I3,I4,A5,I3)
      IJ(I,8)=FLAT*10.
      IJ(I,9)=FLON*10.
      IJ(I,5)=100.*(IJ(I,5)+FLOAT(IJ(I,6))/60.)
      IF(EOF(5).EQ.0) GO TO 10
      NV=I-1
C     ALLOW FOR LAST CURVE
      DO 17 I=1,16
17    IJ(NV,I)=9998
C     SET UP THE ARRAY THAT IS TO BE ORDERED
      DO 18 I=1,NV
18    X(I)=IJ(I,IK)
C     DETERMINE THE REQUIRED ORDER OF THE DATA
      CALL ARMIN(X,Y,KK,NV)
C     WRITE OUT THE DATA IN THE REQUIRED ORDER
      DO 25 I=1,NV
      KKI=KK(I)
      FLAT=IJ(KKI,8)
      FLAT=FLAT*0.1
      FLON=IJ(KKI,9)
      FLON=FLON*0.1
      TIME=0.01*IJ(KKI,5)
       IJ(KKI,5)=TIME
      IJ(KKI,6)=(TIME-IFIX(TIME))*60.+0.5
25    WRITE(6,100) (IJ(KKI,J),J=1,7),FLAT,FLON,(IJ(KKI,J),J=10,15)
      END
      SUBROUTINE ARMIN(X,Y,IY,N)
C     S/R TO ARRANGE THE VARIABLE X IN INCREASING ORDER....Y
C      IY IS THE ORIGINAL SUBSCRIPT   ..  ARRANGED IN SAME ORDER AS Y
      DIMENSION X(N),Y(N),IY(N)
      DO 20 J=1,N
      CALL VALMIN(X,N,XMIN,IJ)
      Y(IJ)=XMIN
      IY(J)=IJ
C     ONCE THE VALUE HAS BEEN USED, SET IT TO A LARGE VALUE
      X(IJ)=9999.+J
20    CONTINUE
      RETURN
      END
      SUBROUTINE VALMIN(X,N,XI,IX)
C     S/R TO FIND THE MINIMUM VALUE OF AN ARRAY, AND THE POSITION IN
C     THE ARRAY
      DIMENSION X(N)
      IX=1
      XMIN=ABS(X(1))
      DO 10 I=2,N
      IF(ABS(X(I)).GE.XMIN) GO TO 10
      XMIN=ABS(X(I))
      XI=X(I)
      IX=I
10    CONTINUE
      RETURN
      END
```

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UAG-46 "Interplanetary Magnetic Field Data 1963-1974", by Joseph H. King, National Space Science Data Center, NASA Goddard Space Flight Center, Greenbelt, Maryland 20771, June 1975, 382 pages, price $2.95.

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UAG-48A "Synoptic Observations of the Solar Corona during Carrington Rotations 1580-1596 (11 October 1971 - 15 January 1973)", [Reissue with quality images] by R. A. Howard, M. J. Koomen, D. J. Michels, R. Tousey, C. R. Detwiler, D. E. Roberts, R. T. Seal and J. D. Whitney, E. O. Hulbert Center for Space Research, NRL, Washington, D. C. 20375 and R. T. and S. F. Hansen, C. J. Garcia and E. Yasukawa, High Altitude Observatory, NCAR, Boulder, Colorado 80303, February 1976, 200 pages, price $4.27.

UAG-49 "Catalog of Standard Geomagnetic Variation Data", prepared by Environmental Data Service, NOAA, Boulder, Colorado, August 1975, 125 pages, price $1.85.

UAG-50 "High-Latitude Supplement to the URSI Handbook on Ionogram Interpretation and Reduction", by W. R. Piggott, British Antarctic Survey, c/o SRC, Appleton Laboratory, Ditton Park, Slough, England, October 1975, 292 pages, price $4.00.

UAG-51 "Synoptic Maps of Solar Coronal Hole Boundaries Derived from He II 304Å Spectroheliograms from the Manned Skylab Missions", by J. D. Bohlin and D. M. Rubenstein, E. O. Hulbert Center for Space Research, Naval Research Laboratory, Washington, D. C. 20375 U.S.A., November 1975, 30 pages, price 54 cents.

UAG-52 "Experimental Comprehensive Solar Flare Indices for Certain Flares, 1970-1974", compiled by Helen W. Dodson and E. Ruth Hedeman, McMath-Hulbert Observatory, The University of Michigan, 895 Lake Angelus Road North, Pontiac, Michigan 48055 U.S.A., November 1975, 27 pages, price 60 cents.

UAG-53 "Description and Catalog of Ionospheric F-Region Data, Jicamarca Radar Observatory (November 1966 - April 1969)", by W. L. Clark and T. E. Van Zandt, Aeronomy Laboratory, NOAA, Boulder, Colorado 80302 and J. P. McClure, University of Texas at Dallas, Dallas, Texas 75230, April 1976, 10 pages, price 33 cents.

UAG-54 "Catalog of Ionosphere Vertical Soundings Data", prepared by Environmental Data Service, NOAA, Boulder, Colorado 80302, April 1976, 130 pages, price $2.10.

UAG-55 "Equivalent Ionospheric Current Representations by a New Method, Illustrated for 8-9 November 1969 Magnetic Disturbances", by Y. Kamide, Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, Colorado 80302 and Geophysical Institute, University of Alaska, Fairbanks, Alaska 99701, H. W. Kroehl, Data Studies Division, NOAA/EDS/NGSDC, Boulder, Colorado 80302, M. Kanamitsu, Advanced Study Program, National Center for Atmospheric Research, Boulder, Colorado 80303, J. H. Allen, Data Studies Division, NOAA/EDS/NGSDC, Boulder, Colorado 80302, and S.-I. Akasofu, Geophysical Institute, University of Alaska, Fairbanks, Alaska 99701, April 1976, 91 pages, price $1.60.

UAG-56 "Iso-intensity Contours of Ground Magnetic H Perturbations for the December 16-18, 1971 Geomagnetic Storm", by Y. Kamide, Cooperative Institute for Research in Environmental Sciences, University of Colorado, Boulder, Colorado 80302 and Geophysical Institute, University of Alaska, Fairbanks, Alaska 99701 (currently Guest worker at Data Studies Division, NOAA/EDS/NGSDC, Boulder, Colorado 80302), April 1976, 37 pages, price $1.39.

UAG-57 "Manual on Ionospheric Absorption Measurements", edited by K. Rawer, Institut für Physikalische Weltraumforschung, Freiburg, G.F.R., June 1976, 202 pages, price $4.27.

UAG-58 "ATS6 Radio Beacon Electron Content Measurements at Boulder, July 1974 - May 1975", by R. B. Fritz, Space Environment Laboratory (currently with Wave Propagation Laboratory), NOAA, Boulder, Colorado 80302 USA, September 1976, 61 pages, price $1.04.

UAG-59 "Auroral Electrojet Magnetic Activity Indices AE(11) for 1974", by Joe Haskell Allen, Carl C. Abston and Leslie D. Morris, National Geophysical and Solar-Terrestrial Data Center, Environmental Data Service, December 1976, 144 pages, price $2.16.

UAG-60 "Geomagnetic Data for January 1976 (AE(7) Indices and Stacked Magnetograms)" by J. H. Allen, C. A. Abston and L. R. Morris, NGSDC/EDS/NOAA, July 1977, 57 pages, price $1.07.

UAG-61 "Collected Data Reports for STIP Interval II 20 March - 5 May 1976", edited by Helen E. Coffey and John A. McKinnon, National Geophysical and Solar-Terrestrial Data Center, Environmental Data Service, August 1977, 313 pages, price $2.95.

UAG-62 "Geomagnetic Data for February 1976 (AE(7) Indices and Stacked Magnetograms)" by J. H. Allen, C. A. Abston and L. R. Morris, NGSDC/EDS/NOAA, September 1977, 55 pages, price $1.11.

UAG-63 "Geomagnetic Data for March 1976 (AE(7) Indices and Stacked Magnetograms)" by J. H. Allen, C. A. Abston and L. R. Morris, NGSDC/EDS/NOAA, September 1977, 57 pages, price $1.11

UAG-64 "Geomagnetic Data for April 1976 (AE(8) Indices and Stacked Magnetograms)" by J. H. Allen, C. A. Abston and L. R. Morris, NGSDC/EDS/NOAA, February 1978.

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