979

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Network-Day Tape Software Users Guide

by
Madeleine Zirbes
Ray Buland

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*Madeleine Zirbes
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ABSTRACT

The Global Digital Seismograph Network (GDSN) data is now being collected into a new network-day tape format. This users guide describes the programs developed for reading network-day tapes and manipulating the data. Please keep in mind that the software described is not intended to be a general purpose analysis package. It is intended to provide adequate access to GDSN data in as machine-independent a manner as possible. Some modifications will probably have to be made to the software to use it at your site. Notes on installation are provided.

INTRODUCTION

Software has been developed to read, extract, and manipulate data from network-day tapes†. Two programs and several user callable subroutines have been developed for this purpose. The program *ndtsum* writes a summary of the data collected on a network-day tape. The program *retrv* locates selected station-component-time intervals from a network-day tape and writes this information to disk files. The user callable subroutines provide a mechanism for reading and interpreting the data converted by *retrv* in application programs.

1. Programs

1.1. Ndtsum

Ndtsum produces a literal dump of all data logs on a network-day tape, and a list of the start and end times of each interval of data recorded for each instrument at a station. The data logs contain calibration information, station parameters, timing corrections and comments on data quality for every station included on the tape. Short-period and intermediate-period data records are written only when signals are detected, whereas long-period data are recorded continuously. Thus the list of start and end times provides a consistency check on the binary data.

1.1.1. Ndtsum Input

Ndtsum reads from the standard input device (FORTRAN logical unit 5) to obtain the tape drive unit number on which the network-day tape is mounted. (No prompt is given to the user.) The format for the tape drive number is I1.

1.1.2. Ndtsum Output

All output from *ndtsum* is directed to the standard output device (FORTRAN logical unit 6). If an error occurs, a message is printed informing the user where the problem was, before exiting the program.

Listed below is an example of the output produced by *ndtsum*. Although this is not a complete listing, it does include an example of all the different types of logs written on a network-day tape.

† Hoffman, John P., 1980, The Global Digital Seismograph Network-Day Tape, U.S. Geological Survey Open-File Report 80-289, 37 p.

- 2 -

GLOBAL DIGITAL SEISMOGRAPH NETWORK-DAY TAPE LOG

TAPE FILE: 1

DAY: 342 YEAR: 1980 DATE: 7DEC80
 VOLUME: 1 OF 1 EDITION: 1 PACKING DENSITY: 1600

LIST OF THE 13 STATIONS ON THIS TAPE:

ID CODE INST TYPE FORMAT FILE NO

30	ANMO	SRO	1	2
31	ANTO	SRO	1	5
32	BOCO	SRO	1	8
35	GUMO	SRO	1	11
37	BCAO	SRO	1	14
38	NWAO	SRO	1	17
39	GRFO	SRO	1	20
41	TATO	SRO	1	23
42	SNZO	SRO	1	26
50	CTAO	ASRO	1	29
51	ZOBO	ASRO	1	32
53	MAJO	ASRO	1	35
54	KONO	ASRO	1	38

STATION LOG: ALBUQUERQUE, NEW MEXICO

TAPE FILE: 2

DAY: 342 YEAR: 1980 DATE: 7DEC80 NUMBER OF STATIONS ON THIS LOG: 1

STATION LIST: ID CODE INST TYPE LATITUDE LONGITUDE ELEVATION(M)

30	ANMO	SRO	34.9462N	106.4566W	1740.0M
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DATA FILES: 2

FILE NO ID DESCRIPTION

3 30 LONG PERIOD Z,N,E

4 30 SHORT PERIOD Z

TIME CORRECTIONS: 1

YEAR DAY TIME CORRECTION(SEC)

1980 342 0000 -00.001/-

DATA OUTAGES OF MORE THAN ONE HOUR: 0

FROM: DAY TIME TO: DAY TIME

COMMENTS:

NONE.

DATA LOG: FOR 3 CHANNELS LONG PERIOD Z,N,E

TAPE FILE: 3

RECORDING MODE: CONTINUOUS, MULTIPLEXED FORMAT TYPE: 1

SAMPLE RATE: 1.0/SEC SAMPLE INTERVAL: 1.000 SEC

CHANNEL SEQUENCE: 1=VERTICAL, 2=NORTH, 3=EAST

CALIBRATION DATA

CHANNEL	YEAR	DAY	TIME	AMPLITUDE (COUNTS/MICROMETER)	AVE CAL VALUE (COUNTS/MICROMETER)	FREQUENCY (HZ)
1	1980	342	000	4.5409E+03	4.4745E+03	4.0085E-02
1	1980	343	000	4.4492E+03	4.4745E+03	3.9995E-02
2	1980	342	000	4.9276E+03	4.9452E+03	4.0039E-02
2	1980	343	000	4.9582E+03	4.9452E+03	4.0006E-02
3	1980	342	000	5.5281E+03	5.5055E+03	4.0092E-02
3	1980	343	000	5.4907E+03	5.5055E+03	4.0013E-02

THE COMPLEX TRANSFER FUNCTIONS T ARE CALCULATED BY:

$$T(S) = A0 \cdot DS \cdot (S-Z01) \cdot (S-Z02) \cdot \dots \cdot (S-ZM) / ((S-P01) \cdot (S-P02) \cdot \dots \cdot (S-PM))$$

WHERE: S=J*W, W=ANGULAR FREQUENCY, A0 IS SCALAR, M IS THE NUMBER OF COMPLEX ZEROS, N IS THE NUMBER OF COMPLEX POLES, THE Z'S AND THE P'S ARE THE COMPLEX ZEROES AND POLES OF THE SYSTEM, AND DS IS THE APPROPRIATE DIGITAL SENSITIVITY (COUNTS/MICROMETER) IN THE TABLE ABOVE

	CHANNEL 1	CHANNEL 2	CHANNEL 3
A0	+.932E+05	+.194E+06	+.132E+06
P01	-.454E+01,+.330E+01	-.422E+01,+.420E+01	-.493E+01,+.381E+01
P02	-.454E+01,-.330E+01	-.422E+01,-.420E+01	-.493E+01,-.381E+01
P03	-.117E+00	-.125E+00	-.125E+00
P04	-.409E+02	-.415E+02	-.401E+02
P05	-.100E+03	-.999E+02	-.999E+02
P06	-.160E+00	-.129E+00	-.133E+00
P07	-.264E+03	-.264E+03	-.264E+03
P08	-.393E+01	-.393E+01	-.393E+01
P09	-.282E+00	-.282E+00	-.282E+00
P10	-.201E+00,+.241E+00	-.201E+00,+.241E+00	-.201E+00,+.241E+00
P11	-.201E+00,-.241E+00	-.201E+00,-.241E+00	-.201E+00,-.241E+00
P12	-.134E+00,+.100E+00	-.134E+00,+.100E+00	-.134E+00,+.100E+00
P13	-.134E+00,-.100E+00	-.134E+00,-.100E+00	-.134E+00,-.100E+00
P14	-.251E-01	-.251E-01	-.251E-01
P15	-.924E-02	-.924E-02	-.924E-02
P16	-.855E+00,+.255E+00	-.101E+01,+.307E+00	-.897E+00,+.274E+00
P17	-.855E+00,-.255E+00	-.101E+01,-.307E+00	-.897E+00,-.274E+00
P18	-.541E+00,+.683E+00	-.639E+00,+.808E+00	-.569E+00,+.718E+00
P19	-.541E+00,-.683E+00	-.639E+00,-.808E+00	-.569E+00,-.718E+00
Z01	-.126E+00	-.126E+00	-.126E+00
Z02	-.501E+02	-.501E+02	-.501E+02
Z03	+.105E+01	+.105E+01	+.105E+01
Z04	-.105E+01	-.105E+01	-.105E+01
Z05	S**5	S**5	S**5

RELATIVE RESPONSE TO EARTH DISPLACEMENT

CHANNEL 1			CHANNEL 2			CHANNEL 3		
MEASURED-JUL,1979			MEASURED-JUL,1979			MEASURED-JUL,1979		
PERIOD (SEC)	AMPLITUDE (DEG)	PHASE (SEC)	PERIOD (SEC)	AMPLITUDE (DEG)	PHASE (SEC)	PERIOD (SEC)	AMPLITUDE (DEG)	PHASE (SEC)
1022	+.165E-04	392	1011	+.195E-04	392	1006	+.199E-04	391
516	+.342E-03	351	514	+.383E-02	352	502	+.412E-03	349
258	+.509E-02	296	258	+.554E-02	297	251	+.599E-02	293
99.0	+.110E+00	199	99.2	+.118E+00	198	100.4	+.112E+00	198
78.4	+.208E+00	167	79.6	+.214E+00	167	79.9	+.206E+00	167
59.6	+.405E+00	122	59.6	+.423E+00	122	59.8	+.415E+00	122
50.1	+.573E+00	90	50.0	+.596E+00	90	48.2	+.635E+00	85
39.7	+.823E+00	42	39.9	+.832E+00	45	40.0	+.834E+00	42
30.1	+.102E+01	-24	30.1	+.102E+01	-20	30.1	+.103E+01	-25
25.0	+.100E+01	-72	24.9	+.100E+01	-68	25.0	+.100E+01	-73
20.0	+.801E+00	-132	20.0	+.808E+00	-124	20.0	+.807E+00	-131
14.5	+.392E+00	-218	14.4	+.395E+00	-207	15.0	+.436E+00	-209
9.6	+.883E-01	-319	9.9	+.102E+00	-298	10.0	+.100E+00	-312
7.9	+.253E-01	-378	7.8	+.286E-01	-354	8.0	+.284E-01	-364
6.9	+.703E-02	-413						

START TIME	END TIME
YEAR MONTH DAY TIME	YEAR MONTH DAY TIME
1980 12 7 0:0:0.580.	1980 12 8 2:0:59.580.

DATA LOG: FOR 1 CHANNEL SHORT PERIOD Z TAPE FILE: 4
 RECORDING MODE: TRIGGERED FORMAT TYPE: 1
 SAMPLE RATE: 20.0/SEC SAMPLE INTERVAL: 0.050 SEC
 CHANNEL SEQUENCE: 1=VERTICAL

CALIBRATION DATA

CHANNEL	YEAR DAY TIME	AMPLITUDE (COUNTS/MICROMETER)	AVE CAL VALUE (COUNTS/MICROMETER)	FREQUENCY (HZ)
1	1980 342	1.9815E+06	1.0004E+00	
1	1980 343	1.9815E+06	1.0004E+00	

THE COMPLEX TRANSFER FUNCTIONS T ARE CALCULATED BY:

$$T(S) = A0 \cdot DS \cdot (S-Z01) \cdot (S-Z02) \cdot \dots \cdot (S-ZM) / ((S-P01) \cdot (S-P02) \cdot \dots \cdot (S-PM))$$

WHERE: S=J*W, W=ANGULAR FREQUENCY, A0 IS SCALAR, M IS THE NUMBER OF COMPLEX ZEROS, N IS THE NUMBER OF COMPLEX POLES, THE Z'S AND THE P'S ARE THE COMPLEX ZEROES AND POLES OF THE SYSTEM, AND DS IS THE APPROPRIATE DIGITAL SENSITIVITY (COUNTS/MICROMETER) IN THE TABLE ABOVE

CHANNEL 1

ANMO SP TRANSFER FUNCTION

A0 +.669E+10
 P01 -.454E+01,+.330E+01
 P02 -.454E+01,-.330E+01
 P03 -.117E+00
 P04 -.409E+02
 P05 -.100E+03
 P06 -.160E+00
 P07 -.284E+03
 P08 -.167E+02,+.340E+01
 P09 -.167E+02,-.340E+01
 P10 -.633E+02
 P11 -.633E+02
 Z01 -.126E+00
 Z02 -.501E+02
 Z03 S**4

RELATIVE RESPONSE TO EARTH DISPLACEMENT

CHANNEL 1

MEASURED-JUL1979

PERIOD AMPLITUDE PHASE

(SEC)	(DEG)
10.000	+.207E-02 285
5.000	+.164E-01 244
2.500	+.120E+00 207
2.000	+.221E+00 191
1.670	+.351E+00 174
1.250	+.672E+00 143
1.000	+.100E+01 116
.833	+.129E+01 91
.667	+.161E+01 83
.500	+.189E+01 25

- 5 -

.333 +.194E+01 -30
 .250 +.166E+01 -68
 .200 +.132E+01 -99
 .143 +.843E+00 -145

START TIME				END TIME			
YEAR	MONTH	DAY	TIME	YEAR	MONTH	DAY	TIME
1980	12	7	0:27:55.580.	1980	12	7	0:28:44.530.
1980	12	7	1:56:14.580.	1980	12	7	1:59:30.530.
1980	12	7	2:48:30.580.	1980	12	7	2:48: 8.530.
1980	12	7	2:59:38.580.	1980	12	7	3: 0:27.530.
1980	12	7	4: 7:57.580.	1980	12	7	4: 8:46.530.
1980	12	7	6:15:16.580.	1980	12	7	6:16: 5.530.
1980	12	7	6:24: 5.580.	1980	12	7	6:24:54.530.
1980	12	7	8:48:54.580.	1980	12	7	8:49:43.530.
1980	12	7	9: 3:13.580.	1980	12	7	9: 5:40.530.
1980	12	7	9: 9:10.580.	1980	12	7	9:11:37.530.
1980	12	7	9:45:37.580.	1980	12	7	9:47:15.530.
1980	12	7	10:42:45.580.	1980	12	7	10:43:34.530.
1980	12	7	11:16: 4.580.	1980	12	7	11:16:53.530.
1980	12	7	13:32:53.580.	1980	12	7	13:33:42.530.
1980	12	7	14:47:12.580.	1980	12	7	14:48: 1.530.
1980	12	7	15: 8: 1.580.	1980	12	7	15:10:28.530.
1980	12	7	15:30:58.580.	1980	12	7	15:31:47.530.
1980	12	7	16:10:47.580.	1980	12	7	16:11:36.530.
1980	12	7	17:49: 6.580.	1980	12	7	17:54:49.530.
1980	12	7	19: 3:19.580.	1980	12	7	19: 4:57.530.
1980	12	7	19:27:27.580.	1980	12	7	19:28:16.530.
1980	12	7	19:30:16.580.	1980	12	7	19:31: 5.530.
1980	12	7	20:35:35.580.	1980	12	7	20:36:24.530.
1980	12	7	20:46:54.580.	1980	12	7	20:47:43.530.
1980	12	7	21: 3:43.580.	1980	12	7	21: 4:32.530.
1980	12	7	22:10: 2.580.	1980	12	7	22:11:40.530.
1980	12	7	22:57:40.580.	1980	12	7	22:59:18.530.
1980	12	8	0: 8:18.580.	1980	12	8	0: 9:56.530.
1980	12	8	0:30:56.580.	1980	12	8	0:31:45.530.
1980	12	8	1:34:45.580.	1980	12	8	1:35:34.530.
1980	12	8	4:35: 4.580.	1980	12	8	4:35:53.530.

Note the list of start and end times in the above listing. This information is not contained on a log, but is produced by *ndtsum* to provide a consistency check on the binary data.

1.2. Retrv

Retrv locates selected information from a network-day tape and writes this information into binary output files.

1.2.1. Retrv Input

Retrv reads from the standard input device (FORTRAN logical unit 5) to obtain the tape drive unit number on which the network-day tape is mounted. The format for the tape drive number is I1. *Retrv* then continues to read requests from the standard input to determine what information is to be extracted from the network-

- 6 -

day tape. (No prompt is given to the user to obtain either the tape drive number or the requests.) The requests define station, instrument, and time interval information that the user wants extracted. Each request line specifies the following information:

station code	up to 4 alphabetic characters
instrument code	up to 4 alphabetic characters
start time	6 integers
year, month,	
day, hour,	
minute, second	
length of time	real
(in seconds)	

The station code is the four-letter character string (upper case) of the station desired. It can optionally be the character string "ALL", to retrieve the specified instrument and time interval information for all the stations recorded on the tape.

The instrument code is a four-letter character string (upper case) indicating the instrument and orientation of data desired. The first character of the instrument code can be:

S for short-period instrument,
L for long-period instrument, or
I for intermediate-period instrument.

The second, third, and fourth characters of the instrument code specify the orientation of the data wanted and can be:

P for vertical, north-south, and east-west,
Z for vertical,
N for north-south,
E for east-west,

or any combination of the characters Z, N, E if more than one orientation of data is desired. The instrument code can also be the character string "ALL", retrieving each orientation of data for each instrument recorded.

The input is free format with the fields delimited by blanks or commas. Each request cannot be longer than 80 characters. To indicate that there are no more requests, the last request line must be the character string "STOP".

For example, a sample request line might be

ANMO,LP,1980,5,25,16,33,44,3600

(A)

- 7 -

This request line is asking that data from Albuquerque, New Mexico, be extracted from the long-period instrument, vertical, north-south, and east-west orientations, starting at 16:33:44 on 25 May, 1980, and ending 3600 seconds later.

The request line

ALL,ALL,1980,5,25,19,44,51,1800

(B)

would retrieve all short-period, long-period, and intermediate-period data from all the stations recorded on the tape starting at 19:44:51 on 25 May, 1980, for a length of 1800 seconds.

1.2.2. Retrv Output

Retrv opens seven output files, one for each type of data that could be retrieved. The output file names and their corresponding data types are:

RETRV.SPZ	short-period vertical data
RETRV.LPZ	long-period vertical data
RETRV.LPN	long-period north-south data
RETRV.LPE	long-period east-west data
RETRV.IPZ	intermediate-period vertical data
RETRV.IPN	intermediate-period north-south data
RETRV.IPE	intermediate-period east-west data

These binary output files contain two types of records: header records and data records. Header records contain station information. Data records contain the actual data extracted, preceded by the number of data values contained in the data record.

Header and data records are written to the appropriate output files as each request is satisfied. Header records are written to the output files first, followed by one or more data records. This means that an output file may contain several header records, each followed by data records. To indicate that a data record is the last data record for a particular request, a null data record is written having one data value that is equal to 10,000,000,000.0. To indicate that there are no more records in the output file, a final null header record is written just before the file is closed. A null header record has the station code and instrument code set to "END", the number of poles and zeroes set to one, and all other values set to zero.

A schematic representation of the format of these binary files is:

header record

```
C INTEGER SMN
C SECONDS
  INTEGER SSEC
C MILLISECONDS
  REAL SMS
C
C END TIME OF CONTINUOUS DATA
C
C YEAR
  INTEGER LYR
C DAY OF YEAR
  INTEGER LDY
C HOUR
  INTEGER LHR
C MINUTE
  INTEGER LMN
C SECONDS
  INTEGER LSEC
C MILLISECONDS
  REAL LMS
C BINARY DATA
  INTEGER IDATA(1000)
C NUMBER OF SAMPLES OF LAST DATA READ
  INTEGER LNSAM
C NUMBER OF CHANNELS OF LAST DATA READ
  INTEGER LNCHAN
C NEXT EXPECTED TIME FOR DATA
  INTEGER NYR, NDY, NHR, NMN, NSEC
C CURRENT TIME OF DATA
  INTEGER TYR, TDY, THR, TMN, TSEC
  REAL TMS
C LOOP INDEX
  INTEGER I
  INTEGER IBUFF(80)
C FUNCTION
  INTEGER MAGRD
C NUMBER OF FRAMES READ
  INTEGER NR
  INTEGER KUS, KUT
C MILLISECONDS
  REAL FMS
  REAL NMS
C SAMPLING RATE OF LAST DATA READ
  REAL LRATE
C NUMBER OF FRAMES OF DATA TO READ
  INTEGER NWORDS
C
  COMMON /HEADER/ ID, INSTR, YEAR, DOFY, HOUR, MIN, SEC, MSS, NFORM,
    1 NCHAN, NSAMP, RATE
C
  COMMON /START/ SYR, SDY, SHR, SMN, SSEC, SMS
C
  COMMON /END/ LYR, LDY, LHR, LMN, LSEC, LMS
C
  DATA NWORDS /1000/
  DATA KUS, KUT /'S', 'T'/
C
C NETWORK DAY TAPE FORMAT
C
C
C
C EOF
C
```

- 8 -

```

data record
data record
.
.
.
null data record
header record
data record
.
.
.
null data record
.
.
.
null header record

```

When *retru* has satisfied a request, a statement summarizing the data that was extracted is written to the standard output device. This summary consists of the station code, instrument code, year, month, day, start time of the data, and length of the data extracted, in seconds.

For example, if data was found to satisfy request line (A), the output lines describing what in fact was extracted might be:

ANMO LPZ	1980	5	25	18:33:44.53	3600.000
ANMO LPN	1980	5	25	18:33:44.53	3600.000
ANMO LPE	1980	5	25	18:33:44.53	3600.000

If data was found satisfying request line (B), the output lines describing what was retrieved might be:

ANMO LPZ	1980	5	25	19:44:51.53	1800.000
ANMO LPN	1980	5	25	19:44:51.53	1800.000
ANMO LPE	1980	5	25	19:44:51.53	1800.000
ANMO SPZ	1980	5	25	19:44:51.53	1800.000
ANTO LPZ	1980	5	25	19:44:51.91	1800.000
ANTO LPN	1980	5	25	19:44:51.91	1800.000
ANTO LPE	1980	5	25	19:44:51.91	1800.000
ANTO SPZ	1980	5	25	20:11: 3.91	98.000
BOCO LPZ	1980	5	25	19:44:51.91	1800.000
BOCO LPN	1980	5	25	19:44:51.91	1800.000
BOCO LPE	1980	5	25	19:44:51.91	1800.000
BOCO SPZ	1980	5	25	19:53:43.91	1800.000
CHTO LPZ	1980	5	25	19:44:51.93	1800.000
CHTO LPN	1980	5	25	19:44:51.93	1800.000
CHTO LPE	1980	5	25	19:44:51.93	1800.000
CHTO SPZ	1980	5	25	20: 4: 3.93	147.000
CHTO SPZ	1980	5	25	20: 8: .93	49.000
GUMO LPZ	1980	5	25	19:44:51.79	1800.000
GUMO LPN	1980	5	25	19:44:51.79	1800.000
GUMO LPE	1980	5	25	19:44:51.79	1800.000
BCAO LPZ	1980	5	25	19:44:51.39	1800.000

- 9 -

BCAO LPN	1980	5	25	19:44:51.39	1800.000
BCAO LPE	1980	5	25	19:44:51.39	1800.000
BCAO SPZ	1980	5	25	20: 8:11.39	294.000
NWAO LPZ	1980	5	25	19:44:51.92	1800.000
NWAO LPN	1980	5	25	19:44:51.92	1800.000
NWAO LPE	1980	5	25	19:44:51.92	1800.000
GRFO LPZ	1980	5	25	19:44:51.93	1800.000
GRFO LPN	1980	5	25	19:44:51.93	1800.000
GRFO LPE	1980	5	25	19:44:51.93	1800.000
GRFO SPZ	1980	5	25	19:56:50.93	392.000
TATO LPZ	1980	5	25	19:44:51.91	1800.000
TATO LPN	1980	5	25	19:44:51.91	1800.000
TATO LPE	1980	5	25	19:44:51.91	1800.000
SNZO LPZ	1980	5	25	19:44:51.93	1800.000
SNZO LPN	1980	5	25	19:44:51.93	1800.000
SNZO LPE	1980	5	25	19:44:51.93	1800.000
CTAO LPZ	1980	5	25	19:44:51.93	1800.000
CTAO LPN	1980	5	25	19:44:51.93	1800.000
CTAO LPE	1980	5	25	19:44:51.93	1800.000
ZOBO LPZ	1980	5	25	19:44:51.94	1800.000
ZOBO LPN	1980	5	25	19:44:51.94	1800.000
ZOBO LPE	1980	5	25	19:44:51.94	1800.000
ZOBO SPZ	1980	5	25	19:55:32.94	588.000
KAAO LPZ	1980	5	25	19:44:51.81	1800.000
KAAO LPN	1980	5	25	19:44:51.81	1800.000
KAAO LPE	1980	5	25	19:44:51.81	1800.000
MAJO LPZ	1980	5	25	19:44:51.20	1800.000
MAJO LPN	1980	5	25	19:44:51.20	1800.000
MAJO LPE	1980	5	25	19:44:51.20	1800.000
MAJO SPZ	1980	5	25	19:56:30.20	294.000
KONO LPZ	1980	5	25	19:44:51.37	1800.000
KONO LPN	1980	5	25	19:44:51.37	1800.000
KONO LPE	1980	5	25	19:44:51.37	1800.000
KONO SPZ	1980	5	25	19:56: 3.37	245.000

The user can specify the list of stations from which he desires information in any order. But if he has requested more than one time interval for a particular station and component, these requests must be in increasing time sequence. Because *retrv* does not backspace the tape, requests for overlapping data are not handled.

For example, the request lines

```

ANTO, LP, 1980, 5, 25, 17, 0, 0, 180
ANTO, SP, 1980, 5, 25, 18, 18, 0, 450
ANTO, LP, 1980, 5, 25, 19, 5, 0, 780
ANTO, LP, 1980, 5, 25, 19, 13, 0, 1020
STOP

```

would produce the output:

ANTO	LPZ	1980	5	25	17: 0: .91	180.000
ANTO	LPN	1980	5	25	17: 0: .91	180.000
ANTO	LPE	1980	5	25	17: 0: .91	180.000
ANTO	LPZ	1980	5	25	19: 5: .91	780.000
ANTO	LPN	1980	5	25	19: 5: .91	780.000
ANTO	LPE	1980	5	25	19: 5: .91	780.000
ANTO	LPZ	1980	5	25	19:15: .91	1020.000
ANTO	LPN	1980	5	25	19:15: .91	1020.000
ANTO	LPE	1980	5	25	19:15: .91	1020.000
ANTO	SPZ	1980	5	25	18:18: .91	123.000

Note that although the user's fourth request is for data beginning at 19:13:00, his previous request asks for data to be extracted at 19:05:00 for a length of 13 minutes, leaving the tape positioned after the record containing the start time of 19:13:00. *Retrv* extracts data as close to the time requested as possible extending for the requested number of seconds. One would think that the result of the fourth request would begin at 19:18:00. However, *retrv* will overlap the third and fourth requests by part of one buffer (the last physical tape record used by the third request is still in memory when the fourth request is initiated). The fourth request actually overlaps the third by three minutes in this case.

Each time a request is satisfied *retrv* checks the list of stations recorded on the tape against the list of stations the user has requested. If there are requests for station data recorded later on the tape, *retrv* continues reading the tape searching for data to satisfy those requests. If not, *retrv* stops. This means that only as much of the tape will be read as is necessary.

Most computers do one of two things when a pre-existing file is opened for output: the data in the file is overwritten, or new data is appended to the end of the file. In either case, the output files produced as a result of executing *retrv* should be moved elsewhere before running *retrv* again, to insure against loss. Because *retrv* has its own convention for end-of-file (the null header record), even if data is appended, the input routines provided will not read past the end of the pre-existing data.

1.2.3. Retrv Files

File	Logical Unit Number	Input/Output
RETRV.SPZ	1	Output
RETRV.LPZ	2	Output
RETRV.LPN	3	Output
RETRV.IPF	4	Output
RETRV.IPZ	7	Output
RETRV.IPN	8	Output
RETRV.IPE	9	Output
'standard-input'	5	Input
'standard-output'	6	Output

2. Routines

2.1. *Iasnlu*, *Initfl*, *Irdhd*, *Irddat*

Iasnlu, *initfl*, *irdhd*, and *irddat* operate on the binary files produced by *retrv*. *Irdhd* reads header records. *Irddat* reads data records. *Initfl* initializes flags used by *irdhd* and *irddat*. *Iasnlu* associates a logical unit number with a data array index.

The syntax of these routines is:

```
CALL INITFL
```

```
INTEGER IERR, IASNLU, LUN, INDX  
IERR = IASNLU(LUN, INDX)
```

```
INTEGER IERR, IRDHD, INDX  
IERR = IRDHD(INDX)
```

```
INTEGER IERR, IRDDAT, INDX  
REAL VALU  
IERR = IRDDAT(INDX, VALU)
```

Irdhd reads the next header record from the logical unit associated with *indx*. The header record information is stored in common block */head/*. This function returns 1 upon a successful read, 0 on end of file, and -1 for an error. *Irdhd* will always try to read the next header record, even though intermediate data records may have to be skipped.

On each call, *irddat* sequentially accesses the next data point of a data record, returning it in *valu*. This function returns 1 upon a successful read, 0 on end of data or end of file, and -1 if the next record is not a data record.

Initialization of flags used by *irdhd* and *irddat* is done by calling the subroutine *initfl*. The flags are stored in common block */flags/*. *Initfl* must be called before any reference to *irdhd* or *irddat*, to insure reading the header and data records successfully.

The function *iasnlu* associates a logical unit number with an index to the head and data arrays. *Iasnlu* returns 1 if an index was assigned, -1 if no more buffer space is available. The variable *indx* is an input to the functions *irdhd* and *irddat*.

These routines are designed to read up to three files simultaneously. Note that all elements in common */head/* have an outer dimension of three. Information associated with a given logical unit number is buffered in space pointed to by *indx*. See program *sample* below for an example.

2.2. Resp

The function *resp* returns the complex forward transfer function of the instrument system, at angular frequency *omega*.

The syntax is:

```
COMPLEX RESP, T
INTEGER IFL, INDX
REAL OMEGA
T = RESP(INDX, OMEGA, IFL)
```

The transfer function is the Fourier transform of the system impulse response using the Fourier convention $\int f(t) e^{-i\omega t} dt$. The transfer function describes how the instrument modifies ground motion as follows:

$$U(\omega) = H(\omega) D(\omega)$$

where

D is the Fourier transform of the ground displacement,
H is the Fourier transform of the transfer function,
U is the Fourier transform of the recorded signal, and
 ω is the angular frequency in radians per sec.

The user specifies the desired output units by setting *ifl* appropriately. If *ifl* equals 1, *resp* returns $H(\omega)$ at ω in units of counts/micron, assuming the input is ground displacement. If *ifl* equals 2, the units are in counts/micron/sec (assuming the input is ground velocity); and if *ifl* equals 3, the units are in counts/micron/sec² (assuming the input is ground acceleration).

The variable *indx* is set in a reference to the function *iasnlu*, to indicate which array index is to be referenced.

2.3. Common Blocks

COMMON BLOCK HEAD

```
C STATION CODE
  INTEGER CODE(4,3)
C INSTRUMENT CODE
  INTEGER CHN(4,3)
C STATION LATITUDE
  REAL LAT(3)
C STATION LONGITUDE
  REAL LON(3)
C STATION ELEVATION
  REAL ELEV(3)
C START TIME OF DATA
  INTEGER SYEAR(3)
```

INTEGER SDOFY(3)
INTEGER SHOUR(3)
INTEGER SMIN(3)
REAL SSECS(3)
C SAMPLE RATE
REAL RATE(3)
C NORMALIZATION CONSTANT
REAL A0(3)
C NUMBER OF POLES
INTEGER NP(3)
C POLES
COMPLEX POLES(20,3)
C NUMBER OF ZEROES
INTEGER NZ(3)
C ZEROES
COMPLEX ZEROES(10,3)

COMMON /HEAD/ CODE, CHN, LAT, LON, ELEV,
1 SYEAR, SDOFY, SHOUR, SMIN, SSECS,
1 RATE, A0, NP, POLES, NZ, ZEROES

COMMON BLOCK DATA

C NUMBER OF DATA POINTS IN BUFF
REAL PTS(3)
C DATA BUFFER
REAL BUFF(500,3)

COMMON /DATA/ PTS, BUFF

COMMON BLOCK FLAGS

C HEADER RECORD FLAG
INTEGER HFLG(3)
C DATA RECORD FLAG
INTEGER DFLG(3)
C NUMBER OF LOGICAL UNIT NUMBERS ASSIGNED
INTEGER NLUN
C LOGICAL UNIT NUMBERS ASSOCIATED WITH DATA INDEXES
INTEGER LLUN(20)
C ASSOCIATES AN INDEX WITH A LOGICAL UNIT NUMBER
INTEGER ILUN(3)
C INDEX OF NEXT DATA VALUE TO BE RETURNED
INTEGER NPTS(3)

COMMON /FLAGS/ HFLG, DFLG, NLUN, LLUN, ILUN, NPTS

3. Installation

3.1. Ndtsum

The program *ndtsum* produces a literal dump of a network-day tape, with a list of start and end times of the continuous data. The main program, *ndtsum.fortran*, reads the tape drive unit number from the standard input, and opens the tape drive for reading. It then calls a subroutine that does the work of producing the summary, and finally closes the tape drive. *Ndtsum* assumes that logical unit number 5 is already open for formatted input, and that logical unit number 6 is open for formatted output.

3.2. Retrv

The program *retrv* locates selected information from a network-day tape and writes this information into binary output files. The main program, *retrv.fortran*, reads the tape drive unit number and requests input from the standard input device. A subroutine is called to initialize the program variables. *Retrv* assumes that logical unit 5 is already open for formatted input.

All output files are then opened for unformatted, sequential writing. The tape drive is opened for reading. *Retrv* assumes that logical unit 6 is already open for formatted output. Control then passes to the subroutine that reads the tape, searching for data to satisfy the requests. When a request is satisfied, this information is written to the appropriate output files, and a statement summarizing the data retrieved is written to the standard output device. On returning to the main program, all output files and the tape drive are closed.

3.3. Software Additions

Several routines have not been provided with this package because they are machine dependent. The routines are *gbytes*, *magrd*, *matt*, and *mretrn*.

3.3.1. Gbytes

Gbytes is a general purpose bit-manipulation routine. The syntax of the subroutine *gbytes* is:

```
INTEGER IA(1), IB(1)
INTEGER IS, IL, NS, N
CALL GBYTES (IA, IB, IS, IL, NS, N)
```

Gbytes treats *ia* as a bit string. In other words, the highest order bit of *ia*(1) is the first bit in the string and the lowest order

bit of $ia(i)$ is considered to be contiguous with the highest order bit of $ia(i+1)$. *Gbytes* ignores word boundaries in ia .

N bytes, each il bits long, are extracted from ia , and placed in the low order end of successive words of ib (zero padded to the left). Is bits are skipped before the first byte. Ns bits are skipped between successive bytes. Notice that byte is used here in its most general sense: a contiguous string of one or more bits.

For example, let the contents of the input array ia be

$ia = Z'123456789ABCDEF'$

where the notation $Z'...'$ means a string of hexadecimal digits, and let the call to *gbytes* be

call *gbytes*($ia, ib, 10, 5, 2, 7$)

then the values of the output array ib are:

$ib(1) = Z'001A'$
 $ib(2) = Z'0015'$
 $ib(3) = Z'000F'$
 $ib(4) = Z'0009'$
 $ib(5) = Z'0015'$
 $ib(6) = Z'0013'$
 $ib(7) = Z'001D'$

assuming that each element of ib is 16 bits in length.

Gbytes is referenced in the routines *filreq*, *getlin*, and *head*.

Examples of *gbytes* for CDC, IBM, Honeywell, and some DEC machines are included later in this User's Guide. (See Appendix C).

3.3.2. Magrd

Magrd is an input routine for reading the day tape. Each call returns the contents of one physical record from the tape or an end-of-file condition. The syntax of the function *magrd* is:

INTEGER IERR, MAGRD
 INTEGER IA(1)
 INTEGER LEN, N
 IERR = MAGRD (LUN, N, IA, LEN)

Magrd reads up to *n* frames (8 bit bytes) from logical unit number *lun* and places them into *ia*. The number of frames actually read is returned in *len*. *Magrd* returns 1 on a successful read, 0 on end of file, and -1 if the read was otherwise unsuccessful. If a data record is read, *magrd* positions the tape after the physical record regardless of its length. If an end of file is detected, *magrd* positions the tape after the file mark.

Magrd is referenced in *filreq*, *getrqt*, and *sum*.

3.3.3. **Matt**

Matt opens the tape drive (from which the day tape will be read) for reading. The syntax for the subroutine *matt* is:

```
INTEGER NDEN, NDR, NRW  
CALL MATT (NDR, NDEN, NRW)
```

Matt opens the logical tape unit (or physical drive) designated by *ndr*. *Nden* specifies the tape density. *Nrw* is the read/write flag, 1 for reading, 2 for writing.

The subroutine *matt* may need to be changed to suit your system. *Matt* presupposes that the user knows what logical tape unit needs to be opened. A more general usage might be to have the tape label name as an argument, and let *matt* return the logical tape unit in the variable *ndr*. In that case, the syntax of *matt* might be:

```
CHARACTER*6 TAPENM  
INTEGER NDR, NDEN, NRW  
CALL MATT (TAPENM, NDR, NDEN, NRW)
```

Matt is referenced in *ndtsum* and *retrv*.

3.3.4. **Mretrn**

Mretrn is used to close the tape drive. The syntax for the subroutine *mretrn* is:

```
INTEGER NDR  
CALL MRETRN (NDR)
```

Mretrn closes the logical tape file previously opened by *matt*.

Mretrn is referenced in *ndtsum* and *retrv*.

3.4. Additional Changes

Additional changes may be needed to get the source code to compile and load at your site. The following paragraphs give a few suggestions of where to look for problems that may occur.

To help the user spot the machine dependencies easily in the software, the following comment has been inserted before each statement that may be machine dependent:

```
C*****
C*                MACHINE DEPENDENT                *
C*****
```

3.4.1. Close Statements

The close statement is used to remove the association between a unit number and the file or device it currently represents.

Close statements are referenced in *clsout*, *getdat*, and *sample*.

3.4.2. Rewind Statements

A rewind statement is used to set the current position of a file or device to the beginning of the file or device. If your system positions the file at the beginning when the file is opened, this rewind statement is not necessary.

The rewind statement is referenced in *sample*.

3.4.3. Save Statements

The purpose of a save statement is to retain the value of a variable or a common block after the execution of a return statement, and not initialize the variables each time the program is entered. Most implementations of FORTRAN do this automatically.

Save statements are referenced in *iasnlu*, *irddat* and *irdhd*.

3.4.4. Nwords

In all the references to *magrd*, the argument *nwords* is set equal to 1000 in a data statement. This constant depends on the word length for your machine. If the word length for your machine is *nbits* long, then

$$nwords = (2000*8 + (nbits - 1))/nbits$$

Nwords is referenced in *filreq*, *getrqt*, and *sum*.

3.4.5. Idata

The integer array *idata* is used to store one physical record from a network-day tape, 16000 bits of information. It is dimensioned to 1000, the same as the value of *nwords*.

Storage for *idata* is provided by *getrqt* and *sum*. *Idata* is an argument in the routines *filreq*, *getcal*, *getcpz*, *getlin*, *head*, *prbuf*, *rdntlg*, and *stadat*, where it is declared as INTEGER IDATA (1), which is a dummy argument declaration.

3.4.6. Constants

Certain constants have been arbitrarily defined in the routines. They can be changed, increased or decreased, to suit the system and the users needs.

The size of the data record written on disk is set to 500. The number 500 is referenced in *filreq*, and the common blocks /buffer/ and /data/.

The maximum number of user requests allowed is set to 50. 50 is referenced in *flsbuf*, *getdat*, *icpych*, *istreq*, *prhead*, and common block /reqsts/.

3.4.7. Colon

The colon (:) character is used in several routines in a format statement to print out the time of day. A colon may not be available on all machines.

The colon is referenced in *getlin*, *getrqt*, *ndtprt*, and *sample*.

3.5. Example

3.5.1. Sample

The following FORTRAN main program, sample.fortran, demonstrates the usage of the routines, once data has been extracted from a network-day tape.

```

C      SAMPLE.FORTRAN
C
C
C
C  THIS IS A SAMPLE OF USING THE SUBROUTINES PROVIDED
C  TO READ DATA CONVERTED BY RETRV. NOTE THAT THE PROGRAM
C  SUCCESSIVELY READS A HEADER, SOME DATA, ANOTHER HEADER,
C  ETC.
C
C  SAMPLE USES A COLON IN A FORMAT STATEMENT.
C  THIS MAY NOT BE AVAILABLE ON ALL MACHINES.
C
C  CALLS CLOSE - MACHINE DEPENDENT
C      IASNLU
C      INITFL

```

- 19 -

```

C   IRDDAT
C   IRDHD
C   OPEN - MACHINE DEPENDENT
C   RESP
C   REWIND - MACHINE DEPENDENT
C
C
C   PROGRAMMED BY RAY BULAND
C   SEPTEMBER 15, 1980
C
C   INTEGER CODE(4,3),CHAN(3,4)
C   DIMENSION T(15)
C   COMPLEX P,Z,ZZ,RESP
C   DIMENSION A(300)
C   COMMON/HEAD/CODE,CHAN,XLAT(3),XLON(3),ELEV(3),
C   1 IY(3),ID(3),IH(3),IM(3),SS(3),SR(3),
C   1 AO(3),NP(3),P(20,3),NZ(3),Z(10,3)
C   DATA T/1022.,516.,258.,99.,78.4,59.6,50.1,39.7,30.1,
C   1 25.,20.,14.5,9.8,7.9,6.9/
C   DATA NO/300/
C   PI2=2.*3.1415927
C   CN=360./PI2
C   FOR THE SAKE OF ILLUSTRATION WE OPEN ONLY THE LONG
C   PERIOD VERTICAL DATA FILE.
C*****
C*           MACHINE DEPENDENT           *
C*****
C   OPEN(1,FILE='RETRV.LPZ',STATUS='OLD',FORM='UNFORMATTED',
C   1 ACCESS='SEQUENTIAL')
C*****
C*           MACHINE DEPENDENT           *
C*****
C   REWIND 1
C   INITIALIZE THE READING ROUTINES.
C   CALL INTFL
C   ASSIGN AN INDEX TO BE ASSOCIATED WITH LOGICAL UNIT 1.
C   IF(IASNLU(1,INDX)) 17,17,1
C   READ A HEADER. IF NOT ALL OF THE DATA HAS BEEN READ
C   FROM A PREVIOUS STATION, IT WILL BE SKIPPED.
C   1 IF(IRDHD(1))14,13,2
C   DUMP OUT SOME OF THE STUFF IN COMMON/HEAD/.
C   2 WRITE(6, 101) (CODE(I,INDX), I=1,4),(CHAN(I,INDX), I=1,4),
C   1 IY(INDX),ID(INDX),IH(INDX),IM(INDX),SS(INDX)
C*****
C*           MACHINE DEPENDENT           *
C*****
C   101 FORMAT(/1X,4A1,1X,4A1,I6,I4,I3,' ',I2,' ',F4.1)
C   WRITE(6, 102) XLAT(INDX),XLON(INDX),ELEV(INDX),SR(INDX)
C   102 FORMAT(1X,'LAT =' ,F7.2,' LON =' ,F8.2,' ELEV =' ,
C   1 F7.1,' RATE =' ,F5.1)
C   MAKE A CALIBRATION TABLE FOR THE INSTRUMENT TO ILLUSTRATE
C   THE USE OF RESP.
C   PRINT PERIOD IN SECONDS, AMPLITUDE IN COUNTS,
C   AND PHASE IN DEGREES.
C   WRITE(6, 103)
C   103 FORMAT(/6X,'PERIOD',3X,'COUNTS',4X,'PHASE')
C   CON=PI2
C   PHN=0.
C   DO 5 I=1,15
C   NOTE THAT RESP TAKES ANGULAR FREQUENCY. ALSO WE WANT
C   THE RESPONSE TO GROUND DISPLACEMENT.
C   ZZ=RESP(INDX,PI2/T(I),1)
C   AM=CABS(ZZ)
C   PH=ATAN2(AMAG(ZZ),REAL(ZZ))
C   MAKE THE PHASE CONTINUOUS.

```

- 20 -

```

      IF(ABS(PH-PHN).LE.4.) GO TO 6
      CON=CON-PI2
6     PHN=PH
      PH=(PH+CON)*CN
5     WRITE(6, 104) T(I),AM,PH
104  FORMAT(5X,3F9.1)
C     READ UP TO THE FIRST 300 DATA POINTS AT THIS STATION.
      DO 3 I=1,NO
      IF(IRDDAT(INDX,A(I)))15,4,3
3     CONTINUE
      I=NO+1
4     I=I-1
C     DUMP THEM OUT.
      WRITE(6, 105) I,(A(J),J=1,I)
105  FORMAT(/5X,I5/(5X,1P7E11.3))
      GO TO 1
C     CATCH ERRORS IN THE HEADER.
14    WRITE(6, 200)
200  FORMAT('ERROR IN HEADER.')
      GO TO 16
C     CATCH ERRORS IN THE DATA.
15    WRITE(6, 201)
201  FORMAT('ERROR IN DATA.')
      GO TO 16
C     DATA BUFFERS FULL.
17    WRITE(6,202)
202  FORMAT('DATA BUFFERS FULL.')
      GO TO 16
C     ALL DONE.
13    WRITE(6, 203)
203  FORMAT('ALL DATA READ.')
C*****
C*                MACHINE DEPENDENT                *
C*****
16    CLOSE(1)
      STOP
      END

```

Using request line (A) as input to *retrv*, *sample* reads the file RETRV.LPZ and produces the output:

```

ANMO LPZ  1980 146 16:33:44.5
LAT = 34.95 LON = -106.46 ELEV = 1740.0 RATE = 1.0

```

PERIOD	COUNTS	PHASE
1022.0	.1	392.7
516.0	1.7	351.6
258.0	24.8	297.3
99.0	539.6	198.2
78.4	1017.0	166.3
59.6	1964.2	122.4
50.1	2787.1	90.2
39.7	3986.0	41.8
30.1	4937.5	-23.5
25.0	4873.7	-71.2
20.0	3938.0	-131.3
14.5	1932.9	-216.3
9.8	431.3	-320.8
7.9	120.9	-377.2
6.9	36.7	-412.0

300

8.400E+01	1.010E+02	1.090E+02	1.130E+02	1.090E+02	9.300E+01	7.000E+01
4.100E+01	1.300E+01	-1.100E+01	-2.900E+01	-4.000E+01	-4.600E+01	-4.900E+01
-4.300E+01	-2.900E+01	-7.000E+00	2.300E+01	5.100E+01	7.500E+01	8.600E+01
8.700E+01	8.200E+01	7.300E+01	6.300E+01	5.200E+01	4.000E+01	2.200E+01
5.000E+00	-1.100E+01	-2.000E+01	-2.400E+01	-1.900E+01	-1.400E+01	-6.000E+00
-7.000E+00	-9.000E+00	-9.000E+00	-4.000E+00	4.000E+00	1.500E+01	2.300E+01
2.800E+01	2.600E+01	2.300E+01	2.000E+01	1.600E+01	1.000E+01	1.100E+01
1.400E+01	2.000E+01	3.400E+01	4.800E+01	5.800E+01	6.300E+01	6.300E+01
5.500E+01	4.100E+01	2.700E+01	1.900E+01	1.500E+01	1.300E+01	6.000E+00
-4.000E+00	-1.700E+01	-3.100E+01	-4.400E+01	-5.300E+01	-5.900E+01	-6.200E+01
-6.200E+01	-5.700E+01	-5.600E+01	-5.700E+01	-6.300E+01	-6.600E+01	-6.900E+01
-6.900E+01	-6.900E+01	-6.900E+01	-6.900E+01	-7.000E+01	-6.600E+01	-6.300E+01
-5.500E+01	-4.900E+01	-3.800E+01	-3.600E+01	-3.500E+01	-2.900E+01	-1.500E+01
3.000E+00	2.200E+01	3.500E+01	3.800E+01	2.800E+01	7.000E+00	-1.700E+01
-3.500E+01	-4.200E+01	-3.900E+01	-3.800E+01	-3.500E+01	-3.800E+01	-4.400E+01
-4.500E+01	-4.500E+01	-4.000E+01	-3.800E+01	-4.100E+01	-4.600E+01	-5.300E+01
-5.700E+01	-5.500E+01	-5.100E+01	-4.800E+01	-4.700E+01	-4.600E+01	-4.000E+01
-3.300E+01	-2.100E+01	-1.000E+01	-4.000E+00	-1.200E+01	-2.900E+01	-5.100E+01
-6.900E+01	-7.700E+01	-7.700E+01	-7.500E+01	-7.400E+01	-7.300E+01	-7.200E+01
-6.300E+01	-4.300E+01	-1.500E+01	1.200E+01	2.800E+01	2.800E+01	1.100E+01
-1.000E+01	-2.500E+01	-3.300E+01	-3.000E+01	-1.700E+01	-1.100E+01	-9.000E+00
-1.600E+01	-2.500E+01	-3.100E+01	-2.500E+01	-1.000E+01	1.100E+01	3.600E+01
5.700E+01	7.700E+01	9.400E+01	1.140E+02	1.570E+02	2.340E+02	3.720E+02
6.070E+02	1.005E+03	1.660E+03	2.696E+03	4.048E+03	5.732E+03	7.616E+03
9.464E+03	1.096E+04	1.172E+04	1.143E+04	9.904E+03	7.120E+03	3.224E+03
-1.403E+03	-6.344E+03	-1.099E+04	-1.490E+04	-1.774E+04	-1.939E+04	-1.986E+04
-1.939E+04	-1.837E+04	-1.714E+04	-1.606E+04	-1.536E+04	-1.508E+04	-1.514E+04
-1.526E+04	-1.508E+04	-1.430E+04	-1.262E+04	-9.936E+03	-6.264E+03	-1.813E+03
2.946E+03	7.624E+03	1.175E+04	1.502E+04	1.723E+04	1.842E+04	1.886E+04
1.906E+04	1.942E+04	2.040E+04	2.222E+04	2.493E+04	2.827E+04	3.174E+04
3.478E+04	3.670E+04	3.680E+04	3.469E+04	3.010E+04	2.301E+04	1.363E+04
2.436E+03	-1.001E+04	-2.296E+04	-3.574E+04	-4.766E+04	-5.827E+04	-6.707E+04
-7.386E+04	-7.848E+04	-8.090E+04	-8.122E+04	-7.955E+04	-7.603E+04	-7.078E+04
-6.413E+04	-5.626E+04	-4.746E+04	-3.806E+04	-2.656E+04	-1.931E+04	-1.066E+04
-2.956E+03	3.446E+03	8.384E+03	1.187E+04	1.393E+04	1.466E+04	1.431E+04
1.316E+04	1.146E+04	9.464E+03	7.432E+03	5.516E+03	3.854E+03	2.516E+03
1.554E+03	1.064E+03	1.023E+03	1.292E+03	1.800E+03	2.456E+03	3.016E+03
3.378E+03	3.510E+03	3.454E+03	3.270E+03	3.090E+03	3.114E+03	3.506E+03
4.308E+03	5.552E+03	7.232E+03	9.224E+03	1.136E+04	1.351E+04	1.551E+04
1.723E+04	1.850E+04	1.923E+04	1.930E+04	1.867E+04	1.739E+04	1.557E+04
1.326E+04	1.074E+04	8.136E+03	5.584E+03	3.184E+03	9.690E+02	-9.690E+02
-2.764E+03	-4.276E+03	-5.464E+03	-6.212E+03	-6.380E+03	-5.876E+03	-4.612E+03
-2.616E+03	-4.600E+01	2.644E+03	5.686E+03	8.136E+03	9.936E+03	

ALL DATA READ.

4. Notes

There are no prompts in the commands *ndtsum* and *retrv* to tell the user what information he needs to enter next.

Retrv normally reads requests from the standard input device. Another alternative is to insert these requests in a file, and have *retrv* read from this file. To do this, the subroutine *getdat.fortran* needs to be changed. Note the comments that have been inserted in *getdat.fortran* to assist you in doing this.

If your machine swaps bytes (eg. PDP11's and VAX's), you will need to add a routine to *magrd* that exchanges even and odd bytes of the data.

Table 1. Summary of Routines

Routine	Description	Referenced by
close	statement opens a file or device	clsout sample
clsout	subroutine write a null header to each open output file before closing it	retrv
daymo	integer function converts day of year to month and day	getrqt ndtprt
doy	integer function converts month and day to day of year	req
dtpfmt	real function decodes binary data from Network Day Tape	filreq
ffin	real function scans character string for numeric constant	getcal getcpz getdat stadat
filreq	subroutine fills a request	getrqt
flsbuf	subroutine writes data buffers to output files	filreq
gbytes	subroutine general purpose bit manipulation routine	filreq getlin head
getcal	integer function scans data log for calibration constants	getrqt
getcpz	subroutine scans data log for station constants, poles, and zeroes	getrqt

Table 1. Summary of Routines

Routine	Description	Referenced by
getdat	subroutine scans input request file	retrv
getlin	subroutine reads characters from input buffer, then converts them to the internal character code of the host machine	getcal getcpz getrqt prbuf rdntlg stadat sum
getrqt	subroutine reads Network Day Tape searching for data that will satisfy a request	retrv
getstr	subroutine scans a character string for a blank or comma-delimited substring	getcal getdat rdntlg stadat
head	subroutine decodes Network Day Tape header information	filreq getrqt sum
iasnlu	integer function associates a logical unit number with an index in the data arrays	sample
icpych	subroutine copies one character string to another	getdat
initbd	subroutine initializes output files, logical unit numbers, and instrument codes	retrv
initfl	subroutine initializes header and data record flags	sample

Table 1. Summary of Routines

Routine	Description	Referenced by
irddat	integer function reads next data point of a data record	irdhd sample
irdhd	integer function reads next header record	sample
istreq	integer function compares two character strings	getrqt req setflg
lpyr	integer function determines if year is a leap year	daymo doy stndrd
magrd	function reads day tape returning one physical record	filreq getrqt sum
matt	subroutine opens tape drive	ndtsum retrv
mod	intrinsic function returns remainder	lpyr
mretrn	subroutine closes tape drive	ndtsum retrv
ndtprt	subroutine write out values in common blocks /start/ and /end/	sum
ndtsum	command dump contents of a Network Day Tape	
open	statement opens a file	opnout sample
opnout	subroutine opens binary output files	retrv

Table 1. Summary of Routines

Routine	Description	Referenced by
prbuf	subroutine writes out data logs	sum
prhead	subroutine writes out a header record to a binary output file	filreq
rddata	subroutine reads a data record	irddat
rdhead	subroutine reads a header record	irdhd
rdntlg	subroutine scans a data log	getrqt
req	integer function determines if current record will fill a request	getrqt
resp	complex function returns the complex forward transfer function of the instrument system	sample
retrv	command retrieves selected information from a Network Day Tape	
rewind	statement positions file at the beginning	sample
sample	command example program	
save	statement retains values of variable after execution of return statement	iasnlu irddat irdhd
setfig	subroutine sets request station flags	getrqt rdntlg

Table 1. Summary of Routines

Routine	Description	Referenced by
stadat	subroutine scans a data log	getrqt
stndrd	subroutine checks time values for consistency	filreq sum
sum	subroutine produces summary of a Network Day Tape	ndtsum
tset	subroutine sets time variables	filreq sum

Table 2. Summary of Common Blocks

Common Block	Description	Referenced by
/buffer/	contains three arrays for each orientation of data	filreq flsbuf getrqt retrv
/data/	stores binary data read from disk	initfl irddat rddata
/end/	end time of continuous data	ndtprt ndtsum sum
/files/	output files and instrument codes	clsout getdat initbd opnout retrv
/flags/	flags that signal what type of record is to be read next from disk	iasnlu initfl irddat irdhd
/head/	station and start time information	irdhd rdhead resp
/header/	Network Day Tape header information	filreq getrqt head ndtsum prhead req retrv sum tset
/reqsts/	user request information	filreq getdat getrqt

Table 2. Summary of Common Blocks

Common Block	Description	Referenced by
		req retrv setflg
/start/	start time of continuous data	ndtprt ndtsum sum
/sstart/	start time of request	filreq getrqt prhead retrv
/stinfo/	station information	filreq getrqt prhead retrv

Table 3. Routines Used by Main Programs

Routine	Main		
	Retrv	Ndtsum	Sample
close	*		*
clsout	*		
daymo	*	*	
doy	*		
dtpfmt	*		
ffin	*		
filreq	*		
flsbuf	*		
gbytes †	*	*	
getcal	*		
getcpz	*		
getdat	*		
getlin	*	*	
getrqt	*		
getstr	*		
head	*	*	
iasnlu			*
icpych	*		
initbd	*		
initfl			*
irddat			*
irdhd			*
istreq	*		

Table 3. Routines Used by Main Programs

Routine	Main		
	Retrv	Ndtsum	Sample
lpyr	*	*	
magrd †	*	*	
matt †	*	*	
mod	*	*	
mretrn †	*	*	
ndtprt		*	
open	*		*
opnout	*		
prbuf		*	
prhead	*		
rddata			*
rdhead			*
rdntlg	*		
req	*		
resp			*
rewind			*
save			*
setflg	*		
stadat	*		
stndrd	*	*	
sum		*	
tset	*	*	

† User-supplied routine.

- 32 -

INCLUDE FILES

DEFINES.H

```
define(SP,1)
define(LP,2)
define(IP,3)
define(ZZ,1)
define(NS,2)
define(EW,3)
define(NREQS,50)
define(NPOLES,20)
define(NZEROES,10)
define(BUFSIZE,500)
define(DISKFILES,3)
```

BUFFER.DCL

```
#
# 500 - BUFFER SIZE OF DATA RECORD ON DISK
#
real z(BUFSIZE) # VERTICAL BUFFER
real n(BUFSIZE) # NORTH-SOUTH BUFFER
real e(BUFSIZE) # EAST-WEST BUFFER
real spts # NUMBER OF POINTS IN BUFFERS
real pts # TOTAL NUMBER OF POINTS READ TO FILL REQUEST
```

BUFFER.COM

```
common /buffer/ z, n, e, spts, pts
```

DATA.DCL

```
#
# THE DATA READ FROM DISK IS SET TO ALLOW
# ACCESS TO THREE FILES SIMULTANEOUSLY
#
real pts(DISKFILES) # NUMBER OF VALUES READ INTO DATA BUFFER buff
real buff(BUFSIZE, DISKFILES) # DATA BUFFER
```

DATA.COM

```
#
common /data/ pts, buff
```

FILES.DCL

```
#
integer*2 lun(3,3) # LOGICAL UNIT NUMBER FOR EACH OUTPUT FILE
integer*2 chn(3,3,4) # INSTRUMENT CODE FOR EACH OUTPUT FILE
```

APPENDIX A

RATFOR CODE

The software written to read the Network Day Tapes was written in Ratfor (Rational FORTRAN)†. Ratfor translates easily into FORTRAN. The FORTRAN code produced in Appendix B was generated from this Ratfor code.

† Kernighan, Brian W. and P.J. Plauger, *Software Tools*, Addison-Wesley, Reading, Massachusetts, (1978).

- 33 -

FILES.COM

```
#
common /files/ lun, chn
```

FLAGS.DCL

```
#
integer*2 hfig(DISKFILES) # HEADER RECORD FLAG
integer*2 dfig(DISKFILES) # DATA RECORD FLAG
integer*2 nlun # NUMBER OF LOGICAL UNIT NUMBERS ASSIGNED
integer*2 llun(20) # LOGICAL UNIT NUMBERS ASSOCIATED WITH DATA INDEXES
integer*2 ilun(DISKFILES) # INDEX ASSOCIATED WITH A LOGICAL UNIT NUMBER
integer*2 npts(DISKFILES) # INDEX OF NEXT DATA VALUE TO BE RETURNED
```

FLAGS.COM

```
#
common /flags/ hfig, dfig, nlun, llun, ilun, npts
```

HEAD.DCL

```
#
# THE DATA READ FROM DISK IS SET TO ALLOW
# ACCESS TO THREE FILES SIMULTANEOUSLY
#
integer*2 code(4,DISKFILES) # STATION CODE - CHARACTER STRING
integer*2 chn(4,DISKFILES) # INSTRUMENT CODE - CHARACTER STRING
real lat(DISKFILES) # STATION LATITUDE
real lon(DISKFILES) # STATION LONGITUDE
real elev(DISKFILES) # STATION ELEVATION
# START TIME OF DATA
integer*2 syear(DISKFILES) # YEAR
integer*2 sdofy(DISKFILES) # DAY OF YEAR
integer*2 shour(DISKFILES) # HOUR
integer*2 smin(DISKFILES) # MINUTE
real ssecs(DISKFILES) # SECONDS
real rate(DISKFILES) # SAMPLING RATE
real a0(DISKFILES) # NORMALIZATION CONSTANT
integer*2 np(DISKFILES) # NUMBER OF POLES
complex poles(NPOLES,DISKFILES) # POLES
integer*2 nz(DISKFILES) # NUMBER OF ZEROES
complex zeroes(NZEROES,DISKFILES) # ZEROES
```

HEAD.COM

```
#
common /head/ code, chn, lat, lon, elev,
      syear, sdofy, shour, smin, ssecs,
      rate, a0, np, poles, nz, zeroes
```

- 34 -

HEADER.DCL

```
#
# TAPE HEADER INFORMATION
#
integer*2 id # STATION ID
integer*2 instr # INSTRUMENT
integer*2 year # YEAR
integer*2 dofy # DAY OF YEAR
integer*2 hour # HOUR
integer*2 min # MINUTE
integer*2 sec # SECOND
real mss # MILLISECONDS
integer*2 nform # FORMAT ID
integer*2 nchan # NUMBER OF CHANNELS
integer*2 nsamp # NUMBER OF SAMPLES
real rate # SAMPLING RATE
```

HEADER.COM

```
#
common /header/ id, instr, year, dofy, hour, min, sec, mss,
               nform, nchan, nsamp, rate
```

REQUESTS.DCL

```
#
# REQUEST INFORMATION
# 50 - MAXIMUM NUMBER OF REQUESTS ALLOWED
#
# REQUEST INFORMATION
integer*2 nreq # NUMBER OF REQUESTS
integer*2 rcode(NREQS,4) # STATION CODE - CHARACTER STRING
integer*2 rinstr(NREQS) # INSTRUMENT ID
integer*2 ryear(NREQS) # YEAR
integer*2 rmonth(NREQS) # MONTH
integer*2 rday(NREQS) # DAY
integer*2 rhour(NREQS) # HOUR
integer*2 rmin(NREQS) # MINUTE
integer*2 rsec(NREQS) # SECONDS
real rlen(NREQS) # LENGTH IN SECONDS
integer*2 rlun(NREQS,3,3) # LOGICAL UNIT NUMBER
integer*2 rchn(NREQS,3,3,4) # INSTRUMENT CODE - CHARACTER STRING
integer*2 rflg(NREQS) # STATION FLAG
```

REQUESTS.COM

```
#
common /reqsts/ nreq,rcode,rinstr,ryear,rmonth,rday,
               rhour,rmin,rsec,rlen,rlun,rchn,rflg
```

STAINFO.DCL

```
#
# STATION INFORMATION
#
```

```
integer*2 code(4) # STATION CODE - CHARACTER STRING
integer*2 np # NUMBER OF POLES, 20 LARGEST NUMBER OF SRO POLES
integer*2 nz # NUMBER OF ZEROES, 10 LARGEST NUMBER OF SRO ZEROES
integer*2 ichan # NUMBER OF CHANNELS
real a0(3) # CONSTANT
real cal(3) # CALIBRATION CONSTANT
real elev # STATION ELEVATION
real lat # STATION LATITUDE
real lon # STATION LONGITUDE
complex poles(NPOLES,3) # POLES
complex zeroes(NZEROES,3) # ZEROES
#
# START TIME OF DATA
#
integer*2 syear # YEAR
integer*2 sdofy # DAY OF YEAR
integer*2 shour # HOUR
integer*2 smin # MINUTES
real ssecs # SECONDS
```

STAINFO.COM

```
#
common /stinfo/ code, ichan, np, nz, lat, lon, elev, a0, cal,
      poles, zeroes
#
common /start/ syear, sdofy, shour, smin, ssecs
```

TIMES.DCL

```
#
# START TIME OF CONTINUOUS DATA
#
integer*2 syr # YEAR
integer*2 sdy # DAY OF YEAR
integer*2 shr # HOUR
integer*2 smn # MINUTE
integer*2 ssec # SECONDS
real sms # MILLISECONDS
#
# END TIME OF CONTINUOUS DATA
#
integer*2 lyr # YEAR
integer*2 ldy # DAY OF YEAR
integer*2 lhr # HOUR
integer*2 lmn # MINUTE
integer*2 lsec # SECONDS
real lms # MILLISECONDS
```

TIMES.COM

```
#
common /start/ syr, sdy, shr, smn, ssec, sms
#
common /end/ lyr, ldy, lhr, lmn, lsec, lms
```

- 36 -

NDTSUM MAIN

```
#
# Command NDTSUM produces a summary
# of the data written on a Network
# Day Tape. This includes a literal
# dump of all data logs, and a list
# of start and end times of the
# continuous data recorded for each
# station and each instrument.
#
# NDTSUM reads from the standard
# input (logical unit number 5)
# for the tape drive unit number.
# No prompt is given to the user.
#
# Calls:
# matt - user supplied
# mretrn - user supplied
# sum
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
include(header.dcl)
include(times.dcl)
integer*2 dr # TAPE DRIVE NUMBER
integer*2 read # READ ONLY FLAG
integer*2 den # TAPE DRIVE DENSITY
include(header.com)
include(times.com)
data read /1/
data den /1600/
#
# GET LOGICAL TAPE UNIT NUMBER
# FROM THE USER - NO PROMPT GIVEN
#
  read(5, 10) dr
10 format(i1)
#
# OPEN TAPE DRIVE FOR READING
#
  call matt(dr,den,read)
#
# PRODUCE SUMMARY
#
  call sum (dr)
#
# CLOSE TAPE DRIVE
#
  call mretrn (dr)
#
end
```

NDSTUM SPECIFIC ROUTINES

SUM,RATFOR

```

# subroutine sum(dr)
#
# Sum produces a summary of the
# data contained on a Network
# Day Tape.
#
#
# Calls:
#   getlin
#   head
#   magrd - user supplied
#   ndtprt
#   prbuf
#   stndrd
#   tset
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
integer*2 dr # TAPE DRIVE LOGICAL UNIT
#
include(header.dcl)
include(times.dcl)
integer*2 idata(1000) # BINARY DATA
integer*2 lnsam # NUMBER OF SAMPLES OF LAST DATA READ
integer*2 lnchan # NUMBER OF CHANNELS OF LAST DATA READ
integer*2 nyr, ndy, nhr, nmh, nsec # NEXT EXPECTED TIME FOR DATA
integer*2 tyr, tdy, thr, tmn, tsec # CURRENT TIME OF DATA
real tms
integer*2 i # LOOP INDEX
integer*2 ibuff(80)
integer*2 magrd # FUNCTION
integer*2 nr # NUMBER OF FRAMES READ
integer*2 kus, kut
real fms # MILLISECONDS
real nms
real irate # SAMPLING RATE OF LAST DATA READ
integer*2 nwords # NUMBER OF FRAMES OF DATA TO READ
include(header.com)
include(times.com)
#
data nwords /1000/
data kus, kut /'S', 'T'/
#
#
# NETWORK DAY TAPE FORMAT
#
#
# EOF
#
# |
# -----
# NETWORK-DAY
# TAPE LOG
# (ASCII)
# -----
# |
#
# EOF
#
# |
# -----
# STATION DAY
# TAPE LOG
# (ASCII)
# -----
# |

```



```

#
#
# EOF
#
#-----#-----#-----#
# LP DATA SP DATA LOG SP DATA
# (ASCII)
#-----#-----#-----#
#
#
# EOF
#
#-----#-----#-----#
# IP DATA LOG IP DATA STATION DAY TAPE LOG
# (ASCII) (ASCII)
#-----#-----#-----#
#
#
#
for (;;) {
#
# READ NETWORK DAY TAPE LOG
#
i = magrd(dr, nwords, idata, nr)
if (i == 0) break
#
# PRINT OUT NETWORK DAY TAPE LOG
#
else if (i == 1) call prbuff(idata)
else {
write(6,10)
10 format(1x, 'Error reading - Network Day Tape log.')
return
}
}
#
# READ STATION LOG
#
if (magrd(dr, nwords, idata, nr) != 1) {
write(6, 12)
12 format(1x, 'Error reading - Station log expected.')
return
}
#
# LOOP ONCE FOR EACH STATION
#
for (;;) {
#
if (magrd(dr, nwords, idata, nr) != 0) {
write(6, 13)
13 format(1x, 'Error reading - EOF expected after Station log.')
return
}
}
#
# START A NEW PAGE WITH EACH NEW STATION
#
write(6, 20)
#

```

- 39 -

```

# PRINT NEW PAGE
#
20  format( '\f')
#
# PRINT STATION LOG
#
call prbuf(idata)
#
for (:) {
#
# IF MAGRD == 0, END OF TAPE
#
if (magrd(dr, nwords, idata, nr) == 0) return
call getlin(idata, 1, ibuff)
#
# IF THE FIRST TWO CHARACTERS OF THE FIRST LINE
# OF THIS RECORD EQUALS 'ST', THIS IS A STATION LOG
#
if (ibuff(1) == kus & ibuff(2) == kut) break
#
# THIS WAS NOT A STATION LOG, IT WAS A DATA LOG
#
call prbuf(idata)
#
# READ AND PRINT REMAINING TWO DATA LOGS
#
do i = 1,2 {
  if(magrd(dr, nwords, idata, nr) != 1) {
    write(8, 14)
14    format(1x, 'Error reading data log.')
    return
  }
  call prbuf(idata)
}
#
# OUTPUT HEADER FOR THE START AND END
# TIMES OF THE CONTINUOUS DATA
#
write(8, 30)
30  format(1x, '      START TIME          END TIME')
write(8, 40)
40  format(1x, 'YEAR MONTH DAY  TIME      YEAR MONTH DAY  TIME')
#
# READ DATA RECORDS
#
# IF MAGRD == 0, NO BINARY RECORDS FOR THIS INSTRUMENT
#
if (magrd(dr, nwords, idata, nr) == 0) next
#
# INTERPRET BINARY HEADER DATA
#
call head(idata)
#
# SET INITIAL VALUES FOR
# START TIME, NEXT EXPECTED TIME
# AND LAST TIME READ
#
call tset(syr, sdy, shr, smn, ssec, sms)
call tset(nyr, ndy, nhr, nmh, nsec, nms)
#
# NUMBER OF MILLISECONDS COVERED BY THIS RECORD
#
fms = float(nsamp)*1000./(float(nchan)*rate)
nms = nms + fms
call stdrd(nyr, ndy, nhr, nmh, nsec, nms)

```

- 40 -

```

call tset(lyr, ldy, lhr, lmn, lsec, lms)
lmsam = nsamp
lrate = rate
lnchan = nchan
#
for(;;) {
#
#   IF MAGRD == 0, END OF FILE
#
  if (magrd(dr, nwords, idata, nr) == 0) break
  call head(idata)
#
#   SET CURRENT TIME
#
  call tset(tyr, tdy, thr, tmn, tsec, tms)
#
#   IS CURRENT TIME EQUAL TO NEXT EXPECTED TIME?
#
  if ((tyr == nyr) & (tdy == ndy) &
      (thr == nhr) & (tmn == nmtn) &
      (tsec == nsec) & (tms == nms)) {
#
#     YES
#
    call tset(nyr, ndy, nhr, nmtn, nsec, nms)
    fms = float(nsamp)*1000./float(nchan)*rate) # reinitialize values
    nms = nms + fms
    call stndrd(nyr, ndy, nhr, nmtn, nsec, nms)
    call tset(lyr, ldy, lhr, lmn, lsec, lms)
    lmsam = nsamp
    lrate = rate
    lnchan = nchan
  }
#
  else {
#
#     NO
#
    fms = (float(lmsam/lnchan) - 1.0)*1000./lrate
    lms = lms + fms
    call stndrd(lyr, ldy, lhr, lmn, lsec, lms)
#
#     PRINT OUT STARTING AND ENDING TIMES
#     OF THE CONTINUOUS DATA
#
    call ndtpnt
#
#     REINITIALIZE VALUES
#
    call tset(syr, sdy, shr, smtn, ssec, sms)
    call tset(nyr, ndy, nhr, nmtn, nsec, nms)
    fms = float(nsamp)*1000./float(nchan)*rate)
    nms = nms + fms
    call stndrd(nyr, ndy, nhr, nmtn, nsec, nms)
    call tset(lyr, ldy, lhr, lmn, lsec, lms)
    lmsam = nsamp
    lrate = rate
    lnchan = nchan
  }
}
fms = (float(lmsam/lnchan) - 1.0)*1000./lrate
lms = lms + fms
call stndrd(lyr, ldy, lhr, lmn, lsec, lms)
call ndtpnt
write(6,50)

```

- 41 -

```
50  format(//)
    }
    }
end
```

PRBUF.RATFOR

```
subroutine prbuf(idata)
#
# Prbuf prints one ascii record(2000 characters) -
# 25 lines, 80 characters per line.
#
#
# Calls:
#   getlin
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
integer*2 idata(1) # DATA RECORD - INPUT
# SET TO HOLD 16000 BITS OF TAPE INPUT RECORD
#
integer*2 i
integer*2 j
integer*2 ibuff(80)
#
do i = 1,25 {
  call getlin(idata, i, ibuff)
  write(6, 10) (ibuff(j), j=1,80)
10  format(1x, 80a1)
}
#
return
#
end
```

NDTPRT.RATFOR

```

subroutine ndtprt
#
# Ndtprt writes out the start and
# end times in common blocks
# /start/ and /end/.
#
# Ndtprt uses a colon (:) in
# the format statement. This may
# not be available on all machines.
#
#
# Calls:
#   daymo
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
#
include(times.dcl)
integer*2 smonth, sday, lmonth, lday
integer*2 daymo # FUNCTION
integer*2 ier # ERROR CODE
include(times.com)
#
ier = daymo(sdy, smonth, sday, syr)
ier = daymo(ldy, lmonth, lday, lyr)
#
write(6, 10) syr, smonth, sday, shr, smn, ssec, sms,
            lyr, lmonth, lday, lhr, lmn, lsec, lms
#*****
#*          MACHINE DEPENDENT          *
#*****
10 format (1x,(2(i4,4x,i2,2x,i3,4x,i2,':',i2,':',i2,':',f4,4x)))
#
return
#
end

```

- 44 -

RETRV MAIN

```

#
# Command RETRV fetches data from a
# Network Day Tape mounted on
# logical tape unit N and generates
# output files.
# RETRV reads from the standard
# input (logical unit number 5)
# the tape drive unit number,
# and then continues to read the
# user's requests.
# No prompt is given to the user
# for this information.
#
#
# Calls:
#  clout
#  getdat
#  getrqt
#  initbd
#  matt - user supplied
#  mretrn - user supplied
#  opnout
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
include(defines.h)
include(requests.dcl)
include(header.dcl)
include(stainfo.dcl)
include(files.dcl)
include(buffer.dcl)
integer*2 dr # TAPE DRIVE NUMBER
integer*2 den # TAPE DENSITY
integer*2 read # READ ONLY FLAG
include(requests.com)
include(header.com)
include(stainfo.com)
include(files.com)
include(buffer.com)
data den/1800/
data read/1/
#
# GET LOGICAL TAPE UNIT NUMBER
# FROM THE USER - NO PROMPT GIVEN
#
  read(5, 10) dr
10 format(11)
#
# INITIALIZE
  call initbd
#
# READ USERS REQUESTS
#
  call getdat
  if (nreq == 0) {
    write(6, 20)
20  format(1x, 'No requests.')
    stop
  }
#
# OPEN OUTPUT FILES

```


call opnout

OPEN TAPE FOR READING

call matt(dr, den, read)

RETRIEVE REQUESTS

call getrqt(dr)

CLOSE OUTPUT FILES

call clscut

CLOSE TAPE DRIVE

call mretrn(dr)

end

RETRV SPECIFIC ROUTINES

INITBD.RATFOR

```

subroutine initbd
#
# Initbd initializes the output files
# logical unit numbers and the
# instrument codes.
#
#
# Calls no other routine.
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
#
# include(defines.h)
# include(files.dcl)
# integer*2 kus, kul, kui
# integer*2 kuz, kun, kue
# integer*2 kup, kbl
# include(files.com)
# data kus, kul, kui /'S', 'L', 'T'/
# data kuz, kun, kue /'Z', 'N', 'E'/
# data kup, kbl /'P', ''/
#
# lun(SP,ZZ) = 1
# lun(SP,NS) = 0
# lun(SP,EW) = 0
# lun(LP,ZZ) = 2
# lun(LP,NS) = 3
# lun(LP,EW) = 4
# lun(IP,ZZ) = 7
# lun(IP,NS) = 8
# lun(IP,EW) = 9
#
# chn(1,1,1) = kus
# chn(1,1,2) = kup
# chn(1,1,3) = kuz
# chn(1,1,4) = kbl
#
# chn(1,2,1) = kus
# chn(1,2,2) = kup
# chn(1,2,3) = kun
# chn(1,2,4) = kbl
#
# chn(1,3,1) = kus
# chn(1,3,2) = kup
# chn(1,3,3) = kue
# chn(1,3,4) = kbl
#
# chn(2,1,1) = kul
# chn(2,1,2) = kup
# chn(2,1,3) = kuz
# chn(2,1,4) = kbl
#
# chn(2,2,1) = kul
# chn(2,2,2) = kup
# chn(2,2,3) = kun
# chn(2,2,4) = kbl
#
# chn(2,3,1) = kul

```

- 47 -

```
chn(2,3,2) = kup
chn(2,3,3) = kue
chn(2,3,4) = kbl
#
chn(3,1,1) = kui
chn(3,1,2) = kup
chn(3,1,3) = kuz
chn(3,1,4) = kbl
#
chn(3,2,1) = kui
chn(3,2,2) = kup
chn(3,2,3) = kun
chn(3,2,4) = kbl
#
chn(3,3,1) = kui
chn(3,3,2) = kup
chn(3,3,3) = kue
chn(3,3,4) = kbl
#
return
#
end
```

GETDAT.RATFOR

```

subroutine getdat
#
# Getdat scans the standard input,
# (logical unit 5) reading requests.
# Scanning stops upon reading a station
# code of STOP.
#
#
# Calls:
#   ffin
#   getstr
#   icpych
#
#   Programmed by Madeleine Zirbes
#   September 16, 1980
#
#
include(defines.h)
include(requests.dcl)
include(files.dcl)
integer*2 kua, kue, kui, kul, kun
integer*2 kuo, kup, kus, kut, kuz
integer*2 kema, kbl
integer*2 i, j, k, l, m, mm
integer*2 lfi
integer*2 fid
integer*2 instr(4)
integer*2 code(4)
integer*2 line(80)
real ffin # FUNCTION
include(requests.com)
include(files.com)
data fid /5/
data kua, kue, kui, kul, kun /'A', 'E', 'T', 'L', 'N'/
data kuo, kup, kus, kut, kuz /'O', 'P', 'S', 'T', 'Z'/
data kema, kbl /',', ''/
#
#
# If you want to read the user's requests
# from a file, change the software as follows:
#
#
# 1.) Obtain the file name that contains the requests,
# 2.) Open the file for formatted input, positioning
#    the file at the beginning,
# 3.) Before exiting the subroutine getdat, close the
#    file, and
# 4.) Change the data statement that initializes fid
#    to 5 to another unit number.
#
#
#
nreq = 0
#
# ZERO OUT LOGICAL UNIT NUMBERS
#
do i = 1,NREQS {
  do j = 1,3 {
    do k = 1,3 {
      rlun(i,j,k) = 0
    }
  }
}

```

- 49 -

```

}
#
# THIS LOOP WILL READ REQUESTS UNTIL A SINGLE LINE
# CONTAINING THE CHARACTER STRING STOP IS ENCOUNTERED,
# OR UNTIL 50 REQUESTS ARE READ INTO THE REQUEST BUFFERS.
#
do i = 1, NREQS {
#
  read(fid,10) line
10  format(80a1)
  do k = 1, 4 {
    code(k) = kbl
  }
  call getstr(1, 80, line, m, ifl, k, 4, code)
  if (code(1) == kus &
    code(2) == kut &
    code(3) == kuo &
    code(4) == kup) break
  if (ifl == kema) mm = m + 1
  else mm = m
  call getstr(mm, 80, line, m, ifl, k, 4, instr)
  if (ifl == kema) mm = m + 1
  else mm = m
  ryear(i) = int(ffin(mm, 80, line, m, ifl))
  if (ifl == kema) mm = m + 1
  else mm = m
  rmonth(i) = int(ffin(mm, 80, line, m, ifl))
  if (ifl == kema) mm = m + 1
  else mm = m
  rday(i) = int(ffin(mm, 80, line, m, ifl))
  if (ifl == kema) mm = m + 1
  else mm = m
  rhour(i) = int(ffin(mm, 80, line, m, ifl))
  if (ifl == kema) mm = m + 1
  else mm = m
  rmin(i) = int(ffin(mm, 80, line, m, ifl))
  if (ifl == kema) mm = m + 1
  else mm = m
  rsec(i) = int(ffin(mm, 80, line, m, ifl))
  if (ifl == kema) mm = m + 1
  else mm = m
  rlen(i) = ffin(mm, 80, line, m, ifl)
  if (code(1) == kua & code(2) == kul & code(3) == kul) {
    rflg(i) = 1
    code(4) = kbl
  }
  else rflg(i) = 0
#
  rcode(i,1) = code(1)
  rcode(i,2) = code(2)
  rcode(i,3) = code(3)
  rcode(i,4) = code(4)
#
  if (instr(1) == kua &
    instr(2) == kul &
    instr(3) == kul) {
#
#   USER WANTS ALL CHANNELS
#
    rinstr(i) = 0
    rlun(i,SP,ZZ) = lun(SP,ZZ)
    rlun(i,SP,NS) = lun(SP,NS)
    rlun(i,SP,EW) = lun(SP,EW)
    rlun(i,LP,ZZ) = lun(LP,ZZ)
    rlun(i,LP,NS) = lun(LP,NS)
  }
}

```

- 50 -

```

      rlun(i,LP,EW) = lun(LP,EW)
      rlun(i,IP,ZZ) = lun(IP,ZZ)
      rlun(i,IP,NS) = lun(IP,NS)
      rlun(i,IP,EW) = lun(IP,EW)
#
      do l = 1,3 {
        do m = 1,3 {
          call icpych(rchn, chn, i, l, m)
        }
      }
#
      next
    }
#
    else if (instr(1) == kus) {
#
#      SHORT PERIOD
#
      j = SP
      rinstr(i) = SP
    }
#
    else if (instr(1) == kul) {
#
#      LONG PERIOD
#
      j = LP
      rinstr(i) = LP
    }
#
    else if (instr(1) == kui) {
#
#      INTERMEDIATE PERIOD
#
      j = IP
      rinstr(i) = IP
    }
#
    else {
#
#      ERROR IN INPUT
#      SKIP REQUEST THAT WAS JUST READ IN
#
      i = i - 1
      next
    }
#
    do k = 2,4 {
      if (instr(k) == kup) {
#
#        ALL CHANNELS
#
        rlun(i,j,ZZ) = lun(j,ZZ)
        rlun(i,j,NS) = lun(j,NS)
        rlun(i,j,EW) = lun(j,EW)
#
        do m = 1,3 {
          call icpych(rchn, chn, i, j, m)
        }
      }
#
      else if (instr(k) == kuz) {
#
#        VERTICAL
#

```

- 51 -

```
      rlun(i,j,ZZ) = lun(j,ZZ)
      m = 1
      call icpych(rehn, chn, i, j, m)
    }
#
#   else if (instr(k) == kun) {
#
#       NORTH/SOUTH
#
#       rlun(i,j,NS) = lun(j,NS)
#       m = 2
#       call icpych(rehn, chn, i, j, m)
#   }
#
#   else if (instr(k) == kue) {
#
#       EAST/WEST
#
#       rlun(i,j,EW) = lun(j,EW)
#       m = 3
#       call icpych(rehn, chn, i, j, m)
#   }
# }
#
#
# NUMBER OF REQUESTS
#
# nreq = i - 1
#
# return
#
end
```

CLSOUT.RATFOR

```

subroutine clsout
#
# Clsout writes out a null header
# record to each open output file
# (opened by opnout) before
# closing that file.
#
#
# Calls:
#   close - machine dependent
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
#
include(files.dcl)
integer*2 i, j, k # LOOP INDEX
integer*2 izero # INTEGER ZERO
integer*2 ione # INTEGER ONE
integer*2 code(4) # CHARACTER STRING
integer*2 l # LOGICAL UNIT NUMBER
real fzero # FLOAT ZERO
include(files.com)
data izero, ione /0, 1/
data fzero /0.0/
data code /'E', 'N', 'D', ' '/
#
do i = 1,3 {
  do j = 1,3 {
    if (lun(i,j) .ne. 0) {
#      WRITE OUT NULL HEADER
      l = lun(i,j)
      write(l) (code(k), k=1,4), (code(k), k=1,4),
        fzero, fzero, fzero,
        izero, izero, izero, izero,
        fzero, fzero, fzero,
        ione, cmplx(fzero, fzero),
        ione, cmplx(fzero, fzero)
#*****
#*                               *
#*****
      close(l)
      lun(i,j) = 0
    }
  }
}
#
return
#
end

```

OPNOUT.RATFOR

```
subroutine opnout
#
# Opnout opens the output files
# for retrv.
#
#
# Calls:
# open - machine dependent
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
#
# include(defines.h)
# include(files.dcl)
# include(files.com)
#
# *****
# *                MACHINE DEPENDENT                *
# *****
# if (lun(SP,ZZ) !=0) open(lun(SP,ZZ), file='retrv.spz', form = 'unformatted')
# if (lun(SP,NS) !=0) open(lun(SP,NS), file='retrv.spn', form = 'unformatted')
# if (lun(SP,EW) !=0) open(lun(SP,EW), file='retrv.spe', form = 'unformatted')
# if (lun(LP,ZZ) !=0) open(lun(LP,ZZ), file='retrv.lpz', form = 'unformatted')
# if (lun(LP,NS) !=0) open(lun(LP,NS), file='retrv.lpn', form = 'unformatted')
# if (lun(LP,EW) !=0) open(lun(LP,EW), file='retrv.lpe', form = 'unformatted')
# if (lun(IP,ZZ) !=0) open(lun(IP,ZZ), file='retrv.ipz', form = 'unformatted')
# if (lun(IP,NS) !=0) open(lun(IP,NS), file='retrv.ipn', form = 'unformatted')
# if (lun(IP,EW) !=0) open(lun(IP,EW), file='retrv.ipe', form = 'unformatted')
#
# return
#
end
```


GETRQT.RATFOR

```

subroutine getrqt(dr)
#
# Getrqt reads a Network Day Tape
# and trys to satisfy each request.
#
# Getrqt uses a colon in a format
# statement. This may not be
# available on all machines.
#
#
# Calls:
# daymo
# filreq
# getcal
# getcpz
# getlin
# head
# istreq
# magrd - user supplied
# rdntlg
# req
# setflg
# stadat
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
integer*2 dr # TAPE DRIVE LOGICAL UNIT - INPUT
#
include(defines.h)
include(header.dcl)
include(requests.dcl)
include(stainfo.dcl)
include(buffer.dcl)
integer*2 magrd # FUNCTION
integer*2 ierr # ERROR CODE
integer*2 nwords
integer*2 nr
integer*2 idata(1000) # BINARY DATA
# SET TO HOLD 16000 BITS OF TAPE RECORD INPUT
integer*2 indx # USER REQUEST BEING SATISFIED
integer*2 i, j
integer*2 ibuff(80)
integer*2 kus, kut
integer*2 rdflag
integer*2 req # FUNCTION
integer*2 getcal # FUNCTION
integer*2 daymo # FUNCTION
integer*2 istreq # FUNCTION
integer*2 flag
integer*2 kall(4)
integer*2 mon # MONTH
integer*2 idy # DAY
integer*2 linstr # INSTRUMENT
real rstart
include(header.com)
include(requests.com)
include(stainfo.com)
include(buffer.com)
data nwords/1000/
data kall /'A', 'L', 'L', ''/
data kus, kut /'S', 'T'/

```

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EOF

LP DATA LOG
(ASCII)

EOF

SP DATA

EOF

**STATION DAY
TAPE LOG
(ASCII)**

1

LOOP ONCE FOR EACH STATION

```

#
# for (:) {
#
#   if (magrd(dr, nwords, idata, nr) != 0) {
#     write(6,12)
# 12   format(1x, 'Error reading - EOF expected after station log.')
#   }
#
#   BEFORE READING NEW STATION LOG,
#   CHECK TO SEE IF THERE ARE ANY
#   MORE REQUESTS TO SATISFY.
#   IF NOT, RETURN TO MAIN PROGRAM.
#
#
#   SET REQUEST FLAG TO TRUE FOR ALL REQUESTS THAT
#   HAVE THE REQUESTED STATION EQUAL TO 'ALL'
#
#   call setflg(kall, 1)
#
#   SET REQUEST FLAG TO FALSE FOR ALL REQUESTS THAT
#   MATCH THE PREVIOUS STATION CODE. EVEN IF THEY
#   WERE NOT SATISFIED, NO MORE DATA FOR THAT STATION
#   REMAINS ON THE TAPE.
#
#   call setflg(code, 0)
#
#   ARE THERE ANY OUTSTANDING REQUESTS?
#
#   flag = 0
#   do i = 1,nreq {
#     if (rflg(i) == 1) {
#       flag = 1
#       break
#     }
#   }
#   if (flag == 0) return
#
#   GET STATION DATA - LATITUDE, LONGITUDE, ELEVATION, INSTRUMENT TYPE
#
#   call etadat(idata, code, lat, lon, elev)
#
#   for (:) {
#
#     IF MAGRD == 0, END OF TAPE
#
#     if (magrd(dr, nwords, idata, nr) == 0) return
#
#     IF THE FIRST TWO CHARACTERS OF THE FIRST LINE OF THE BUFFER
#     EQUALS 'ST', THIS IS A STATION LOG
#
#     call getlin(idata, 1, ibuff)
#     if (ibuff(1) == kus & ibuff(2) == kut) break
#
#     IF THIS WAS NOT A STATION LOG, IT IS A DATA LOG.
#     GET DATA FROM FIRST DATA LOG RECORD -
#     AVE CALIBRATION VALUES FOR EACH CHANNEL.
#
#     if (getcal(idata, lchan, cal, lnstr) == 0) {
#       write(6,13)
# 13   format(1x, 'Error reading - calibration')
#     }
#
#     CHECK TO SEE OF THE USER HAS REQUESTED INFORMATION
#     TO BE EXTRACTED FROM THIS STATION AND INSTRUMENT
#
#
#

```

- 57 -

```

flag = 0
do i = 1,nreq {
#
#   RESET THE REQUEST FLAG TO TRUE
#   1.) IF THE REQUESTED STATION CODE IS 'ALL'
#       AND THE REQUESTED INSTRUMENT MATCHES
#       THE CURRENT INSTRUMENT, OR
#   2.) IF THE REQUESTED STATION CODE MATCHES
#       THE CURRENT STATION, AND THE REQUESTED
#       INSTRUMENT MATCHES THE CURRENT INSTRUMENT.
#
#   if ((istreq(rcode, kall, i) == 1) | (istreq(rcode, code, i) == 1)
#       & ((rinstr(i) == linstr) | (rinstr(i) == 0))) {
#       flag = 1
#       rflag(i) = 1
#   }
#
#   if (flag == 0) {
#
#       IF THE USER HAS NOT REQUESTED THIS STATION,
#       READ RECORDS UNTIL AN END-OF-FILE HAS BEEN FOUND
#
#       for(;;) {
#           if (magrd(dr, nwords, idata, nr) == 0) break
#       }
#       next
#   }
#
#   GET DATA FROM SECOND DATA LOG RECORD - CONSTANTS, POLES, ZEROES
#
#   if (magrd(dr, nwords, idata, nr) != 1) {
#       write(6,14)
14      format(1x, 'Error reading - Data log 2.')
#   }
#
#   call getcpz(idata,lchan,a0,np,poles,nz,zeroes)
#
#   READ THIRD DATA LOG RECORD
#   NO INFORMATION IS NEEDED FROM THE THIRD DATA LOG
#
#   if (magrd(dr, nwords, idata, nr) != 1) {
#       write(6,15)
15      format(1x, 'Error reading - Data log 3.')
#   }
#
#   READ BINARY RECORDS
#
#   indx = 0
#   rdflag = 1
#
#   for (;;) {
#
#       if (rdflag == 1) {
#
#           IF MAGRD == 0, END OF BINARY RECORDS
#
#           if (magrd(dr, nwords, idata, nr) == 0) break
#
#           INTERPRET BINARY HEADER DATA
#
#           call head(idata)
#       }
#       rdflag = 1
#   }
#

```

```

#      WILL THIS RECORD SATISFY A REQUEST?
#
#      if (req(code, indx, rstart) == 0) next
#
#      FILL REQUEST
#
#      pts = 0.
#      ierr = 1
#      call filreq(dr, indx, rstart, rdflag, idata, ierr)
#
#      if (ierr == -1 ) {
#          write(6,16)
16      format(1x, 'Error reading - could not fill request.')
#          next
#      }
#
#      PRINT INFORMATION STATING WHICH REQUEST WAS SATISFIED
#
#      do i = 1,3 {
#          if (rlun(indx,instr,i) /= 0) {
#              flag = daymo(sdofy, mon, idy, syear)
#              write(6, 20)(code(j), j=1,4), (rchn(indx,instr,i,j), j=1,4),
#                  syear, mon, idy, shour, smin, ssecs, pts/rate
#*****
#*          MACHINE DEPENDENT          *
#*****
20      format(1x,2(4a1,1x),i4,1x,2(i2,1x),2(i2,':'),f5.2,1x,f10.3)
#          }
#      }
#
#      END OF FILE
#
#      if (ierr == 0) break
#  }
# }
#
end

```

RDNTLG.RATFOR

```
subroutine rdntlg (idata)
#
# Rdntlg scans a Network Day Tape
# Log for the stations recorded
# on the tape. Rdntlg sets a flag for
# the request information.
#
#
# Calls:
# getlin
# getstr
# setflg
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
integer*2 idata(1) # DATA RECORD
#
integer*2 kbl
integer*2 code(4) # STATION CODE - CHARACTER STRING
integer*2 ibuff(80) # CHARACTER BUFFER
integer*2 m, i, ifl
integer*2 line # LOOP INDEX
data kbl /' '/
#
do line = 8,25 {
  call getlin(idata, line, ibuff)
#
#   CHECK COLUMN ONE FOR STATION CODE
#
do i = 1, 4
  code(i) = kbl
  call getstr(8, 9, ibuff, m, ifl, i, 4, code)
  if (code(1) == kbl &
    code(2) == kbl &
    code(3) == kbl &
    code(4) == kbl) break
  call setflg(code, 1)
#
#   CHECK COLUMN TWO FOR STATION CODE
#
do i = 1, 4
  code(i) = kbl
  call getstr(41, 44, ibuff, m, ifl, i, 4, code)
  if ( !(code(1) == kbl &
    code(2) == kbl &
    code(3) == kbl &
    code(4) == kbl)) call setflg(code, 1)
}
#
return
#
end
```

- 60 -

SETFLG.RATFOR

```
subroutine setflg (code, flag)
#
# Setflg loops through the requests
# and sets rflg(i) to flag if code and
# rcode are equal.
#
#
# Calls:
#   istreq
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
integer*2 code(4) # STATION CODE - INPUT
integer*2 flag # STATION FLAG - INPUT
#
  include(defines.h)
  include(requests.dcl)
  integer*2 i
  integer*2 istreq
  include(requests.com)
#
  do i = 1,nreq {
    if (istreq(rcode, code, i) == 1) rflg(i) = flag
  }
#
  return
#
end
```

STADAT.RATFOR

```

subroutine stadat(idata, code, lat, lon, elev)
#
# Stadat scans a Station Log for the
# station code, latitude, longitude, and
# elevation.
#
#
# Calls:
#   ffin
#   getlin
#   getstr
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
integer*2 idata(1) # DATA RECORD - INPUT
integer*2 code(4) # STATION CODE - OUPUT
real lat # STATION LATTITUDE - OUTPUT
real lon # STATION LONGITUDE - OUTPUT
real elev # STATION ELEVATION - OUTPUT
#
integer*2 kus, kuw, kbl
integer*2 i
integer*2 m
integer*2 ifl
integer*2 ibuff(80)
integer*2 l
real ffin # FUNCTION
data kus, kuw, kbl /'S', 'W', ' ' /
#
do i = 1,4 {
  code(i) = kbl
}
call getlin(idata, 5, ibuff)
#
call getstr(20, 80, ibuff, m, ifl, i, 4, code)
#
# LATITUDE
#
lat = ffin(36, 80, ibuff, m, ifl)
if (ifl == kus) lat = -lat
#
# LONGITUDE
#
l = m + 1
lon = ffin(1, 80, ibuff, m, ifl)
if (ifl == kuw) lon = -lon
#
# ELEVATION
#
l = m + 1
elev = ffin(1, 80, ibuff, m, ifl)
#
return
end

```


GETCAL.RATFOR

```

integer*2 function getcal(idata, ichan, cal, linstr)
#
# Function getcal scans Data Log 1 for
# calibration constant(s).
# The calibration constants are the
# amplitude in counts of a sinusoid
# at the primary reference period
# (1 sec for short period and 25 for
# long period).
# Getcal also returns in linstr
# the type of instrument,
# 1 for short period,
# 2 for long period, and
# 3 for intermediate period data.
#
#
# Calls:
#   ffin
#   getlin
#   getstr
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
integer*2 idata(1) # DATA RECORD - INPUT
# SET TO HOLD 16000 BITS OF TAPE INPUT RECORD
integer*2 ichan # NUMBER OF CHANNELS - OUTPUT
real cal(3) # CALIBRATION CONSTANT - OUTPUT
integer*2 linstr # INSTRUMENT
#
integer*2 kuc, kui, kul, kus
integer*2 i
integer*2 line
integer*2 k
integer*2 ifi, m
integer*2 ibuff(80)
integer*2 code
real ffin # FUNCTION
data kuc, kul, kul, kus /'C', 'T', 'L', 'S'/
#
# GET NUMBER OF CHANNELS
#
call getlin (idata, 1, ibuff)
ichan = int(ffin(13, 80, ibuff, k, ifi))
if (((ichan > 0) .and. (ifi == kuc))) return (0)
#
# DETERMINE TYPE OF INSTRUMENT
#
call getstr (28, 28, ibuff, m, ifi, i, 1, code)
if (code == kus) linstr = 1
else if (code == kul) linstr = 2
else if (code == kui) linstr = 3
#
# ERROR
#
else linstr = -1
#
# GET CALIBRATION VALUES
#
line = 7
do i = 1, ichan {
    line = line + 2

```

```
    call getlin (idata, line, ibuff)
    cal(i) = ffin (51, 80, ibuff, k, ifi)
  }
# return (1)
#
end
```

GETCPZ.RATFOR

```

subroutine getcpz(idata, ichan, a0, np, poles, nz, zeroes)
#
# Getcpz scans Data Log 2 for the
# constant(s), poles and zeroes
# of the instrument transfer
# function(s).
#
#
# Calls:
#   ffin
#   getlin
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
include(defines.h)
integer*2 idata(1) # CHARACTER BUFFER - INPUT
# SET TO HOLD 16000 BITS OF TAPE RECORD INPUT
integer*2 ichan # NUMBER OF CHANNELS - INPUT
real a0(3) # CONSTANT - OUTPUT
integer*2 np # NUMBER OF POLES - OUTPUT
complex poles(NPOLES,3) # POLES - OUTPUT
integer*2 nz # NUMBER OF ZEROES - OUTPUT
complex zeroes(NZEROES,3) # ZEROES - OUTPUT
#
integer*2 kua, kup, kus, kuz
integer*2 i, j, m, k, l, m2
integer*2 ibuff(80) # CHARACTER BUFFER
integer*2 line
integer*2 ifi
integer*2 itf
real ffin # FUNCTION
real a(6)
data kua, kup, kus, kuz /'A', 'P', 'S', 'Z'/
#
# INITIALIZE VALUES
#
a0(1) = 0.0
a0(2) = 0.0
a0(3) = 0.0
l = 2*ichan
#
# CONSTANT
#
# DETERMINE WHAT LINE TO START READING THE CONSTANTS AND
# WHERE ON THAT LINE TO BEGIN
#
line = 1
for(;;) {
  call getlin (idata, line, ibuff)
  k = int(ffin (1, 80, ibuff, m, ifi))
  if (ifi == kua) {
    m = m + 2
    a0(1) = ffin(m, 80, ibuff, m2, ifi)
    if (a0(1) /= 0.0) break
  }
  line = line + 1
}
#
# THE LINE JUST READ IN LOOKS LIKE ONE OF THESE TWO LINES -
#
# AO   +.689E+10

```

```

# A0  +.932E+05      +.194E+06      +.132E+06
#
# do i = 1,ichan {
#   a0(i) = ffin (m, 80, ibuff, m2, ifi)
#   if (m2 >= 80) break
#   m = m2
# }
#
# IF ALL THE CONSTANTS ARE THE SAME, THEY ARE NOT
# REPEATED. SET ALL VALUES TO A0(1)
#
# if ( (ichan == 3) && ( (a0(2) == 0.0) || (a0(3) == 0.0) ) ) {
#   a0(2) = a0(1)
#   a0(3) = a0(1)
# }
#
# POLES
#
# do i = 1,NPOLES {
#
#   READ IN NEXT LINE
#
#   line = line + 1
#   call getlin (idata, line, ibuff)
#   k = int(ffin (1, 80, ibuff, m, ifi))
#
#   ifi SHOULD EQUAL 'P' OR 'Z'
#
#   if (ifi ^= kup) break
#
#   np EQUALS THE NUMBER OF THE POLE TO BE READ
#
#   np = int(ffin (m+1, 80, ibuff, m, ifi))
#
#   a(1) = 0.0
#   a(2) = 0.0
#   do j = 1,1 {
#     a(j) = ffin(m, 80, ibuff, m2, ifi)
#     m = m2 + 1
#
#     IF m >= 80, READ TO END OF LINE
#
#     if (m >= 80) break
#   }
#
#   IF J == 1 THE LINE JUST READ LOOKS LIKE THIS -
#
#   P03  -.117E+00
#
#   IF J == 2 THE LINE JUST READ LOOKS LIKE THIS -
#
#   P01  -.454E+01,+.330E+01
#
#   if (j == 1 || j == 2) {
#     do k = 1,ichan {
#       poles(np,k) = cmplx(a(1), a(2))
#     }
#   }
#
#   IF j = 3 ONLY THE REAL PARTS OF THE POLES WERE READ IN
#   IF J == 3 THE LINE JUST READ LOOKS LIKE THIS -
#
#   P03  -.117E+00      -.125E+00      -.125E+00
#
#   else if (j == 3) {

```

```

    do k = 1, ichan {
        poles(np,k) = cmplx(a(k), 0.0)
    }
}

#
# ELSE 6 VALUES WERE READ IN
# IF J == 6 THE LINE JUST READ LOOKS LIKE THIS -
#
# P01  -.454E+01,+.330E+01  -.422E+01,+.420E+01  -.493E+01,+.381E+01
#
    else {
        j = 1
        do k = 1, ichan {
            poles(np,k) = cmplx(a(j), a(j+1))
            j = j + 2
        }
    }
}

#
#ZER0ES
#
# REREAD LAST LINE
#
line = line - 1
do i = 1,NZER0ES {
#
# INITIALIZE
#
    itf = 0
    line = line + 1
    call getlin (ldata, line, ibuff)
    k = int(ffn (1, 80, ibuff, m, ifl))
#
# ifl SHOULD EQUAL 'Z' OR 'S'
#
    if (ifl /= kuz) break
#
# nz EQUALS THE NUMBER OF THE ZERO TO BE READ
#
    nz = int(ffn (m+1, 80, ibuff, m, ifl))
#
# IF m>15, THE NEXT VALUE READ WILL
# BE THE IMAGINARY PART OF THE ZERO.
# THIS MEANS NO DELIMITTER (,) WAS USED
# TO SEPARATE THE REAL PART (WHICH WAS
# BLANK) AND THE IMAGINARY PART.
#
    if (m > 15) itf = 1
#
    a(1) = 0.0
    a(2) = 0.0
    do j = 1,1 {
        a(j) = ffn(m, 80, ibuff, m2, ifl)
        m = m2 + 1
        if (ifl == kus) break 2
        if (m >= 80) break
    }
#
# IF J == 1 THE LINE JUST READ LOOKS LIKE THIS -
#
# Z01  -.128E+01
# IF J == 2 THE LINE JUST READ LOOKS LIKE THIS -
#
# Z04      ,-.105E+01
#
```

```

if ( ( j == 1 ) || ( j == 2 ) ) && ( ichan == 1 ) {
  if ( itf == 0 ) zeroes(nz,1) = cmplx(a(1), a(2))
  else zeroes(nz,1) = cmplx(0.0, a(1))
}
#
else if ( j == 1 || j == 2 ) {
  do k = 1, ichan {
    zeroes(nz,k) = cmplx(a(1), a(2))
  }
}
#
# IF J == 3 AND ITF == 0 THE LINE JUST READ LOOKS LIKE THIS -
#
# Z01  -.126E+00      -.126E+00      -.126E+00
#
# IF J == 3 AND ITF == 1 THE LINE JUST READ LOOKS LIKE THIS -
#
# Z03      +.105E+01      +.105E+01      +.105E+01
#
  else if ( j == 3 ) {
    do k = 1, ichan {
      if ( itf == 0 ) zeroes(nz,k) = cmplx(a(k), 0.0)
      else zeroes(nz,k) = cmplx(0.0, a(k))
    }
  }
#
# IF J == 6 THE LINE JUST READ LOOKS LIKE THIS -
#
# Z04      ,-.105E+01      ,-.105E+01      ,-.105E+01
#
  else {
    j = 1
    do k = 1, ichan {
      zeroes(nz,k) = cmplx(a(j), a(j+1))
      j = j + 2
    }
  }
#
# IF IFL == 'S' THE LINE JUST READ LOOKS LIKE THIS -
#
# Z05  S**5      S**5      S**5
#
  if ( ifl == kus ) {
    #
    # READ THE NUMBER OF ZEROES TO BE SET
    # TO CMPLX(0.0, 0.0)
    #
    m = m + 2
    k = int(ffn (m, 80, ibuff, m2, ifl))
    do j = 1, k {
      do i = 1, ichan {
        zeroes(nz,i) = (0.0, 0.0)
      }
      nz = nz + 1
    }
    #
    nz = nz - 1
  }
#
  return
#
end

```

REQ.RATFOR

```

integer*2 function req(code, indx, rstart)
#
# Function req loops through the requests
# and checks to see if a request can be
# filled by data in this record. Req returns
# 1 if a request can be satisfied, 0 otherwise.
#
#
# Calls:
#   doy
#   istreq
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
integer*2 code(4) # STATION CODE - INPUT
integer*2 indx # REQUEST INDEX - OUTPUT
real rstart # STARTING DATA POINT IN RECORD - OUTPUT
#
  include(defines.h)
  include(header.dcl)
  include(requests.dcl)
  integer*2 kall(4) # CHARACTER STRING ALL
  integer*2 doy # FUNCTION
  integer*2 lpyr # FUNCTION
  integer*2 rdofy # DAY OF YEAR
  integer*2 i # INDEX LOOP
  integer*2 istreq # FUNCTION
  real time # CURRENT TIME IN HEADER
  real tup # END TIME OF CURRENT RECORD
  real rtime # START TIME OF REQUEST
  real rup # END TIME OF REQUEST
  include(header.com)
  include(requests.com)
  data kall /'A', 'L', 'L', ''/
#
#
  indx = 0
#
# LOOP OVER NUMBER OF USER REQUESTS
#
  do i = 1,nreq {
#
#   if (rflg(i) == 0) next
#
#   IF rcode = ALL, USER WANTS ALL STATIONS
#   IF rinstr = 0, USER WANTS ALL CHANNELS
#
#   if ( (istreq(rcode, code, i) == 0) &
#     (istreq(rcode, kall, i) == 0) ) next
#   if (instr != rinstr(i) & rinstr(i) != 0) next
#
#
#   if (year /= ryear(i)) next
#   rdofy = doy(rmonth(i), rday(i), ryear(i))
#   time = float(dofy)*86400. + float(hour)*3600. +
#     float(min)*60. + float(sec)
#   rtime = float(rdofy)*86400. + float(rhour(i))*3600. +
#     float(rmin(i))*60. + float(rsec(i))
#
#   tup = time + float(nsamp)/(rate*float(nchan))
#   rup = rtime + float(rlen(i))

```

FILREQ.RATFOR

```

subroutine filreq(dr,indx,rstart,rdfldg,ldata,ierr)
#
# A record satisfying a request has been found.
# Filreq fills this request.
#
#
# Calls:
#   dtpfmt
#   flsbuf
#   gbytes - user supplied
#   head
#   magrd - user supplied
#   prhead
#   stndrd
#   tset
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
integer*2 dr # TAPE DRIVE LOGICAL UNIT - INPUT
integer*2 indx # INDEX OF REQUEST - INPUT
real rstart # STARTING DATA POINT IN RECORD - INPUT
integer*2 rdfldg # READING FLAG - OUTPUT
integer*2 ldata(1) # DATA RECORD - INPUT
# SET TO HOLD 16000 BITS OF TAPE INPUT RECORD
integer*2 ierr # ERROR CODE
#
  include(header.dcl)
  include(defines.h)
  include(requests.dcl)
  include(stainfo.dcl)
  include(buffer.dcl)
  integer*2 n1,n2 # LOOP LIMITS
# EXPECTED TIME OF NEXT RECORD
integer*2 uyear # YEAR
integer*2 udofy # DAY OF YEAR
integer*2 uhour # HOUR
integer*2 umin # MINUTE
integer*2 usec # SECONDS
real ums # MILLISECONDS
integer*2 magrd # FUNCTION
integer*2 ssec # SECONDS
integer*2 nwords # NUMBER OF FRAMES OF DATA TO READ
integer*2 nr # NUMBER OF FRAMES READ
# SIZE OF 990 DETERMINED BY DATA RECORD ON TAPE
integer*2 mant(990) # MANTISSA
integer*2 nchar(990) # CHARACTERISTIC
integer*2 i # LOOP INDEX
integer*2 lpts # INT OF SPTS
real dtpfmt # FUNCTION
real fms # MILLISECONDS
real sms # MILLISECONDS
real tpts # TOTAL NUMBER OF POINTS TO EXTRACT
include(header.com)
include(requests.com)
include(stainfo.com)
include(buffer.com)
data nwords/1000/
#
# SET START TIME OF DATA
#
call tset(syear,sdofy,shour,smin,ssec,sms)

```



```

fms = (rstart*1000.)/(rate*float(nchan))
sms = sms + fms
call stndrd(eyear,sdofy,shour,smin,ssec,sms)
ssecs = float(ssec) + sms/1000.0
#
# spts = 0.
#
# PRINT FILE HEADER
#
# call prhead(rlun,rchn,indx,instr)
#
# TPTS - total number of points to retrieve
#       to satisfy request
#
# tpts = rate*float(nchan)*rlen(indx)
# tpts = rstart + tpts
# n1 = int(rstart) + 1
#
# SET EXPECTED TIME OF NEXT RECORD TO BE READ
#
# call tset(uyear,udofy,uhour,umin,usec,ums)
# fms = float(nsamp)*1000./(rate*float(nchan))
# ums = ums + fms
# call stndrd(uyear,udofy,uhour,umin,usec,ums)
#
# LOOP
# KEEP READING AND DECODING BINARY DATA UNTIL
# 1.) REQUEST IS SATISFIED
# 2.) END OF FILE
# 3.) ERROR
# 4.) NEXT RECORD IS NOT CONTINUOUS
#
# for(;;) {
#   if (nform==1) { # SRO format
#     call gbytes(idata,mant,164,12,4,nsamp)
#     call gbytes(idata,nchar,160,4,12,nsamp)
#   }
#   else if (nform==2) # DWSSN format
#     call gbytes(idata,mant,160,16,0,nsamp)
#
#   if (tpts > float(nsamp)) n2 = nsamp
#   else n2 = int(tpts)
#
#   DECODE BINARY DATA AND FILL BUFFERS
#
#   do i = n1,n2,nchan {
#     spts = spts + 1.
#     lpts = int(spts)
#     z(lpts) = dtpfmt(nform,mant(i),nchar(i))
#     if (nchan == 3) {
#       n(lpts) = dtpfmt(nform,mant(i+1),nchar(i+1))
#       e(lpts) = dtpfmt(nform,mant(i+2),nchar(i+2))
#     }
#
#     BUFFERS FULL - FLUSH OUTPUT
#
#     if (spts == 500.) {
#       call flsbuf(rlun,indx,instr,0)
#       spts = 0.
#     }
#   }
#
#   USERS REQUEST IS SATISFIED - RETURN
#
#
#

```

- 69 -

```
#
# IS CURRENT TIME GREATER THAN LENGTH OF REQUEST
# OR
# IS END OF RECORD TIME LESS THAN REQUEST TIME
#
  if ( (time>rup) | (tup<=rtime) )
    next
#
  rstart = (rtime-time)*rate*float(nchan)
  if (rstart < 0.) rstart = 0.
  if (rstart > float(nsamp)) next
  indx = i
#
# RECORD HAS BEEN FOUND TO
# SATISFY REQUEST
#
  return (1)
}
#
# NO REQUEST SATISFIED BY THIS RECORD
#
  return (0)
#
end
```

```

if (tpts==float(n2)) {
    call flsbuf(rlun,indx,instr,1)
#
#   SET READING FLAG TO FALSE -
#   LEAVE RECORD IN BUFFER,
#   IT MAY SATISFY ANOTHER REQUEST
#
    rdflag = 0
#
#   SET REQUEST FLAG TO FALSE -
#   REQUEST SATISFIED
#
    rfig(indx) = 0
    return
}
#
#   READ NEXT RECORD
#
ierr = magrd(dr,nwords,idata,nr)
#
#   END-OF-FILE
#
if (ierr == 0) {
    call flsbuf(rlun,indx,instr,1)
#
#   SET REQUEST FLAG TO FALSE -
#   REQUEST SATISFIED
#
    rfig(indx) = 0
    return
}
#
#   ERROR
#
else if (ierr == -1 ) {
    call flsbuf(rlun,indx,instr,1)
#
#   SET REQUEST FLAG TO TRUE -
#   REQUEST NOT SATISFIED
#
    rdflag = 1
    rfig(indx) = 1
    return
}
#
#   DECODE HEADER INFORMATION
#
call head(idata)
#
#   CONTINUOUS DATA
#
if ((uyear==year) &&
    (udofy==dofy) &&
    (uhour==hour) &&
    (umin==min) &&
    (usec==sec) &&
    (ums==mss) ) {
#
#   SET LOOP LIMITS FOR DECODING BINARY DATA
#
    n1 = 1
    tpts = tpts - float(n2)
#
#   SET NEXT EXPECTED TIME
#

```

```

    fms = float(nsamp)*1000./(rate*float(nchan))
    ums = mss + fms
    call stndrd(uyear,udofy,uhour,umin,usec,ums)
}
#
# DISCONTINUOUS DATA
#
else {
#
# SET READING FLAG TO FALSE -
# LEAVE RECORD IN BUFFER,
# IT MAY SATISFY ANOTHER REQUEST
#
    rdflag = 0
    call fisbuf(rlun,indx,instr,1)
#
# SET REQUEST FLAG TO TRUE -
# REQUEST NOT SATISFIED
#
    rfig(indx) = 1
    return
}
}
end
```

PRHEAD.RATFOR

```
subroutine prhead(fid,chan,l,m)
#
# Prhead writes a header record to
# the appropriate output files.
#
#
# Calls no other routine.
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
include(defines.h)
integer*2 fid(NREQS,3,3) # LOGICAL UNIT NUMBER - INPUT
integer*2 chan(NREQS,3,3,4) # INSTRUMENT CODE - INPUT
integer*2 l # REQUEST INDEX - INPUT
integer*2 m # INSTRUMENT INDEX - INPUT
#
include(stainfo.dcl)
include(header.dcl)
integer*2 i, j # LOOP INDEX
integer*2 ll # LOGICAL UNIT NUMBER
include(stainfo.com)
include(header.com)
#
do j = 1,3 {
  if (fid(l,m,j) /= 0) {
    ll = fid(l,m,j)
    write(ll) (code(i), i=1,4), (chan(l,m,j,i), i=1,4),
      lat,lon,elev,
      year,sdofy,shour,smin,ssecs,
      rate,a0(j)*cal(j),
      np, (poles(i,j), i = 1,np),
      nz, (zeroes(i,j), i = 1,nz)
  }
}
#
return
#
end
```

FLSBUF.RATFOR

```

subroutine flsbuf(fid, l, m, itf)
#
# Flsbuf writes data buffers to the
# appropriate output files.
#
#
# Calls no other routine.
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
include(defines.h)
integer*2 fid(NREQS,3,3) # LOGICAL UNIT NUMBER - INPUT
integer*2 l # REQUEST INDEX - INPUT
integer*2 m # INSTRUMENT INDEX - INPUT
integer*2 itf # DATA FLAG
#
  include(buffer.dcl)
  integer*2 i
  integer*2 ll # LOGICAL UNIT NUMBER
  real big
  real one
  include(buffer.com)
  data big /100000000000./
  data one /1./
#
# TOTAL NUMBER OF DATA VALUES WRITTEN TO OUTPUT FILES
#
  pts = pts + spts
#
#
# IF itf = 1, THIS IS THE LAST DATA RECORD TO
# BE WRITTEN FOR THIS REQUEST
#
# VERTICAL BUFFER
#
  if (fid(l,m,1) .ne. 0) {
    ll = fid(l,m,1)
    write(ll) spts, (z(i), i=1,spts)
    if (itf == 1) write(ll) one, big
  }
#
# NORTH/SOUTH BUFFER
#
  if (fid(l,m,2) .ne. 0) {
    ll = fid(l,m,2)
    write(ll) spts, (n(i), i=1,spts)
    if (itf == 1) write(ll) one, big
  }
#
# EAST/WEST BUFFER
#
  if (fid(l,m,3) .ne. 0) {
    ll = fid(l,m,3)
    write(ll) spts, (e(i), i=1,spts)
    if (itf == 1) write(ll) one, big
  }
#
#
  return
#
end

```

TIME HANDLING ROUTINES

TSET.RATFOR

```
subroutine tset(syear, sdofy, shour, smin, ssec, sms)
#
# Tset sets the time variables equal to those
# in common block /head/
#
#
# Calls no other routine.
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
integer*2 syear # YEAR - OUTPUT
integer*2 sdofy # DAY OF YEAR - OUTPUT
integer*2 shour # HOUR - OUTPUT
integer*2 smin # MINUTE - OUTPUT
integer*2 ssec # SECONDS - OUTPUT
real sms # MILLISECONDS - OUTPUT
#
  include(header.dcl)
  include(header.com)
#
  syear = year
  sdofy = dofyear
  shour = hour
  smin = min
  ssec = sec
  sms = mss
#
  return
#
end
```

- 77 -

STNDRD.RATFOR

```
subroutine stndrd(year, dofy, hour, minute, sec, ms)
```

```
#
```

```
# Stndrd checks to see that the  
# time values are within legal limits.
```

```
#
```

```
#
```

```
# Calls:
```

```
# lpyr
```

```
#
```

```
# Programmed by Madeleine Zirbes
```

```
# September 15, 1980
```

```
#
```

```
integer*2 year # YEAR - INPUT/OUTPUT
```

```
integer*2 dofy # DAY OF YEAR - INPUT/OUTPUT
```

```
integer*2 hour # HOUR - INPUT/OUTPUT
```

```
integer*2 minute # MINUTE - INPUT/OUTPUT
```

```
integer*2 sec # SECOND - INPUT/OUTPUT
```

```
real ms # MILLISECONDS - INPUT/OUTPUT
```

```
#
```

```
integer*2 lpyr # FUNCTION
```

```
#
```

```
for(;;) {
```

```
  if ((ms >= 1000.) {
```

```
    (sec >= 60) {
```

```
      (minute >= 60) {
```

```
        (hour >= 24) {
```

```
          ((lpyr(year) == 1) && (dofy > 366)) {
```

```
            ((lpyr(year) == 0) && (dofy > 365)) ) {
```

```
#
```

```
              if (ms .ge. 1000.) {
```

```
                sec = sec + 1
```

```
                ms = ms - 1000.
```

```
              }
```

```
              if (sec .ge. 60) {
```

```
                minute = minute + 1
```

```
                sec = sec - 60
```

```
              }
```

```
              if (minute .ge. 60) {
```

```
                hour = hour + 1
```

```
                minute = minute - 60
```

```
              }
```

```
              if (hour .ge. 24) {
```

```
                dofy = dofy + 1
```

```
                hour = hour - 24
```

```
              }
```

```
              if (lpyr(year) == 1 && (dofy .gt. 366)) {
```

```
                year = year + 1
```

```
                dofy = dofy - 366
```

```
              }
```

```
#
```

```
              if (lpyr(year) == 0 && (dofy .gt. 365)) {
```

```
                year = year + 1
```

```
                dofy = dofy - 365
```

```
              }
```

```
#
```

```
    }
```

```
  else break
```

```
}
```


- 78 -

return

end

DAYMO.RATFOR

```
integer*2 function daymo (dofy, month, day, year)
#
# Function daymo determines the month and day
# of the month, given the year and day of year.
# It returns 1 if it was successful, 0 otherwise.
# If dofy is not within legal limits, month and
# day will be returned as zero.
#
#
# Calls:
# lpyr
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
integer*2 dofy # DAY OF YEAR - INPUT
integer*2 month # MONTH - OUTPUT
integer*2 day # DAY OF MONTH - OUTPUT
integer*2 year # YEAR - INPUT
#
  integer*2 iday # DAY OF YEAR
  integer*2 lpyr # FUNCTION
  integer*2 mdays(12) # NUMBER OF DAYS IN MONTH
  data mdays/31,28,31,30,31,30,31,31,30,31,30,31/
#
  iday = dofy
  if (iday<1) {
    month = 0
    day = 0
    return (0)
  }
#
  if (lpyr(year) == 1) mdays(2) = 29
  else mdays(2) = 28
#
  do month = 1,12 {
    day = iday
    iday = iday - mdays(month)
    if (iday<=0) return(1)
  }
#
  month = 0
  day = 0
  return (0)
#
end
```

- 80 -

DOY.RATFOR

```

integer*2 function doy (month, day, year)
#
# Function doy determines the day of the
# year, given the month, day and year.
# If month or day are illegal, the return
# value of the function is zero.
#
#
# Calls:
#   lpyr
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
integer*2 month # MONTH - INPUT
integer*2 day # DAY OF MONTH - INPUT
integer*2 year # YEAR - INPUT

integer*2 lpyr # FUNCTION
integer*2 inc
integer*2 ndays(12)
data ndays /0,31,59,90,120,151,181,212,243,273,304,334/
#
if (month < 1 || month > 12) return(0)
if (day < 1 || day > 31) return (0)
if (lpyr(year) == 1 && month > 2) inc = 1
else inc = 0

return(ndays(month) + day + inc)
end

```

- 81 -

LPYR.RATFOR

```
integer*2 function lpyr(year)
#
# Function lpyr determines if year
# is a leap year.
#
# This function uses the intrinsic
# function mod. If your machine
# does not supply this function,
# make one -
# mod(i,j) = iabs(i - (i/j)*j)
#
#
# Calls:
#   mod - intrinsic function
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
integer*2 year # YEAR - INPUT

  if (mod(year, 400) == 0) return (1)
  if (mod(year, 4) != 0) return (0)
  if (mod(year, 100) == 0) return (0)
  return (1)

end
```

CHARACTER HANDLING ROUTINES

GETLIN.RATFOR

```

subroutine getlin (idata, line, ibuff)
#
# Getlin reads a line(80 characters)
# from idata, storing the result in
# ibuff. Then getlin converts the
# character set on the Network Day
# Tape to the internal character code
# of the host machine.
#
#
# Calls:
# gbytes - user supplied
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
integer*2 idata(1) # DATA BUFFER - INPUT
# SET TO HOLD 16000 BITS OF TAPE RECORD INPUT
integer*2 line # LINE OF BUFFER DESIRED - INPUT
integer*2 ibuff(80) # LINE OF BUFFER - OUTPUT
#
integer*2 i, n
integer*2 ntab(128)
data ntab /33* ' ', '"', '#', '$', '%', '&', "'", '(', ')',
  *, '+', ',', '-', '.', '/',
  '0', '1', '2', '3', '4', '5', '6', '7', '8', '9',
  ':', ';', '<', '=', '>', '?', '●',
  'A', 'B', 'C', 'D', 'E', 'F', 'G', 'H', 'I', 'J',
  'K', 'L', 'M', 'N', 'O', 'P', 'Q', 'R', 'S', 'T',
  'U', 'V', 'W', 'X', 'Y', 'Z',
  '[', ']', '^', '_', '`',
  'a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j',
  'k', 'l', 'm', 'n', 'o', 'p', 'q', 'r', 's', 't',
  'u', 'v', 'w', 'x', 'y', 'z',
  '{', '|', '}', '~', ' ' /
#
#
# call gbytes (idata, ibuff, (line-1)*840, 8, 0, 80)
#
do i = 1, 80 {
  n = ibuff(i) + 1
  ibuff(i) = ntab(n)
}
#
return
#
end

```

FFIN.RATFOR

```

real function ffin(n1,n,ia,m,ifi)
#
#
# Function ffin scans the n character string ia for a numeric constant.
# It will correctly interpret a number in e or f format,
# and return it as the function value.  ifi = ia(m)
# is the first non-blank character that can't be a part of the
# constant.
#
#
# Calls no other routine.
#
#   Programmed by Ray Buland
#   August 21, 1980
#
integer*2 n1 # START INDEX - INPUT
integer*2 n # STOP INDEX - INPUT
integer*2 ia(80) # CHARACTER STRING - INPUT
# The character string is stored in the users
# internal character code, one character
# (blank padded to the left) per integer word.
integer*2 m # INDEX IN ia OF FIRST ILLEGAL CHARACTER - OUPUT
integer*2 ifi # ILLEGAL CHARACTER - OUTPUT
#
  integer*2 lb(10)
  integer*2 kbl, kpl, kmn, kdp, kue
  integer*2 i, j, k
  integer*2 min
  integer*2 mex
  integer*2 lfi
  real sc1
  real sc2
  real ex
  data lb /'0', '1', '2', '3', '4', '5', '6', '7', '8', '9'/
  data kbl, kpl, kmn, kdp /' ', '+', '-', '.'/
  data kue /'E'/
#
#   SET UP SOME DEFAULTS.
#
  ffin = 0.
  sc1 = 10.
  sc2 = 1.
  min = 1
  ex = 0.
  mex = 1
#
#   SKIP THE LEADING BLANKS.
#
  do k = n1,n
    if (ia(k)~=kbl)
      go to 10
  go to 80
#
#   CHECK FOR UNARY PLUS.
#
  10 lfi = k
  if (ia(k)~=kpl)
    k = k+1
  else
#
#   CHECK FOR UNARY MINUS.
#

```

```

if (ia(k)==kmn) {
    min = 2
    k = k+1
}
do i = k,n
    if (ia(i) !=kbl) break
k = i
#
#   ACCUMULATE THE NUMERIC CONSTANT.
#
do i = k,n
#
#   CHECK FOR A DECIMAL POINT.
#
    if (ia(i)!=kdp) {
#
#   SEE IF THE NEXT CHARACTER IS A DIGIT.
#
        do j = 1,10
            if (ia(i)==ib(j))
                go to 20
        go to 30
#
#   CONSTRUCT THE CONSTANT.
#
        20 if (sc1<5.)
            sc2 = sc2*.1
            fin = fin*sc1+(j-1)*sc2
        }
        else {
            if (sc1<5.)
                go to 60
            sc1 = 1.
        }
    go to 80
#
#   CHECK FOR SCIENTIFIC NOTATION.
#
    30 if (lf!=1&&ia(i)==kue) {
        k = i+1
        lf = k
#
#   CHECK FOR UNARY PLUS IN THE EXPONENT.
#
        if (ia(k)==kpl)
            k = k+1
        else
#
#   CHECK FOR UNARY MINUS IN THE EXPONENT.
#
        if (ia(k)==kmn) {
            mex = 2
            k = k+1
        }
#
#   ACCUMULATE THE EXPONENT.
#
do i = k,n {
#
#   SEE IF THE NEXT CHARACTER IS A DIGIT.
#
        do j = 1,10
            if (ia(i)==ib(j))
                go to 40
        go to 50

```

```
#
#   CONSTRUCT THE EXPONENT.
#
#   40 ex = ex*10.+(j-1)
#   }
#   go to 80
#
#   SEE IF THE 'E' AFTER THE NUMBER WAS REALLY THE START OF
#   AN EXPONENT.
#
#   50 if (lft==1)
#       l = l-1
#   }
#
#   SKIP TRAILING BLANKS
#
#   60 do j = i,n
#       if (ia(j)~=kbl)
#           go to 70
#   j = n
#   70 lft = ia(j)
#   m = j
#   go to 90
#   80 lft = kbl
#   m = i+1
#
#   CHECK FOR A NEGATIVE EXPONENT.
#
#   90 if (mex>1)
#       ex = -ex
#
#   APPLY THE EXPONENT TO THE CONSTANT.
#
#   ffin = ffin*(10.**ex)
#
#   CHECK FOR A NEGATIVE CONSTANT.
#
#   if (min>1)
#       ffin = -ffin
#   return
#
end
```


GETSTR.RATFOR

```

subroutine getstr (i1, i2, ibuff, m, ifl, k, l, outstr)
#
#
# Getstr scans the character string ibuff for a
# character string. ifl = ibuff(m) is the first
# character that can not be part of the string.
#
#
# Calls no other routine.
#
#   Programmed by Madeleine Zirbes
#   September 16, 1980
#
integer*2 i1 # START INDEX - INPUT
integer*2 i2 # STOP INDEX - INPUT
integer*2 ibuff(80) # CHARACTER STRING - INPUT
integer*2 m # INDEX IN ibuff OF FIRST ILLEGAL CHARACTER - OUTPUT
integer*2 ifl # ILLEGAL CHARACTER - OUTPUT
integer*2 k # LENGTH OF outstr - OUTPUT
integer*2 l # LENGTH OF outstr - INPUT
integer*2 outstr(l) # CHARACTER STRING - OUTPUT
#
integer*2 i, ii
integer*2 kbl, kua, kuz
data kbl, kua, kuz /' ', 'A', 'Z'/
#
# SKIP LEADING BLANKS
#
k = 0
do i = 1, i2 {
  if (ibuff(i) .eq. kbl) break
}
ii = i
#
do i = ii, i2 {
#
# CHECK IF CHARACTER IS ALPHABETIC
#
if (ibuff(i) < kua || ibuff(i) > kuz) {
  m = i
  ifl = ibuff(i)
  return
}
k = k + 1
outstr(k) = ibuff(i)
}
m = i2 + 1
ifl = kbl
return
#
end

```

ICPYCH.RATFOR

```
subroutine icpych (i1, i2, l, j, k)
#
# Icopych copies argument i2 to i1.
# It copies exactly 4 characters.
#
#
# Calls no other routine.
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
include(defines.h)
integer*2 i1(NREQS,3,3,4) # INSTRUMENT CODE - OUTPUT
integer*2 i2(3,3,4) # INSTRUMENT CODE - INPUT
integer*2 l # REQUEST INDEX - INPUT
integer*2 j # INSTRUMENT INDEX - INPUT
integer*2 k # CHANNEL INDEX - INPUT
#
  integer*2 l
#
  do l = 1,4 {
    i1(l,j,k,l) = i2(j,k,l)
  }
#
  return
#
end
```

ISTREQ.RATFOR

```
integer*2 function istreq (i1, i2, l)
#
# Istreq compares arguments i1 and i2
# and returns 1 if they are equal,
# 0 otherwise.
#
#
# Calls no other routine.
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
include(defines.h)
integer*2 i1(NREQS,4) # CHARACTER STRING - INPUT
integer*2 i2(4) # CHARACTER STRING - INPUT
integer*2 l # ARRAY INDEX - INPUT
#
  integer*2 i
#
  do i = 1,4 {
    if (i1(l,i) ^= i2(i)) return (0)
  }
  return (1)
#
end
```

BINARY DATA HANDLING ROUTINES

HEAD.RATFOR

```

subroutine head(idata)
#
# Head decodes header information
# and sets appropriate values in common
# block /header/
#
#
# Calls:
# gbytes - user supplied
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
integer*2 idata(1) # DATA RECORD - INPUT
#
  include(header.dcl)
  integer*2 ib(40)
  include(header.com)
#
# AT THIS TIME, NOT ALL OF THE HEADER HAS INFORMATION.
# THE FIRST 20 FRAMES HAVE BEEN SET ASIDE FOR THE HEADER,
# OF WHICH ONLY 14 FRAMES ARE CURRENTLY USED.
#
  call gbytes(idata, ib, 0, 4, 0, 40)
#
  id = (ib(1)*10 + ib(2))*10 + ib(3)
  year = ib(4)*10 + ib(5) + 1900
  dofyr = (ib(6)*10 + ib(7))*10 + ib(8)
  hour = ib(9)*10 + ib(10)
  min = ib(11)*10 + ib(12)
  sec = ib(13)*10 + ib(14)
  mss = float((ib(15)*10 + ib(16))*10 + ib(17))
  nform = ib(18)
  nchan = ib(21)*10 + ib(22)
  rate = (10. ** (5 - ib(23))) * float(ib(24)*10 + ib(25))
  nsamp = (ib(26)*10 + ib(27))*10 + ib(28)
#
# SHORT-PERIOD DATA
#
  if (rate == 20.) instr = 1
#
# LONG-PERIOD DATA
#
  else if (rate == 1.) instr = 2
#
# INTERMEDIATE-PERIOD DATA
#
  else if (rate == 10.) instr = 3
#
# ERROR
#
  else instr = -1
#
  return
#
end

```

DTPFMT.RATFOR

```

real function dtpfmt(nform, mant, char)
#
# Function dtpfmt decodes one data word from
# a Network Day Tape, and returns it as
# the function value.
# If nform = 1, the data is in SRO format;
# if nform = 2, the data is in DWWSSN format.
#
# SRO and ASRO data samples are recorded as
# 16 bit (2 frames) words using a gain-range
# format. The four most significant bits of
# frame 1 define the gain factor(GF) which is
# an unsigned integer having a value from
# 0 to 10. The following bit defines the sign
# of the mantissa, and the 3 remaining bits
# plus the 8 bits of frame 2 contain seismic
# data in twos complement binary integer form.
# Absolute amplitude in digital counts is
# derived as follows -
#
# Amplitude = Mantissa * 2 ** (10 - GF)
#
# This gives a dynamic range of 72 db, an
# operating range of 120 db and a maximum
# amplitude of +2,096,128 to -2,097,152
# digital counts.
#
# DWWSSN data samples are recorded in a
# 16-bit twos complement integer format. This
# gives a dynamic range of 96 db and
# a maximum amplitude of +32,767 to
# -32,768 digital counts.
#
# Dtpfmt assumes that the users machine has
# a word length of at least 16 bits.
#
# Frame is defined as 8 contiguous byte
# aligned bits by the tape drive.
#
#
# Calls no other routine.
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
integer*2 nform # FORMAT ID - INPUT
integer*2 mant # MANTISSA - INPUT
integer*2 char # CHARACTERISTIC INPUT
#
real pwr(16)
data pwr/1024., 512., 256., 128., 64., 32., 16., 8., 4., 2., 1.,
.5, .25, .125, .0625, .03125/
#
# SRO FORMAT
#
if (nform == 1) {
  if(mant.ge.2048) mant = mant - 4096
  dtpfmt = float(mant)*pwr(char+1)
  return
}
#
# DWWSSN FORMAT

```

- 91 -

```
#
else if (nform == 2) {
  dtpfmt = float(mant)
  if (dtpfmt .ge. 32768.)
    dtpfmt = dtpfmt - 65536.0
  return
}
#
else dtpfmt = 0.
return
#
end
```

USER CALLABLE ROUTINES

IASNLU.RATFOR

```

integer*2 function iasnlun (lun, indx)
#
# Iasnlun associates a logical unit number
# with an index to the head and data arrays.
# Currently, there is buffer space to be
# able to read 3 files simultaneously.
# Iasnlun returns 1 if an index was assigned,
# or -1 if all the buffer space has been
# allocated.
#
#
# Calls:
#   save - machine dependent
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
integer*2 lun # LOGICAL UNIT NUMBER - INPUT
integer*2 indx # INDEX OF DATA BUFFER - OUTPUT
#
include(defines.h)
include(flags.dcl)
include(flags.com)
#
#*****
#*          MACHINE DEPENDENT          *
#*****
# save /flags/
#
# indx = llun(lun)
#
# if (indx > 0) return(1)
#
# else if (nlun < DISKFILES) {
#   nlun = nlun + 1
#   llun(lun) = nlun
#   indx = nlun
#   llun(indx) = lun
#   return (1)
# }
#
# else return(-1)
#
end

```

INITFL.RATFOR

```
subroutine initfl
#
# Initialization of flags used by
# irdhd and irddat is done by initfl.
# Initfl must be called before any
# reference to irdhd or irddat to
# insure reading the header and
# data record of the output files
# produced by retrv successfully.
#
#
# Calls no other routine.
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
#
# include(defines.h)
# include(flags.dcl)
# include(data.dcl)
# include(flags.com)
# include(data.com)
#
# data hfig, dfig /3*1, 3*0/
# data npts, pts /3*1, 3*0.0/
# data nlun, llun /0, 20*0/
#
# return
#
end
```


RDHEAD.RATFOR

```

subroutine rdhead(lun, indx, tf)
#
# Rdhead reads a header record from
# logical unit number lun. tf = 1
# if this is the last record of
# the file.
#
#
# Calls no other routine.
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
integer*2 lun # LOGICAL UNIT NUMBER - INPUT
integer*2 indx # ARRAY INDEX INTO THE DATA WILL BE READ - INPUT
integer*2 tf # END OF DATA FLAG - OUTPUT
#
  integer*2 i
  include(defines.h)
  include(head.dcl)
  include(head.com)
#
  tf = 0
#
  read(lun) (code(i,indx), i=1,4), (chn(i,indx), i=1,4),
    lat(indx), lon(indx), elev(indx),
    year(indx), sdofy(indx), shour(indx), smin(indx),
    secs(indx), rate(indx), a0(indx),
    np(indx), (poles(i,indx), i=1,np(indx)),
    nz(indx), (zeroes(i,indx), i=1,nz(indx))
#
# IF tf EQUALS ONE,
# THIS IS A NULL HEADER RECORD -
# LAST RECORD IN THE FILE
#
  if (a0(indx) == 0.0) tf = 1
#
  return
#
end

```

RDDATA.RATFOR

```
subroutine rddata(lun, indx)
#
# Rddata reads a data record from
# logical unit number lun.
#
#
# Calls no other routine.
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
integer*2 lun # LOGICAL UNIT NUMBER - INPUT
integer*2 indx # ARRAY INDEX INTO WHICH THE DATA WILL BE READ - INPUT
#
  integer*2 i
  include(defines.h)
  include(data.dcl)
  include(data.com)
#
  read(lun) pts(indx), (buff(i,indx), i=1,pts(indx))
#
  return
#
end
```

IRDDAT.RATFOR

```

integer*2 function irddat (indx, valu)
#
# Function irddat sequentially reads
# the next data point of a data record
# on each call, returning it in valu.
# Irddat returns 1 on a successful
# read, 0 for end of data, or end of
# file, and -1 for an error.
#
#
# Calls:
#  rddata
#  save - machine dependent
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
integer*2 indx # ARRAY INDEX - INPUT
real valu # DATA VALUE - OUTPUT
#
  include(defines.h)
  integer*2 lun # LOGICAL UNIT NUMBER
  integer*2 i
  include(data.dcl)
  include(flags.dcl)
  include(data.com)
  include(flags.com)
#*****
#*                MACHINE DEPENDENT                *
#*****
# save /data/, /flags/
#
# valu = 0.0
# lun = ilun(indx)
#
#
# READ IN NEXT DATA RECORD
#
# if (float(npts(indx)) > pts(indx)) {
#
#   NEXT RECORD IS A DATA RECORD
#
#   if (dflg(indx) == 1){
#     call rddata(lun, indx)
#     if ((pts(indx) == 1.0) && (buff(1,indx) > 1000000000.0)) {
#       hflg(indx) = 1
#       dflg(indx) = 0
#       npts(indx) = 1
#       pts(indx) = 0.
#
#     END OF DATA
#
#     return(0)
#   }
#
#   else {
#     valu = buff(1,indx)
#     npts(indx) = 2
#
#     SUCCESSFUL READ
#
#     return (1)

```

- 97 -

```
    }  
#  
#  
#  
#   END OF FILE  
#  
#   else if (hfig(indx) == 0) return (0)  
#  
#   NEXT RECORD IS NOT A DATA RECORD  
#  
#   else return (-1)  
#  
#  
#   else {  
#       i = npts(indx)  
#       valu = buff(i,indx)  
#       npts(indx) = npts(indx) + 1  
#  
#       SUCCESSFUL READ  
#  
#       return(1)  
#   }  
#  
end
```

IRDHD.RATFOR

```

integer*2 function irdhd (indx)
#
# Function irdhd reads the next header
# record from logical unit number lun.
# It will always try to return the
# next header record, reading over
# intermediate data records if
# necessary. It returns 1 on a
# successful read, 0 on end of file.
#
#
# Calls:
#   irddat
#   rdhead
#   save - machine dependent
#
#   Programmed by Madeleine Zirbes
#   September 15, 1980
#
integer*2 indx # ARRAY INDEX - INPUT
#
integer*2 lun # LOGICAL UNIT NUMBER
include(defines.h)
include(head.dcl)
include(flags.dcl)
include(head.com)
include(flags.com)
#*****
#*                MACHINE DEPENDENT                *
#*****
save /flags/
real data
integer*2 irddat # FUNCTION
integer*2 tf # END OF FILE FLAG
#
lun = llun(indx)
#
# THIS IS A DATA RECORD
#
if (dffg(indx) == 1) {
  for (;;) {
#
#   READ RECORDS UNTIL A HEADER RECORD IS FOUND
#
    if (irddat(lun,data) /= 1) break
  }
#
call rdhead(lun, indx, tf)
#
# END OF FILE
#
if (tf == 1) {
  hffg(indx) = 0
  dffg(indx) = 0
  return (0)
}
#
# SUCCESSFULLY READ A HEADER RECORD
#
else {
  hffg(indx) = 0

```

- 99 -

```
    dfig(indx) = 1  
    return (1)  
}  
#  
end
```

- 100 -

RESP.RATFOR

```

complex function resp(indx,omega,ifl)
#
# Resp returns  $T(s)=a0*(s-z(1))*...*(s-z(m))/(s-p(1))*...*(s-p(n))$ .
# where p, z, and s are complex. s = cmplx(0.,omega).
# ifl flags the callers desire for
# displacemt (ifl=1), velocity (ifl=2),
# or acceleration (ifl=3).
#
#
# Calls no other routine.
#
#   Programmed by R. Buland
#   August 23, 1979
#
integer*2 indx # ARRAY INDEX - INPUT
real omega # ANGULAR FREQUENCY - INPUT
integer*2 ifl # FLAG - DETERMINES OUTPUT UNITS - INPUT
#
include(defines.h)
complex s
complex d
integer*2 j
include(head.dcl)
include(head.com)
#
if (np(indx).le.0) return (0.0)
d = (1.,0.)
s = cmplx(0., omega)
#
# COMPUTE THE CONTRIBUTION OF THE ZEROES IF ANY
#
do j = 1,nz(indx) {
  d = d*(s-zeroes(j,indx))
}
#
# COMPUTE THE CONTRIBUTION OF THE POLES
#
do j = 1,np(indx) {
  d = d/(s-poles(j,indx))
}
#
# DISPLACEMENT
#
if (ifl == 1) return (a0(indx)*d)
#
# VELOCITY
#
else if (ifl == 2) return (a0(indx)*d/s)
#
# ACCELERATION
#
else if (ifl == 3) return (a0(indx)*d/(s*s))
end

```

APPENDIX B

FORTRAN CODE

The Fortran code was generated from the Ratfor code in Appendix A.

NDTSUM MAIN

C
C COMMAND NDTSUM PRODUCES A SUMMARY
C OF THE DATA WRITTEN ON A NETWORK
C DAY TAPE. THIS INCLUDES A LITERAL
C DUMP OF ALL DATA LOGS, AND A LIST
C OF START AND END TIMES OF THE
C CONTINUOUS DATA RECORDED FOR EACH
C STATION AND EACH INSTRUMENT.
C
C NDTSUM READS FROM THE STANDARD
C INPUT (LOGICAL UNIT NUMBER 5)
C FOR THE TAPE DRIVE UNIT NUMBER.
C NO PROMPT IS GIVEN TO THE USER.
C
C CALLS:
C MATT - USER SUPPLIED
C MRETRN - USER SUPPLIED
C SUM
C
C PROGRAMMED BY MADELEINE ZIRBES
C SEPTEMBER 15, 1980
C
C
C TAPE HEADER INFORMATION
C
C STATION ID
C INTEGER ID
C INSTRUMENT
C INTEGER INSTR
C YEAR
C INTEGER YEAR
C DAY OF YEAR
C INTEGER DOFY
C HOUR
C INTEGER HOUR
C MINUTE
C INTEGER MIN
C SECOND
C INTEGER SEC
C MLLISECONDS
C REAL MSS
C FORMAT ID
C INTEGER NFORM
C NUMBER OF CHANNELS
C INTEGER NCHAN
C NUMBER OF SAMPLES
C INTEGER NSAMP
C SAMPLING RATE
C REAL RATE
C
C START TIME OF CONTINOUS DATA
C
C YEAR
C INTEGER SYR
C DAY OF YEAR
C INTEGER SDY
C HOUR
C INTEGER SHR
C MINUTE
C INTEGER SMN
C SECONDS
C INTEGER SSEC

- 103 -

```
C MILLISECONDS
  REAL SMS
C
C END TIME OF CONTINUOUS DATA
C
C YEAR
  INTEGER LYR
C DAY OF YEAR
  INTEGER LDY
C HOUR
  INTEGER LHR
C MINUTE
  INTEGER LMN
C SECONDS
  INTEGER LSEC
C MILLISECONDS
  REAL LMS
C TAPE DRIVE NUMBER
  INTEGER DR
C READ ONLY FLAG
  INTEGER READ
C TAPE DRIVE DENSITY
  INTEGER DEN
C
  COMMON /HEADER/ ID, INSTR, YEAR, DOFY, HOUR, MIN, SEC, MSS, NFORM,
1 NCHAN, NSAMP, RATE
C
  COMMON /START/ SYR, SDY, SHR, SMN, SSEC, SMS
C
  COMMON /END/ LYR, LDY, LHR, LMN, LSEC, LMS
  DATA READ /1/
  DATA DEN /1800/
C
C GET LOGICAL TAPE UNIT NUMBER
C FROM THE USER - NO PROMPT GIVEN
C
  READ(5, 10) DR
10  FORMAT(I1)
C
C OPEN TAPE DRIVE FOR READING
C
  CALL MATT(DR,DEN,READ)
C
C PRODUCE SUMMARY
C
  CALL SUM (DR)
C
C CLOSE TAPE DRIVE
C
  CALL MRETRN (DR)
C
  END
```

NDSTUM SPECIFIC ROUTINES

SUM.FORTRAN

SUBROUTINE SUM(DR)

C
C SUM PRODUCES A SUMMARY OF THE
C DATA CONTAINED ON A NETWORK
C DAY TAPE.
C
C
C CALLS:
C GETLIN
C HEAD
C MAGRD - USER SUPPLIED
C NDTPRT
C PRBUF
C STNDRD
C TSET
C
C PROGRAMMED BY MADELEINE ZIRBES
C SEPTEMBER 15, 1980
C
C TAPE DRIVE LOGICAL UNIT
C INTEGER DR
C
C
C TAPE HEADER INFORMATION
C
C STATION ID
C INTEGER ID
C INSTRUMENT
C INTEGER INSTR
C YEAR
C INTEGER YEAR
C DAY OF YEAR
C INTEGER DOFY
C HOUR
C INTEGER HOUR
C MINUTE
C INTEGER MIN
C SECOND
C INTEGER SEC
C MILLISECONDS
C REAL MSS
C FORMAT ID
C INTEGER NFORM
C NUMBER OF CHANNELS
C INTEGER NCHAN
C NUMBER OF SAMPLES
C INTEGER NSAMP
C SAMPLING RATE
C REAL RATE
C
C START TIME OF CONTINUOUS DATA
C
C YEAR
C INTEGER SYR
C DAY OF YEAR
C INTEGER SDY
C HOUR
C INTEGER SHR
C MINUTE

- 106 -

```

C  FOR
23000 CONTINUE
C
C  READ NETWORK DAY TAPE LOG
C
C      I = MAGRD(DR, NWORDS, IDATA, NR)
C      IF(.NOT.(I.EQ. 0))GOTO 23003
C      GOTO 23002
C
C  PRINT OUT NETWORK DAY TAPE LOG
C
C  ELSE
23003  CONTINUE
C      IF(.NOT.(I.EQ. 1))GOTO 23005
C      CALL PRBUF(IDATA)
C      GOTO 23006
C  ELSE
23005  CONTINUE
C      WRITE(6,10)
10     FORMAT(1X, 'ERROR READING - NETWORK DAY TAPE LOG.')
C      RETURN
23006  CONTINUE
23004  CONTINUE
C      GOTO 23000
C  ENDFOR
23002 CONTINUE
C
C  READ STATION LOG
C
C      IF(.NOT.(MAGRD(DR, NWORDS, IDATA, NR) .NE. 1))GOTO 23007
C      WRITE(6, 12)
12     FORMAT(1X, 'ERROR READING - STATION LOG EXPECTED.')
C      RETURN

```

- 107 -

```

C
C LOOP ONCE FOR EACH STATION
C
23007 CONTINUE
C FOR
23009 CONTINUE
C
  IF(.NOT.(MAGRD(DR, NWORDS, IDATA, NR) .NE. 0))GOTO 23012
    WRITE(6, 13)
    FORMAT(1X,
13 1  'ERROR READING - EOF EXPECTED AFTER STATION LOG.')
    RETURN
C
C START A NEW PAGE WITH EACH NEW STATION
C
23012 CONTINUE
  WRITE(6, 20)
C
C PRINT NEW PAGE
C
20  FORMAT('1')
C
C PRINT STATION LOG
C
  CALL PRBUF(IDATA)
C
C FOR
23014 CONTINUE
C
C IF MAGRD == 0, END OF TAPE
C
  IF(.NOT.(MAGRD(DR, NWORDS, IDATA, NR) .EQ. 0))GOTO 23017
    RETURN
23017 CONTINUE
  CALL GETLIN(IDATA, 1, IBUFF)
C
C IF THE FIRST TWO CHARACTERS OF THE FIRST LINE
C OF THIS RECORD EQUALS 'ST', THIS IS A STATION LOG
C
  IF(.NOT.(IBUFF(1) .EQ. KUS .AND. IBUFF(2) .EQ. KUT))GOTO 230
1 19
  GOTO 23016
C
C THIS WAS NOT A STATION LOG, IT WAS A DATA LOG
C
23019 CONTINUE
  CALL PRBUF(IDATA)
C
C READ AND PRINT REMAINING TWO DATA LOGS
C
  DO 23021 I = 1,2
    IF(.NOT.(MAGRD(DR, NWORDS, IDATA, NR) .NE. 1))GOTO 23023
    WRITE(6, 14)
    FORMAT(1X, 'ERROR READING DATA LOG.')
    RETURN
14 23023 CONTINUE
    CALL PRBUF(IDATA)
23021 CONTINUE
C
C OUTPUT HEADER FOR THE START AND END
C TIMES OF THE CONTINUOUS DATA
C
  WRITE(6, 30)
30  FORMAT(1X,
1 1  'START TIME          END TIME')

```

- 108 -

```

      WRITE(6, 40)
40    FORMAT(1X,
1      'YEAR MONTH DAY  TIME          YEAR MONTH DAY  TIM
1      E')
C
C READ DATA RECORDS
C
C IF MAGRD == 0, NO BINARY RECORDS FOR THIS INSTRUMENT
C
C IF(.NOT.(MAGRD(DR, NWORDS, IDATA, NR) .EQ. 0))GOTO 23025
C   GOTO 23015
C
C INTERPRET BINARY HEADER DATA
C
23025  CONTINUE
      CALL HEAD(IDATA)
C
C SET INITIAL VALUES FOR
C START TIME, NEXT EXPECTED TIME
C AND LAST TIME READ
C
      CALL TSET(SYR, SDY, SHR, SMN, SSEC, SMS)
      CALL TSET(NYR, NDY, NHR, NMN, NSEC, NMS)
C
C NUMBER OF MILLISECONDS COVERED BY THIS RECORD
C
      FMS = FLOAT(NSAMP)*1000./(FLOAT(NCHAN)*RATE)
      NMS = NMS + FMS
      CALL STNDRD(NYR, NDY, NHR, NMN, NSEC, NMS)
      CALL TSET(LYR, LDY, LHR, LMN, LSEC, LMS)
      LNSAM = NSAMP
      LRATE = RATE
      LNCHAN = NCHAN
C
C FOR
23027  CONTINUE
C
C IF MAGRD == 0, END OF FILE
C
C IF(.NOT.(MAGRD(DR, NWORDS, IDATA, NR) .EQ. 0))GOTO 23030
C   GOTO 23029
23030  CONTINUE
      CALL HEAD(IDATA)
C
C SET CURRENT TIME
C
      CALL TSET(TYR, TDY, THR, TMN, TSEC, TMS)
C
C IS CURRENT TIME EQUAL TO NEXT EXPECTED TIME?
C
C IF(.NOT.((TYR .EQ. NYR) .AND. (TDY .EQ. NDY) .AND. (THR
1      .EQ. NHR) .AND. (TMN .EQ. NMN) .AND. (TSEC .EQ. NSEC)
1      .AND. (TMS .EQ. NMS)))GOTO 23032
C
C YES
C
      CALL TSET(NYR, NDY, NHR, NMN, NSEC, NMS)
C REINITIALIZE VALUES
      FMS = FLOAT(NSAMP)*1000./(FLOAT(NCHAN)*RATE)
      NMS = NMS + FMS
      CALL STNDRD(NYR, NDY, NHR, NMN, NSEC, NMS)
      CALL TSET(LYR, LDY, LHR, LMN, LSEC, LMS)
      LNSAM = NSAMP
      LRATE = RATE
      LNCHAN = NCHAN

```

- 109 -

```
C      GOTO 23033
C      ELSE
23032    CONTINUE
C
C      NO
C
      FMS = (FLOAT(LNSAM/LNCHAN) - 1.0)*1000./LRATE
      LMS = LMS + FMS
      CALL STNDRD(LYR, LDY, LHR, LMN, LSEC, LMS)
C
C      PRINT OUT STARTING AND ENDING TIMES
C      OF THE CONTINUOUS DATA
C
      CALL NDTPRT
C
C      REINITIALIZE VALUES
C
      CALL TSET(SYR, SDY, SHR, SMN, SSEC, SMS)
      CALL TSET(NYR, NDY, NHR, NMN, NSEC, NMS)
      FMS = FLOAT(NSAMP)*1000./(FLOAT(NCHAN)*RATE)
      NMS = NMS + FMS
      CALL STNDRD(NYR, NDY, NHR, NMN, NSEC, NMS)
      CALL TSET(LYR, LDY, LHR, LMN, LSEC, LMS)
      LNSAM = NSAMP
      LRATE = RATE
      LNCHAN = NCHAN
23033    CONTINUE
      GOTO 23027
C      ENDFOR
23029    CONTINUE
      FMS = (FLOAT(LNSAM/LNCHAN) - 1.0)*1000./LRATE
      LMS = LMS + FMS
      CALL STNDRD(LYR, LDY, LHR, LMN, LSEC, LMS)
      CALL NDTPRT
      WRITE(6,50)
50      FORMAT(//)
23015    GOTO 23014
C      ENDFOR
23016    CONTINUE
      GOTO 23009
C      ENDFOR
23011    CONTINUE
      END
```

- 110 -

PRBUF.FORTRAN

```
      SUBROUTINE PRBUF(IDATA)
C
C PRBUF PRINTS ONE ASCII RECORD(2000 CHARACTERS) -
C 25 LINES, 80 CHARACTERS PER LINE.
C
C
C CALLS:
C  GETLIN
C
C   PROGRAMMED BY MADELEINE ZIRBES
C   SEPTEMBER 15, 1980
C
C DATA RECORD - INPUT
C   INTEGER IDATA(1)
C SET TO HOLD 16000 BITS OF TAPE INPUT RECORD
C
C   INTEGER I
C   INTEGER J
C   INTEGER Ibuff(80)
C
C   DO 23000 I = 1,25
C     CALL GETLIN(IDATA, I, Ibuff)
C     WRITE(6, 10) (IBUFF(J), J=1,80)
10    FORMAT(1X, 80A1)
23000  CONTINUE
C
C   RETURN
C
C   END
```


NDTPRT.FORTRAN

```

SUBROUTINE NDTPRT
C
C NDTPRT WRITES OUT THE START AND
C END TIMES IN COMMON BLOCKS
C /START/ AND /END/.
C
C NDTPRT USES A COLON (:) IN
C THE FORMAT STATEMENT. THIS MAY
C NOT BE AVAILABLE ON ALL MACHINES.
C
C
C CALLS:
C DAYMO
C
C PROGRAMMED BY MADELEINE ZIRBES
C SEPTEMBER 15, 1980
C
C
C START TIME OF CONTINOUS DATA
C
C YEAR
C   INTEGER SYR
C DAY OF YEAR
C   INTEGER SDY
C HOUR
C   INTEGER SHR
C MINUTE
C   INTEGER SMN
C SECONDS
C   INTEGER SSEC
C MILLISECONDS
C   REAL SMS
C
C END TIME OF CONTINUOUS DATA
C
C YEAR
C   INTEGER LYR
C DAY OF YEAR
C   INTEGER LDY
C HOUR
C   INTEGER LHR
C MINUTE
C   INTEGER LMN
C SECONDS
C   INTEGER LSEC
C MILLISECONDS
C   REAL LMS
C   INTEGER SMONTH, SDAY, LMONTH, LDAY
C FUNCTION
C   INTEGER DAYMO
C ERROR CODE
C   INTEGER IER
C
C COMMON /START/ SYR, SDY, SHR, SMN, SSEC, SMS
C
C COMMON /END/ LYR, LDY, LHR, LMN, LSEC, LMS
C
C IER = DAYMO(SDY, SMONTH, SDAY, SYR)
C IER = DAYMO(LDY, LMONTH, LDAY, LYR)
C
C WRITE(6, 10) SYR, SMONTH, SDAY, SHR, SMN, SSEC, SMS, LYR, LMONTH,

```

```
      1 LDAY, LHR, LMN, LSEC, LMS
C*****
C*          MACHINE DEPENDENT          *
C*****
10  FORMAT (1X,(2(I4,4X,I2,2X,I3,4X,I2,',' ,I2,',' ,I2,',' ,F4,4X)))
C
      RETURN
C
      END
```

RETRV MAIN

```

C
C COMMAND RETRV FETCHES DATA FROM A
C NETWORK DAY TAPE MOUNTED ON
C LOGICAL TAPE UNIT N AND GENERATES
C OUTPUT FILES.
C RETRV READS FROM THE STANDARD
C INPUT (LOGICAL UNIT NUMBER 5)
C THE TAPE DRIVE UNIT NUMBER,
C AND THEN CONTINUES TO READ THE
C USER'S REQUESTS.
C NO PROMPT IS GIVEN TO THE USER
C FOR THIS INFORMATION.
C
C
C CALLS:
C CLSOUT
C GETDAT
C GETRQT
C INITBD
C MATT - USER SUPPLIED
C MRETRN - USER SUPPLIED
C OPNOUT
C
C   PROGRAMMED BY MADELEINE ZIRBES
C   SEPTEMBER 15, 1980
C
C
C REQUEST INFORMATION
C 50 - MAXIMUM NUMBER OF REQUESTS ALLOWED
C
C REQUEST INFORMATION
C NUMBER OF REQUESTS
C   INTEGER NREQ
C STATION CODE - CHARACTER STRING
C   INTEGER RCODE(50,4)
C INSTRUMENT ID
C   INTEGER RINSTR(50)
C YEAR
C   INTEGER RYEAR(50)
C MONTH
C   INTEGER RMONTH(50)
C DAY
C   INTEGER RDAY(50)
C HOUR
C   INTEGER RHOUR(50)
C MINUTE
C   INTEGER RMIN(50)
C SECONDS
C   INTEGER RSEC(50)
C LENGTH IN SECONDS
C   REAL RLEN(50)
C LOGICAL UNIT NUMBER
C   INTEGER RLUN(50,3,3)
C INSTRUMENT CODE - CHARACTER STRING
C   INTEGER RCHN(50,3,3,4)
C STATION FLAG
C   INTEGER RFLG(50)
C
C TAPE HEADER INFORMATION
C
C STATION ID
C   INTEGER ID

```

C INSTRUMENT
 INTEGER INSTR
C YEAR
 INTEGER YEAR
C DAY OF YEAR
 INTEGER DOFY
C HOUR
 INTEGER HOUR
C MINUTE
 INTEGER MIN
C SECOND
 INTEGER SEC
C MILLISECONDS
 REAL MSS
C FORMAT ID
 INTEGER NFORM
C NUMBER OF CHANNELS
 INTEGER NCHAN
C NUMBER OF SAMPLES
 INTEGER NSAMP
C SAMPLING RATE
 REAL RATE
C
C STATION INFORMATION
C
C STATION CODE - CHARACTER STRING
 INTEGER CODE(4)
C NUMBER OF POLES, 20 LARGEST NUMBER OF SRO POLES
 INTEGER NP
C NUMBER OF ZEROES, 10 LARGEST NUMBER OF SRO ZEROES
 INTEGER NZ
C NUMBER OF CHANNELS
 INTEGER ICHAN
C CONSTANT
 REAL A0(3)
C CALIBRATION CONSTANT
 REAL CAL(3)
C STATION ELEVATION
 REAL ELEV
C STATION LATITUDE
 REAL LAT
C STATION LONGITUDE
 REAL LON
C POLES
 COMPLEX POLES(20,3)
C ZEROES
 COMPLEX ZEROES(10,3)
C
C START TIME OF DATA
C
C YEAR
 INTEGER SYEAR
C DAY OF YEAR
 INTEGER SDOFY
C HOUR
 INTEGER SHOUR
C MINUTES
 INTEGER SMIN
C SECONDS
 REAL SSECS
C
C LOGICAL UNIT NUMBER FOR EACH OUTPUT FILE
 INTEGER LUN(3,3)
C INSTRUMENT CODE FOR EACH OUTPUT FILE
 INTEGER CHN(3,3,4)

- 115 -

```
C
C 500 - BUFFER SIZE OF DATA RECORD ON DISK
C
C VERTICAL BUFFER
  REAL Z(500)
C NORTH-SOUTH BUFFER
  REAL N(500)
C EAST-WEST BUFFER
  REAL E(500)
C NUMBER OF POINTS IN BUFFERS
  REAL SPTS
C TOTAL NUMBER OF POINTS READ TO FILL REQUEST
  REAL PTS
C TAPE DRIVE NUMBER
  INTEGER DR
C TAPE DENSITY
  INTEGER DEN
C READ ONLY FLAG
  INTEGER READ
C
  COMMON /REQSTS/ NREQ,RCODE,RINSTR,RYEAR,RMONTH,RDAY, RHOURL,RMIN,
1 RSEC,RLEN,RLUN,RCHN,RFLG
C
  COMMON /HEADER/ ID, INSTR, YEAR, DOFY, HOUR, MIN, SEC, MSS, NFORM,
1 NCHAN, NSAMP, RATE
C
  COMMON /STINFO/ CODE, ICHAN, NP, NZ, LAT, LON, ELEV, AO, CAL,
1 POLES, ZEROES
C
  COMMON /SSTART/ SYEAR, SDOFY, SHOUR, SMIN, SSECS
C
  COMMON /FILES/ LUN, CHN
  COMMON /BUFFER/ Z, N, E, SPTS, PTS
  DATA DEN/1600/
  DATA READ/1/
C
C GET LOGICAL TAPE UNIT NUMBER
C FROM THE USER - NO PROMPT GIVEN
C
  READ(5, 10) DR
10  FORMAT(I1)
C
C INITIALIZE
  CALL INITBD
C
C READ USERS REQUESTS
C
  CALL GETDAT
  IF(.NOT.(NREQ.EQ. 0))GOTO 23000
  WRITE(6, 20)
20  FORMAT(1X, 'NO REQUESTS.')
  STOP
C
C OPEN OUTPUT FILES
C
23000 CONTINUE
  CALL OPNOUT
C
C OPEN TAPE FOR READING
C
  CALL MATT(DR, DEN, READ)
C
C RETRIEVE REQUESTS
C
  CALL GETRQT(DR)
```

- 116 -

```
C
C CLOSE OUTPUT FILES
C
C   CALL CLSOUT
C
C CLOSE TAPE DRIVE
C
C   CALL MRETRN(DR)
C
C   END
```

RETRV SPECIFIC ROUTINES

INITBD.FORTRAN

SUBROUTINE INITBD

```

C
C INITBD INITIALIZES THE OUTPUT FILES
C LOGICAL UNIT NUMBERS AND THE
C INSTRUMENT CODES.
C
C
C CALLS NO OTHER ROUTINE.
C
C PROGRAMMED BY MADELEINE ZIRBES
C SEPTEMBER 15, 1980
C
C
C LOGICAL UNIT NUMBER FOR EACH OUTPUT FILE
  INTEGER LUN(3,3)
C INSTRUMENT CODE FOR EACH OUTPUT FILE
  INTEGER CHN(3,3,4)
  INTEGER KUS, KUL, KUI
  INTEGER KUZ, KUN, KUE
  INTEGER KUP, KBL
C
  COMMON /FILES/ LUN, CHN
  DATA KUS, KUL, KUI /'S', 'L', 'T'/
  DATA KUZ, KUN, KUE /'Z', 'N', 'E'/
  DATA KUP, KBL /'P', ''/
C
  LUN(1,1) = 1
  LUN(1,2) = 0
  LUN(1,3) = 0
  LUN(2,1) = 2
  LUN(2,2) = 3
  LUN(2,3) = 4
  LUN(3,1) = 7
  LUN(3,2) = 8
  LUN(3,3) = 9
C
  CHN(1,1,1) = KUS
  CHN(1,1,2) = KUP
  CHN(1,1,3) = KUZ
  CHN(1,1,4) = KBL
C
  CHN(1,2,1) = KUS
  CHN(1,2,2) = KUP
  CHN(1,2,3) = KUN
  CHN(1,2,4) = KBL
C
  CHN(1,3,1) = KUS
  CHN(1,3,2) = KUP
  CHN(1,3,3) = KUE
  CHN(1,3,4) = KBL
C
  CHN(2,1,1) = KUL
  CHN(2,1,2) = KUP
  CHN(2,1,3) = KUZ
  CHN(2,1,4) = KBL
C
  CHN(2,2,1) = KUL
  CHN(2,2,2) = KUP

```

- 118 -

```
      CHN(2,2,3) = KUN
      CHN(2,2,4) = KBL
C
      CHN(2,3,1) = KUL
      CHN(2,3,2) = KUP
      CHN(2,3,3) = KUE
      CHN(2,3,4) = KBL
C
      CHN(3,1,1) = KUI
      CHN(3,1,2) = KUP
      CHN(3,1,3) = KUZ
      CHN(3,1,4) = KBL
C
      CHN(3,2,1) = KUI
      CHN(3,2,2) = KUP
      CHN(3,2,3) = KUN
      CHN(3,2,4) = KBL
C
      CHN(3,3,1) = KUI
      CHN(3,3,2) = KUP
      CHN(3,3,3) = KUE
      CHN(3,3,4) = KBL
C
      RETURN
C
      END
```


- 119 -

GETDAT.FORTRAN

```
SUBROUTINE GETDAT
C
C GETDAT SCANS THE STANDARD INPUT,
C (LOGICAL UNIT 5) READING REQUESTS.
C SCANNING STOPS UPON READING A STATION
C CODE OF STOP.
C
C
C CALLS:
C FFIN
C GETSTR
C ICPYCH
C
C PROGRAMMED BY MADELEINE ZIRBES
C SEPTEMBER 15, 1980
C
C
C REQUEST INFORMATION
C 50 - MAXIMUM NUMBER OF REQUESTS ALLOWED
C
C REQUEST INFORMATION
C NUMBER OF REQUESTS
C INTEGER NREQ
C STATION CODE - CHARACTER STRING
C INTEGER RCODE(50,4)
C INSTRUMENT ID
C INTEGER RINSTR(50)
C YEAR
C INTEGER RYEAR(50)
C MONTH
C INTEGER RMONTH(50)
C DAY
C INTEGER RDAY(50)
C HOUR
C INTEGER RHOUR(50)
C MINUTE
C INTEGER RMIN(50)
C SECONDS
C INTEGER RSEC(50)
C LENGTH IN SECONDS
C REAL RLEN(50)
C LOGICAL UNIT NUMBER
C INTEGER RLUN(50,3,3)
C INSTRUMENT CODE - CHARACTER STRING
C INTEGER RCHN(50,3,3,4)
C STATION FLAG
C INTEGER RFLG(50)
C
C LOGICAL UNIT NUMBER FOR EACH OUTPUT FILE
C INTEGER LUN(3,3)
C INSTRUMENT CODE FOR EACH OUTPUT FILE
C INTEGER CHN(3,3,4)
C INTEGER KUA, KUE, KUI, KUL, KUN
C INTEGER KUO, KUP, KUS, KUT, KUZ
C INTEGER KCMA, KBL
C INTEGER I, J, K, L, M, MM
C INTEGER IFL
C INTEGER FID
C INTEGER INSTR(4)
C INTEGER CODE(4)
C INTEGER LINE(80)
```

- 120 -

```

C FUNCTION
  REAL FFIN
C
  COMMON /REQSTS/ NREQ,RCODE,RINSTR,RYEAR,RMONTH,RDAY, RHOURL,RMIN,
1 RSEC,RLEN,RLUN,RCHN,RFLG
C
  COMMON /FILES/ LUN, CHN
  DATA FID /5/
  DATA KUA, KUE, KUI, KUL, KUN /'A', 'E', 'I', 'L', 'N'/
  DATA KUO, KUP, KUS, KUT, KUZ /'O', 'P', 'S', 'T', 'Z'/
  DATA KCMA, KBL /',', ''/
C
C
C IF YOU WANT TO READ THE USER'S REQUESTS
C FROM A FILE, CHANGE THE SOFTWARE AS FOLLOWS:
C
C
C 1.) OBTAIN THE FILE NAME THAT CONTAINS THE REQUESTS,
C 2.) OPEN THE FILE FOR FORMATTED INPUT, POSITIONING
C   THE FILE AT THE BEGINNING,
C 3.) BEFORE EXITING THE SUBROUTINE GETDAT, CLOSE THE
C   FILE, AND
C 4.) CHANGE THE DATA STATEMENT THAT INITIALIZES FID
C   TO 5 TO ANOTHER UNIT NUMBER.
C
C
C
C   NREQ = 0
C
C ZERO OUT LOGICAL UNIT NUMBERS
C
  DO 23000 I = 1,50
    DO 23002 J = 1,3
      DO 23004 K = 1,3
        RLUN(I,J,K) = 0
23004      CONTINUE
23002    CONTINUE
23000  CONTINUE
C
C THIS LOOP WILL READ REQUESTS UNTIL A SINGLE LINE
C CONTAINING THE CHARACTER STRING STOP IS ENCOUNTERED,
C OR UNTIL 50 REQUESTS ARE READ INTO THE REQUEST BUFFERS.
C
  DO 23006 I = 1, 50
C
  READ(FID,10) LINE
10  FORMAT(80A1)
  DO 23008 K = 1, 4
    CODE(K) = KBL
23008  CONTINUE
    CALL GETSTR(1, 80, LINE, M, IFL, K, 4, CODE)
    IF(.NOT.(CODE(1) .EQ. KUS .AND.CODE(2) .EQ. KUT .AND.CODE(3)
1    .EQ. KUO .AND.CODE(4) .EQ. KUP))GOTO 23010
    GOTO 23007
23010  CONTINUE
    IF(.NOT.(IFL .EQ. KCMA))GOTO 23012
    MM = M + 1
    GOTO 23013
C  ELSE
23012  CONTINUE
    MM = M
23013  CONTINUE
    CALL GETSTR(MM, 80, LINE, M, IFL, K, 4, INSTR)
    IF(.NOT.(IFL .EQ. KCMA))GOTO 23014
    MM = M + 1

```

- 121 -

```

      GOTO 23015
C     ELSE
23014  CONTINUE
      MM = M
23015  CONTINUE
      RYEAR(I) = INT(FFIN(MM, 80, LINE, M, IFL))
      IF(.NOT.(IFL.EQ. KCMA))GOTO 23016
      MM = M + 1
      GOTO 23017
C     ELSE
23016  CONTINUE
      MM = M
23017  CONTINUE
      RMONTH(I) = INT(FFIN(MM, 80, LINE, M, IFL))
      IF(.NOT.(IFL.EQ. KCMA))GOTO 23018
      MM = M + 1
      GOTO 23019
C     ELSE
23018  CONTINUE
      MM = M
23019  CONTINUE
      RDAY(I) = INT(FFIN(MM, 80, LINE, M, IFL))
      IF(.NOT.(IFL.EQ. KCMA))GOTO 23020
      MM = M + 1
      GOTO 23021
C     ELSE
23020  CONTINUE
      MM = M
23021  CONTINUE
      RHOUR(I) = INT(FFIN(MM, 80, LINE, M, IFL))
      IF(.NOT.(IFL.EQ. KCMA))GOTO 23022
      MM = M + 1
      GOTO 23023
C     ELSE
23022  CONTINUE
      MM = M
23023  CONTINUE
      RMIN(I) = INT(FFIN(MM, 80, LINE, M, IFL))
      IF(.NOT.(IFL.EQ. KCMA))GOTO 23024
      MM = M + 1
      GOTO 23025
C     ELSE
23024  CONTINUE
      MM = M
23025  CONTINUE
      RSEC(I) = INT(FFIN(MM, 80, LINE, M, IFL))
      IF(.NOT.(IFL.EQ. KCMA))GOTO 23026
      MM = M + 1
      GOTO 23027
C     ELSE
23026  CONTINUE
      MM = M
23027  CONTINUE
      RLEN(I) = FFIN(MM, 80, LINE, M, IFL)
      IF(.NOT.(CODE(1).EQ. KUA.AND. CODE(2).EQ. KUL.AND. CODE(3)
1      .EQ. KUL))GOTO 23028
      RFLG(I) = 1
      CODE(4) = KBL
      GOTO 23029
C     ELSE
23028  CONTINUE
      RFLG(I) = 0
23029  CONTINUE
C
      RCODE(I,1) = CODE(1)

```

- 122 -

```

RCODE(I,2) = CODE(2)
RCODE(I,3) = CODE(3)
RCODE(I,4) = CODE(4)
C
IF(.NOT.(INSTR(1) .EQ. KUA .AND. INSTR(2) .EQ. KUL .AND. INSTR(3)
1  .EQ. KUL))GOTO 23030
C
C   USER WANTS ALL CHANNELS
C
C   RINSTR(I) = 0
C   RLUN(I,1,1) = LUN(1,1)
C   RLUN(I,1,2) = LUN(1,2)
C   RLUN(I,1,3) = LUN(1,3)
C   RLUN(I,2,1) = LUN(2,1)
C   RLUN(I,2,2) = LUN(2,2)
C   RLUN(I,2,3) = LUN(2,3)
C   RLUN(I,3,1) = LUN(3,1)
C   RLUN(I,3,2) = LUN(3,2)
C   RLUN(I,3,3) = LUN(3,3)
C
C   DO 23032 L = 1,3
C   DO 23034 M = 1,3
C   CALL ICPYCH(RCHN, CHN, I, L, M)
23034 CONTINUE
23032 CONTINUE
C
C   GOTO 23006
C
C   ELSE
23030 CONTINUE
C   IF(.NOT.(INSTR(1) .EQ. KUS))GOTO 23036
C
C   SHORT PERIOD
C
C   J = 1
C   RINSTR(I) = 1
C
C   GOTO 23037
C   ELSE
23036 CONTINUE
C   IF(.NOT.(INSTR(1) .EQ. KUL))GOTO 23038
C
C   LONG PERIOD
C
C   J = 2
C   RINSTR(I) = 2
C
C   GOTO 23039
C   ELSE
23038 CONTINUE
C   IF(.NOT.(INSTR(1) .EQ. KUI))GOTO 23040
C
C   INTERMEDIATE PERIOD
C
C   J = 3
C   RINSTR(I) = 3
C
C   GOTO 23041
C   ELSE
23040 CONTINUE
C
C   ERROR IN INPUT
C   SKIP REQUEST THAT WAS JUST READ IN
C
C   I = I-1

```

- 123 -

```

                GOTO 23008
23041          CONTINUE
23039          CONTINUE
23037          CONTINUE
23031          CONTINUE
C
      DO 23042 K = 2,4
        IF(.NOT.(INSTR(K) .EQ. KUP))GOTO 23044
C
C      ALL CHANNELS
C
        RLUN(I,J,1) = LUN(J,1)
        RLUN(I,J,2) = LUN(J,2)
        RLUN(I,J,3) = LUN(J,3)
C
      DO 23046 M = 1,3
        CALL ICPYCH(RCHN, CHN, I, J, M)
23046          CONTINUE
C
      GOTO 23045
C      ELSE
23044          CONTINUE
        IF(.NOT.(INSTR(K) .EQ. KUZ))GOTO 23048
C
C      VERTICAL
C
        RLUN(I,J,1) = LUN(J,1)
        M = 1
        CALL ICPYCH(RCHN, CHN, I, J, M)
C
      GOTO 23049
C      ELSE
23048          CONTINUE
        IF(.NOT.(INSTR(K) .EQ. KUN))GOTO 23050
C
C      NORTH/SOUTH
C
        RLUN(I,J,2) = LUN(J,2)
        M = 2
        CALL ICPYCH(RCHN, CHN, I, J, M)
C
      GOTO 23051
C      ELSE
23050          CONTINUE
        IF(.NOT.(INSTR(K) .EQ. KUE))GOTO 23052
C
C      EAST/WEST
C
        RLUN(I,J,3) = LUN(J,3)
        M = 3
        CALL ICPYCH(RCHN, CHN, I, J, M)
23052          CONTINUE
23051          CONTINUE
23049          CONTINUE
23045          CONTINUE
23042          CONTINUE
C
C
23008          CONTINUE
23007          CONTINUE
C
C      NUMBER OF REQUESTS
C
      NREQ = I - 1

```

- 124 -

C
RETURN
C
END

- 125 -

OPNOUT.FORTRAN

```

      SUBROUTINE OPNOUT
C
C OPNOUT OPENS THE OUTPUT FILES
C FOR RETRV.
C
C
C CALLS:
C OPEN - MACHINE DEPENDENT
C
C   PROGRAMMED BY MADELEINE ZIRBES
C   SEPTEMBER 15, 1980
C
C
C LOGICAL UNIT NUMBER FOR EACH OUTPUT FILE
      INTEGER LUN(3,3)
C INSTRUMENT CODE FOR EACH OUTPUT FILE
      INTEGER CHN(3,3,4)
C
C   COMMON /FILES/ LUN, CHN
C
C*****
C*           MACHINE DEPENDENT           *
C*****
      IF(.NOT.(LUN(1,1) .NE.0))GOTO 23000
      OPEN(LUN(1,1), FILE='RETRV.SPZ', FORM = 'UNFORMATTED')
23000 CONTINUE
      IF(.NOT.(LUN(1,2) .NE.0))GOTO 23002
      OPEN(LUN(1,2), FILE='RETRV.SPN', FORM = 'UNFORMATTED')
23002 CONTINUE
      IF(.NOT.(LUN(1,3) .NE.0))GOTO 23004
      OPEN(LUN(1,3), FILE='RETRV.SPE', FORM = 'UNFORMATTED')
23004 CONTINUE
      IF(.NOT.(LUN(2,1) .NE.0))GOTO 23006
      OPEN(LUN(2,1), FILE='RETRV.LPZ', FORM = 'UNFORMATTED')
23006 CONTINUE
      IF(.NOT.(LUN(2,2) .NE.0))GOTO 23008
      OPEN(LUN(2,2), FILE='RETRV.LPN', FORM = 'UNFORMATTED')
23008 CONTINUE
      IF(.NOT.(LUN(2,3) .NE.0))GOTO 23010
      OPEN(LUN(2,3), FILE='RETRV.LPE', FORM = 'UNFORMATTED')
23010 CONTINUE
      IF(.NOT.(LUN(3,1) .NE.0))GOTO 23012
      OPEN(LUN(3,1), FILE='RETRV.IPZ', FORM = 'UNFORMATTED')
23012 CONTINUE
      IF(.NOT.(LUN(3,2) .NE.0))GOTO 23014
      OPEN(LUN(3,2), FILE='RETRV.IPN', FORM = 'UNFORMATTED')
23014 CONTINUE
      IF(.NOT.(LUN(3,3) .NE.0))GOTO 23016
      OPEN(LUN(3,3), FILE='RETRV.IPE', FORM = 'UNFORMATTED')
C
23016 CONTINUE
      RETURN
C
      END

```

- 126 -

CLSOUT.FORTRAN

```

SUBROUTINE CLSOUT
C
C CLSOUT WRITES OUT A NULL HEADER
C RECORD TO EACH OPEN OUTPUT FILE
C (OPENED BY OPNOUT) BEFORE
C CLOSING THAT FILE.
C
C
C CALLS:
C   CLOSE - MACHINE DEPENDENT
C
C   PROGRAMMED BY MADELEINE ZIRBES
C   SEPTEMBER 15, 1980
C
C
C LOGICAL UNIT NUMBER FOR EACH OUTPUT FILE
C   INTEGER LUN(3,3)
C INSTRUMENT CODE FOR EACH OUTPUT FILE
C   INTEGER CHN(3,3,4)
C LOOP INDEX
C   INTEGER I, J, K
C INTEGER ZERO
C   INTEGER IZERO
C INTEGER ONE
C   INTEGER IONE
C CHARACTER STRING
C   INTEGER CODE(4)
C LOGICAL UNIT NUMBER
C   INTEGER L
C FLOAT ZERO
C   REAL FZERO
C
C   COMMON /FILES/ LUN, CHN
C   DATA IZERO, IONE /0, 1/
C   DATA FZERO /0.0/
C   DATA CODE /'E', 'N', 'D', ' '/
C
C   DO 23000 I = 1,3
C     DO 23002 J = 1,3
C       IF(.NOT.(LUN(I,J) .NE. 0))GOTO 23004
C     WRITE OUT NULL HEADER
C       L = LUN(I,J)
C       WRITE(L) (CODE(K), K=1,4), (CODE(K), K=1,4), FZERO,
1         FZERO, FZERO, IZERO, IZERO, IZERO, IZERO, FZERO, FZERO,
1         FZERO, IONE, CMPLX(FZERO, FZERO), IONE, CMPLX(FZERO,
1         FZERO)
C*****
C*               MACHINE DEPENDENT               *
C*****
C       CLOSE(L)
C       LUN(I,J) = 0
23004   CONTINUE
23002   CONTINUE
23000   CONTINUE
C
C   RETURN
C
C   END

```


- 127 -

GETRQT.FORTRAN

```
      SUBROUTINE GETRQT(DR)
C
C GETRQT READS A NETWORK DAY TAPE
C AND TRYS TO SATISFY EACH REQUEST.
C
C GETRQT USES A COLON IN A FORMAT
C STATEMENT. THIS MAY NOT BE
C AVAILABLE ON ALL MACHINES.
C
C
C CALLS:
C DAYMO
C FILREQ
C GETCAL
C GETCPZ
C GETLIN
C HEAD
C ISTREQ
C MAGRD - USER SUPPLIED
C RDNTLG
C REQ
C SETFLG
C STADAT
C
C PROGRAMMED BY MADELEINE ZIRBES
C SEPTEMBER 15, 1980
C
C TAPE DRIVE LOGICAL UNIT - INPUT
C INTEGER DR
C
C
C TAPE HEADER INFORMATION
C
C STATION ID
C INTEGER ID
C INSTRUMENT
C INTEGER INSTR
C YEAR
C INTEGER YEAR
C DAY OF YEAR
C INTEGER DOFY
C HOUR
C INTEGER HOUR
C MINUTE
C INTEGER MIN
C SECOND
C INTEGER SEC
C MILLISECONDS
C REAL MSS
C FORMAT ID
C INTEGER NFORM
C NUMBER OF CHANNELS
C INTEGER NCHAN
C NUMBER OF SAMPLES
C INTEGER NSAMP
C SAMPLING RATE
C REAL RATE
C
C REQUEST INFORMATION
C 50 - MAXIMUM NUMBER OF REQUESTS ALLOWED
C
C REQUEST INFORMATION
```

- 128 -

C NUMBER OF REQUESTS
INTEGER NREQ
C STATION CODE - CHARACTER STRING
INTEGER RCODE(50,4)
C INSTRUMENT ID
INTEGER RINSTR(50)
C YEAR
INTEGER RYEAR(50)
C MONTH
INTEGER RMONTH(50)
C DAY
INTEGER RDAY(50)
C HOUR
INTEGER RHOUR(50)
C MINUTE
INTEGER RMIN(50)
C SECONDS
INTEGER RSEC(50)
C LENGTH IN SECONDS
REAL RLEN(50)
C LOGICAL UNIT NUMBER
INTEGER RLUN(50,3,3)
C INSTRUMENT CODE - CHARACTER STRING
INTEGER RCHN(50,3,3,4)
C STATION FLAG
INTEGER RFLG(50)
C
C STATION INFORMATION
C
C STATION CODE - CHARACTER STRING
INTEGER CODE(4)
C NUMBER OF POLES, 20 LARGEST NUMBER OF SRO POLES
INTEGER NP
C NUMBER OF ZEROES, 10 LARGEST NUMBER OF SRO ZEROES
INTEGER NZ
C NUMBER OF CHANNELS
INTEGER ICHAN
C CONSTANT
REAL A0(3)
C CALIBRATION CONSTANT
REAL CAL(3)
C STATION ELEVATION
REAL ELEV
C STATION LATITUDE
REAL LAT
C STATION LONGITUDE
REAL LON
C POLES
COMPLEX POLES(20,3)
C ZEROES
COMPLEX ZEROES(10,3)
C
C START TIME OF DATA
C
C YEAR
INTEGER SYEAR
C DAY OF YEAR
INTEGER SDOFY
C HOUR
INTEGER SHOUR
C MINUTES
INTEGER SMIN
C SECONDS
REAL SSECS
C

- 130 -

```

C  FOR
23000 CONTINUE
C
C  READ NETWORK DAY TAPE LOG(S)
C
    I = MAGRD(DR, NWORDS, IDATA, NR)
    IF(.NOT.(I.EQ. 0))GOTO 23003
    GOTO 23002
C
C  GET DATA FROM NETWORK LOG
C
C  ELSE
23003  CONTINUE
        IF(.NOT.(I.EQ. 1))GOTO 23005
        CALL RDNTLG(IDATA)
        GOTO 23006
C
C  ELSE
23005  CONTINUE
        WRITE(6,10)
10      FORMAT(1X, 'ERROR READING - NETWORK DAY TAPE LOG.')
23006  CONTINUE
23004  CONTINUE
        GOTO 23000
C  ENDFOR
23002 CONTINUE
C
C  READ STATION LOG
C
    IF(.NOT.(MAGRD(DR, NWORDS, IDATA, NR) .NE. 1))GOTO 23007
    WRITE(6,11)

```

```
C 500 - BUFFER SIZE OF DATA RECORD ON DISK
C
C VERTICAL BUFFER
    REAL Z(500)
C NORTH-SOUTH BUFFER
    REAL N(500)
C EAST-WEST BUFFER
    REAL E(500)
C NUMBER OF POINTS IN BUFFERS
    REAL SPTS
C TOTAL NUMBER OF POINTS READ TO FILL REQUEST
    REAL PTS
C FUNCTION
    INTEGER MAGRD
C ERROR CODE
    INTEGER IERR
    INTEGER NWORDS
    INTEGER NR
C BINARY DATA
    INTEGER IDATA(1000)
C SET TO HOLD 16000 BITS OF TAPE RECORD INPUT
C USER REQUEST BEING SATISFIED
    INTEGER INDX
    INTEGER I, J
    INTEGER IBUFF(80)
    INTEGER KUS, KUT
    INTEGER RDFLAG
C FUNCTION
    INTEGER REQ
C FUNCTION
    INTEGER GETCAL
C FUNCTION
    INTEGER DAYMO
C FUNCTION
    INTEGER ISTREQ
    INTEGER FLAG
    INTEGER KALL(4)
C MONTH
    INTEGER MON
C DAY
    INTEGER IDY
C INSTRUMENT
    INTEGER LINSTR
    REAL RSTART
C
COMMON /HEADER/ ID, INSTR, YEAR, DOFY, HOUR, MIN, SEC, MSS, NFORM,
1 NCHAN, NSAMP, RATE
C
COMMON /REQSTS/ NREQ,RCODE,RINSTR,RYEAR,RMONTH,RDAY, RHOUR,RMIN,
1 RSEC,RLEN,RLUN,RCHN,RFLG
C
COMMON /STINFO/ CODE, ICHAN, NP, NZ, LAT, LON, ELEV, AO, CAL,
1 POLES, ZEROES
C
COMMON /SSTART/ SYEAR, SDOFY, SHOUR, SMIN, SSECS
COMMON /BUFFER/ Z, N, E, SPTS, PTS
DATA NWORDS/1000/
DATA KALL /'A','L','L',''/
DATA KUS, KUT /'S','T'/
DATA CODE /' ',' ',' ',' '/
```

C NETWORK DAY TAPE FORMAT
C
C
C
C

- 131 -

```

11  FORMAT(1X, 'ERROR READING - STATION LOG EXPECTED.')
C
C LOOP ONCE FOR EACH STATION
C
23007 CONTINUE
C  FOR
23009 CONTINUE
C
      IF(.NOT.(MAGRD(DR, NWORDS, IDATA, NR) .NE. 0))GOTO 23012
      WRITE (6,12)
12  FORMAT (1X,
1    'ERROR READING - EOF EXPECTED AFTER STATION LOG.')
C
C BEFORE READING NEW STATION LOG,
C CHECK TO SEE IF THERE ARE ANY
C MORE REQUESTS TO SATISFY.
C IF NOT, RETURN TO MAIN PROGRAM.
C
C
C SET REQUEST FLAG TO TRUE FOR ALL REQUESTS THAT
C HAVE THE REQUESTED STATION EQUAL TO 'ALL'
C
23012 CONTINUE
      CALL SETFLG(KALL, 1)
C
C SET REQUEST FLAG TO FALSE FOR ALL REQUESTS THAT
C MATCH THE PREVIOUS STATION CODE. EVEN IF THEY
C WERE NOT SATISFIED, NO MORE DATA FOR THAT STATION
C REMAINS ON THE TAPE.
C
      CALL SETFLG(CODE, 0)
C
C ARE THERE ANY OUTSTANDING REQUESTS?
C
      FLAG = 0
      DO 23014 I = 1,NREQ
        IF(.NOT.(RFLG(I) .EQ. 1))GOTO 23016
        FLAG = 1
        GOTO 23015
23016 CONTINUE
23014 CONTINUE
23015 CONTINUE
      IF(.NOT.(FLAG .EQ. 0))GOTO 23018
      RETURN
C
C GET STATION DATA - LATITUDE, LONGITUDE, ELEVATION, INSTRUMENT TYPE
C
23018 CONTINUE
      CALL STADAT(IDATA, CODE, LAT, LON, ELEV)
C
C  FOR
23020 CONTINUE
C
C IF MAGRD == 0, END OF TAPE
C
      IF(.NOT.(MAGRD(DR, NWORDS, IDATA, NR) .EQ. 0))GOTO 23023
      RETURN
C
C IF THE FIRST TWO CHARACTERS OF THE FIRST LINE OF THE BUFFER
C EQUALS 'ST', THIS IS A STATION LOG
C
23023 CONTINUE
      CALL GETLIN(IDATA, 1, IBUFF)
      IF(.NOT.(IBUFF(1) .EQ. KUS .AND. IBUFF(2) .EQ. KUT))GOTO 230
1    25

```

- 132 -

```

      GOTO 23022
C
C   IF THIS WAS NOT A STATION LOG, IT IS A DATA LOG.
C   GET DATA FROM FIRST DATA LOG RECORD -
C   AVE CALIBRATION VALUES FOR EACH CHANNEL.
C
23025   CONTINUE
      IF(.NOT.(GETCAL(IDATA,ICHAN,CAL,LINSTR) .EQ. 0))GOTO 23027
      WRITE(6,13)
13      FORMAT(1X, 'ERROR READING - CALIBRATION')
C
C   CHECK TO SEE OF THE USER HAS REQUESTED INFORMATION
C   TO BE EXTRACTED FROM THIS STATION AND INSTRUMENT
C
23027   CONTINUE
      FLAG = 0
      DO 23029 I = 1,NREQ
C
C   RESET THE REQUEST FLAG TO TRUE
C   1.) IF THE REQUESTED STATION CODE IS 'ALL'
C   AND THE REQUESTED INSTRUMENT MATCHES
C   THE CURRENT INSTRUMENT, OR
C   2.) IF THE REQUESTED STATION CODE MATCHES
C   THE CURRENT STATION, AND THE REQUESTED
C   INSTRUMENT MATCHES THE CURRENT INSTRUMENT.
C
      IF(.NOT.((ISTREQ(RCODE, KALL, I) .EQ. 1) .OR. (ISTREQ(
1      RCODE, CODE, I) .EQ. 1).AND. ((RINSTR(I) .EQ. LINSTR)
1      .OR. (RINSTR(I) .EQ. 0))))GOTO 23031
      FLAG = 1
      RFLG(I) = 1
23031   CONTINUE
23029   CONTINUE
C
      IF(.NOT.(FLAG .EQ. 0))GOTO 23033
C
C   IF THE USER HAS NOT REQUESTED THIS STATION,
C   READ RECORDS UNTIL AN END-OF-FILE HAS BEEN FOUND
C
C   FOR
23035   CONTINUE
      IF(.NOT.(MAGRD(DR, NWORDS, IDATA, NR) .EQ. 0))GOTO 230
1      36
      GOTO 23037
23036   CONTINUE
      GOTO 23035
C   ENDFOR
23037   CONTINUE
      GOTO 23021
C
C   GET DATA FROM SECOND DATA LOG RECORD - CONSTANTS, POLES, ZEROES
C
23033   CONTINUE
      IF(.NOT.(MAGRD(DR, NWORDS, IDATA, NR) .NE. 1))GOTO 23040
      WRITE(6,14)
14      FORMAT(1X, 'ERROR READING - DATA LOG 2.')
C
23040   CONTINUE
      CALL GETCPZ(IDATA,ICHAN,A0,NP,POLES,NZ,ZEROES)
C
C   READ THIRD DATA LOG RECORD
C   NO INFORMATION IS NEEDED FROM THE THIRD DATA LOG
C
      IF(.NOT.(MAGRD(DR, NWORDS, IDATA, NR) .NE. 1))GOTO 23042
      WRITE(6,15)

```

23059 CONTINUE
23045 GOTO 23044
C ENDFOR
23046 CONTINUE
C
23021 GOTO 23020
C ENDFOR
23022 CONTINUE
C
 GOTO 23009
C ENDFOR
23011 CONTINUE
C
 END

- 133 -

```

15      FORMAT(1X, 'ERROR READING - DATA LOG 3.')
C
C      READ BINARY RECORDS
C
23042      CONTINUE
          INDX = 0
          RDFLAG = 1
C
C      FOR
23044      CONTINUE
C
          IF(.NOT.(RDFLAG .EQ. 1))GOTO 23047
C
          IF MAGRD == 0, END OF BINARY RECORDS
C
          IF(.NOT.(MAGRD(DR, NWORDS, IDATA, NR) .EQ. 0))GOTO 230
1          49
          GOTO 23046
C
C      INTERPRET BINARY HEADER DATA
C
23049      CONTINUE
          CALL HEAD(IDATA)
23047      CONTINUE
          RDFLAG = 1
C
C      WILL THIS RECORD SATISFY A REQUEST?
C
          IF(.NOT.(REQ(CODE, INDX, RSTART) .EQ. 0))GOTO 23051
          GOTO 23045
C
C
C      FILL REQUEST
C
23051      CONTINUE
          PTS = 0.
          IERR = 1
          CALL FILREQ(DR, INDX, RSTART, RDFLAG, IDATA, IERR)
C
          IF(.NOT.(IERR .EQ. -1 ))GOTO 23053
          WRITE(6,16)
16          FORMAT(1X, 'ERROR READING - COULD NOT FILL REQUEST.')
          GOTO 23045
C
C      PRINT INFORMATION STATING WHICH REQUEST WAS SATISFIED
C
23053      CONTINUE
          DO 23055 I = 1,3
              IF(.NOT.(RLUN(INDX,INSTR,I) .NE. 0))GOTO 23057
              FLAG = DAYMO(SDOFY, MON, IDY, SYEAR)
              WRITE(6, 20)(CODE(J), J=1,4), (RCHN(INDX,INSTR,I,J)
1              , J=1,4), SYEAR, MON, IDY, SHOUR, SMIN, SSECS,
1              PTS/RATE
C*****
C*          MACHINE DEPENDENT          *
C*****
20          FORMAT(1X,2(4A1,1X),I4,1X,2(I2,1X),2(I2,' '),F5.2,
1          1X,F10.3)
23057      CONTINUE
23055      CONTINUE
C
C      END OF FILE
C
          IF(.NOT.(IERR .EQ. 0))GOTO 23059
          GOTO 23046

```


RDNTLG.FORTRAN

```

      SUBROUTINE RDNTLG (IDATA)
C
C RDNTLG SCANS A NETWORK DAY TAPE
C LOG FOR THE STATIONS RECORDED
C ON THE TAPE. RDNTLG SETS A FLAG FOR
C THE REQUEST INFORMATION.
C
C
C CALLS:
C  GETLIN
C  GETSTR
C  SETFLG
C
C   PROGRAMMED BY MADELEINE ZIRBES
C   SEPTEMBER 15, 1980
C
C DATA RECORD
C   INTEGER IDATA(1)
C
C   INTEGER KBL
C STATION CODE - CHARACTER STRING
C   INTEGER CODE(4)
C CHARACTER BUFFER
C   INTEGER Ibuff(80)
C   INTEGER M, I, IFL
C LOOP INDEX
C   INTEGER LINE
C   DATA KBL / ' ' /
C
C   DO 23000 LINE = 8,25
C     CALL GETLIN(IDATA, LINE, Ibuff)
C
C   CHECK COLUMN ONE FOR STATION CODE
C
C     DO 23002 I = 1, 4
C       CODE(I) = KBL
23002  CONTINUE
C     CALL GETSTR(6, 9, Ibuff, M, IFL, I, 4, CODE)
C     IF(.NOT.(CODE(1) .EQ. KBL .AND.CODE(2) .EQ. KBL .AND.CODE(3)
1     .EQ. KBL .AND.CODE(4) .EQ. KBL))GOTO 23004
C     GOTO 23001
23004  CONTINUE
C     CALL SETFLG(CODE, 1)
C
C   CHECK COLUMN TWO FOR STATION CODE
C
C     DO 23006 I = 1, 4
C       CODE(I) = KBL
23006  CONTINUE
C     CALL GETSTR(41, 44, Ibuff, M, IFL, I, 4, CODE)
C     IF(.NOT.( .NOT.(CODE(1) .EQ. KBL .AND.CODE(2) .EQ. KBL .AND.
1     CODE(3) .EQ. KBL .AND.CODE(4) .EQ. KBL)))GOTO 23008
C     CALL SETFLG(CODE, 1)
23008  CONTINUE
23000  CONTINUE
23001 CONTINUE
C
C   RETURN
C
C   END

```

- 136 -

SETFLG.FORTRAN

```

SUBROUTINE SETFLG (CODE, FLAG)
C
C SETFLG LOOPS THROUGH THE REQUESTS
C AND SETS RFLG(I) TO FLAG IF CODE AND
C RCODE ARE EQUAL.
C
C
C CALLS:
C  ISTREQ
C
C   PROGRAMMED BY MADELEINE ZIRBES
C   SEPTEMBER 15, 1980
C
C STATION CODE - INPUT
C   INTEGER CODE(4)
C STATION FLAG - INPUT
C   INTEGER FLAG
C
C
C REQUEST INFORMATION
C 50 - MAXIMUM NUMBER OF REQUESTS ALLOWED
C
C REQUEST INFORMATION
C NUMBER OF REQUESTS
C   INTEGER NREQ
C STATION CODE - CHARACTER STRING
C   INTEGER RCODE(50,4)
C INSTRUMENT ID
C   INTEGER RINSTR(50)
C YEAR
C   INTEGER RYEAR(50)
C MONTH
C   INTEGER RMONTH(50)
C DAY
C   INTEGER RDAY(50)
C HOUR
C   INTEGER RHOUR(50)
C MINUTE
C   INTEGER RMIN(50)
C SECONDS
C   INTEGER RSEC(50)
C LENGTH IN SECONDS
C   REAL RLEN(50)
C LOGICAL UNIT NUMBER
C   INTEGER RLUN(50,3,3)
C INSTRUMENT CODE - CHARACTER STRING
C   INTEGER RCHN(50,3,3,4)
C STATION FLAG
C   INTEGER RFLG(50)
C   INTEGER I
C   INTEGER ISTREQ
C
C   COMMON /REQSTS/ NREQ,RCODE,RINSTR,RYEAR,RMONTH,RDAY, RHOUR,RMIN,
C   1 RSEC,RLEN,RLUN,RCHN,RFLG
C
C   DO 23000 I = 1,NREQ
C     IF(.NOT.(ISTREQ(RCODE, CODE, I) .EQ. 1))GOTO 23002
C     RFLG(I) = FLAG
23002 CONTINUE
23000 CONTINUE
C
C   RETURN

```

- 137 -

C
END

- 138 -

STADAT.FORTRAN

```
SUBROUTINE STADAT(IDATA, CODE, LAT, LON, ELEV)
C
C STADAT SCANS A STATION LOG FOR THE
C STATION CODE, LATITUDE, LONGITUDE, AND
C ELEVATION.
C
C
C CALLS:
C FFIN
C GETLIN
C GETSTR
C
C PROGRAMMED BY MADELEINE ZIRBES
C SEPTEMBER 15, 1980
C
C DATA RECORD - INPUT
C   INTEGER IDATA(1)
C STATION CODE - OUPUT
C   INTEGER CODE(4)
C STATION LATITUDE - OUTPUT
C   REAL LAT
C STATION LONGITUDE - OUTPUT
C   REAL LON
C STATION ELEVATION - OUTPUT
C   REAL ELEV
C
C   INTEGER KUS, KUW, KBL
C   INTEGER I
C   INTEGER M
C   INTEGER IFL
C   INTEGER IBUFF(80)
C   INTEGER L
C FUNCTION
C   REAL FFIN
C   DATA KUS, KUW, KBL /'S', 'W', ' '/
C
C   DO 23000 I = 1,4
C     CODE(I) = KHL
C 23000 CONTINUE
C   CALL GETLIN(IDATA, 5, IBUFF)
C
C   CALL GETSTR(20, 80, IBUFF, M, IFL, I, 4, CODE)
C
C LATITUDE
C
C   LAT = FFIN(36, 80, IBUFF, M, IFL)
C   IF(.NOT.(IFL.EQ. KUS))GOTO 23002
C   LAT = -LAT
C
C LONGITUDE
C
C 23002 CONTINUE
C   L = M + 1
C   LON = FFIN(L, 80, IBUFF, M, IFL)
C   IF(.NOT.(IFL.EQ. KUW))GOTO 23004
C   LON = -LON
C
C ELEVATION
C
C 23004 CONTINUE
C   L = M + 1
C   ELEV = FFIN(L, 80, IBUFF, M, IFL)
```

- 139 -

C

RETURN
END

- 140 -

GETCAL.FORTRAN

```

      INTEGER FUNCTION GETCAL(IDATA, ICHAN, CAL, LINSTR)
C
C FUNCTION GETCAL SCANS DATA LOG 1 FOR
C CALIBRATION CONSTANT(S).
C THE CALIBRATION CONSTANTS ARE THE
C AMPLITUDE IN COUNTS OF A SINUSOID
C AT THE PRIMARY REFERENCE PERIOD
C (1 SEC FOR SHORT PERIOD AND 25 FOR
C LONG PERIOD).
C GETCAL ALSO RETURNS IN LINSTR
C THE TYPE OF INSTRUMENT,
C 1 FOR SHORT PERIOD,
C 2 FOR LONG PERIOD, AND
C 3 FOR INTERMEDIATE PERIOD DATA.
C
C
C CALLS:
C FFIN
C GETLIN
C GETSTR
C
C   PROGRAMMED BY MADELEINE ZIRBES
C   SEPTEMBER 15, 1980
C
C DATA RECORD - INPUT
C   INTEGER IDATA(1)
C SET TO HOLD 18000 BITS OF TAPE INPUT RECORD
C NUMBER OF CHANNELS - OUTPUT
C   INTEGER ICHAN
C CALIBRATION CONSTANT - OUTPUT
C   REAL CAL(3)
C INSTRUMENT
C   INTEGER LINSTR
C
C   INTEGER KUC, KUI, KUL, KUS
C   INTEGER I
C   INTEGER LINE
C   INTEGER K
C   INTEGER IFL, M
C   INTEGER IBUFF(80)
C   INTEGER CODE
C FUNCTION
C   REAL FFIN
C   DATA KUC, KUI, KUL, KUS /'C', 'T', 'L', 'S'/
C
C GET NUMBER OF CHANNELS
C
C   CALL GETLIN (IDATA, 1, IBUFF)
C   ICHAN = INT(FFIN(13, 80, IBUFF, K, IFL))
C   IF(.NOT. (.NOT. ((ICHAN .GT. 0) .AND. (IFL .EQ. KUC))))GOTO 23000
C   GETCAL = (0)
C   RETURN
C
C DETERMINE TYPE OF INSTRUMENT
C
C 23000 CONTINUE
C   CALL GETSTR (28, 28, IBUFF, M, IFL, I, 1, CODE)
C   IF(.NOT. (CODE .EQ. KUS))GOTO 23002
C   LINSTR = 1
C   GOTO 23003
C ELSE
C 23002 CONTINUE

```

- 141 -

```
      IF(.NOT.(CODE.EQ.KUL))GOTO 23004
      LINSTR = 2
      GOTO 23005
C      ELSE
23004      CONTINUE
      IF(.NOT.(CODE.EQ.KUI))GOTO 23006
      LINSTR = 3
C
C      ERROR
C
      GOTO 23007
C      ELSE
23006      CONTINUE
      LINSTR = -1
23007      CONTINUE
23005      CONTINUE
23003      CONTINUE
C
C      GET CALIBRATION VALUES
C
      LINE = 7
      DO 23008 I = 1,ICHAN
      LINE = LINE + 2
      CALL GETLIN (IDATA, LINE, IBUFF)
      CAL(I) = FFIN (51, 80, IBUFF, K, IFL)
23008      CONTINUE
C
      GETCAL = (1)
      RETURN
C
      END
```

- 142 -

GETCPZ.FORTRAN

```

SUBROUTINE GETCPZ(IDATA, ICHAN, A0, NP, POLES, NZ, ZEROES)
C
C GETCPZ SCANS DATA LOG 2 FOR THE
C CONSTANT(S), POLES AND ZEROES
C OF THE INSTRUMENT TRANSFER
C FUNCTION(S).
C
C
C CALLS:
C   FFIN
C   GETLIN
C
C   PROGRAMMED BY MADELEINE ZIRBES
C   SEPTEMBER 15, 1980
C
C CHARACTER BUFFER - INPUT
C   INTEGER IDATA(1)
C SET TO HOLD 16000 BITS OF TAPE RECORD INPUT
C NUMBER OF CHANNELS - INPUT
C   INTEGER ICHAN
C CONSTANT - OUTPUT
C   REAL A0(3)
C NUMBER OF POLES - OUTPUT
C   INTEGER NP
C POLES - OUTPUT
C   COMPLEX POLES(20,3)
C NUMBER OF ZEROES - OUTPUT
C   INTEGER NZ
C ZEROES - OUTPUT
C   COMPLEX ZEROES(10,3)
C
C   INTEGER KUA, KUP, KUS, KUZ
C   INTEGER I, J, M, K, L, M2
C CHARACTER BUFFER
C   INTEGER IBUFF(80)
C   INTEGER LINE
C   INTEGER IFL
C   INTEGER ITF
C FUNCTION
C   REAL FFIN
C   REAL A(6)
C   DATA KUA, KUP, KUS, KUZ /'A', 'P', 'S', 'Z'/
C
C INITIALIZE VALUES
C
C   A0(1) = 0.0
C   A0(2) = 0.0
C   A0(3) = 0.0
C   L = 2*ICHAN
C
C CONSTANT
C
C DETERMINE WHAT LINE TO START READING THE CONSTANTS AND
C WHERE ON THAT LINE TO BEGIN
C
C   LINE = 1
C   FOR
23000 CONTINUE
C   CALL GETLIN (IDATA, LINE, IBUFF)
C   K = INT(FFIN (1, 80, IBUFF, M, IFL))
C   IF(.NOT.(IFL.EQ. KUA))GOTO 23003
C   M = M + 2

```


- 143 -

```

      AO(1) = FFIN(M, 80, IBUFF, M2, IFL)
      IF(.NOT.(AO(1) .NE. 0.0))GOTO 23005
      GOTO 23002
23005  CONTINUE
23003  CONTINUE
      LINE = LINE + 1
      GOTO 23000
C  ENDFOR
23002 CONTINUE
C
CTHE LINE JUST READ IN LOOKS LIKE ONE OF THESE TWO LINES -
C
C  AO  +.669E+10
C  AO  +.932E+05      +.194E+06      +.132E+06
C
      DO 23007 I = 1, ICHAN
      AO(I) = FFIN (M, 80, IBUFF, M2, IFL)
      IF(.NOT.(M2 .GE. 80))GOTO 23009
      GOTO 23008
23009  CONTINUE
      M = M2
23007  CONTINUE
23008 CONTINUE
C
C IF ALL THE CONSTANTS ARE THE SAME, THEY ARE NOT
C REPEATED. SET ALL VALUES TO AO(1)
C
      IF(.NOT.( (ICHAN .EQ. 3) .AND. ( (AO(2) .EQ. 0.0) .OR. (AO(3)
1 .EQ. 0.0) ) ))GOTO 23011
      AO(2) = AO(1)
      AO(3) = AO(1)
C
CPOLES
C
23011 CONTINUE
      DO 23013 I = 1, 20
C
C  READ IN NEXT LINE
C
      LINE = LINE + 1
      CALL GETLIN (IDATA, LINE, IBUFF)
      K = INT(FFIN (1, 80, IBUFF, M, IFL))
C
C  IFL SHOULD EQUAL 'P' OR 'Z'
C
      IF(.NOT.(IFL .NE. KUP))GOTO 23015
      GOTO 23014
C
C  NP EQUALS THE NUMBER OF THE POLE TO BE READ
C
23015  CONTINUE
      NP = INT(FFIN (M+1, 80, IBUFF, M, IFL))
C
      A(1) = 0.0
      A(2) = 0.0
      DO 23017 J = 1, L
      A(J) = FFIN(M, 80, IBUFF, M2, IFL)
      M = M2 + 1
C
C  IF M >= 80, READ TO END OF LINE
C
      IF(.NOT.(M .GE. 80))GOTO 23019
      GOTO 23018
23019  CONTINUE
23017  CONTINUE

```

- 144 -

```

23018 CONTINUE
C
C IF J == 1 THE LINE JUST READ LOOKS LIKE THIS -
C
C P03 -.117E+00
C
C IF J == 2 THE LINE JUST READ LOOKS LIKE THIS -
C
C P01 -.454E+01,+.330E+01
C
      IF(.NOT.(J.EQ. 1.OR. J.EQ. 2))GOTO 23021
      DO 23023 K = 1,ICHAN
        POLES(NP,K) = CMPLX(A(1), A(2))
23023 CONTINUE
C
C IF J = 3 ONLY THE REAL PARTS OF THE POLES WERE READ IN
C IF J == 3 THE LINE JUST READ LOOKS LIKE THIS -
C
C P03 -.117E+00          -.125E+00          -.125E+00
C
      GOTO 23022
C ELSE
23021 CONTINUE
      IF(.NOT.(J.EQ. 3))GOTO 23025
      DO 23027 K = 1,ICHAN
        POLES(NP,K) = CMPLX(A(K), 0.0)
23027 CONTINUE
C
C ELSE 6 VALUES WERE READ IN
C IF J == 6 THE LINE JUST READ LOOKS LIKE THIS -
C
C P01 -.454E+01,+.330E+01 -.422E+01,+.420E+01 -.493E+01,+.381E+01
C
      GOTO 23026
C ELSE
23025 CONTINUE
      J = 1
      DO 23029 K = 1,ICHAN
        POLES(NP,K) = CMPLX(A(J), A(J+1))
        J = J + 2
23029 CONTINUE
23026 CONTINUE
23022 CONTINUE
23019 CONTINUE
23014 CONTINUE
C
CZEROES
C
C REREAD LAST LINE
C
      LINE = LINE - 1
      DO 23031 I = 1,10
C
C INITIALIZE
C
      ITF = 0
      LINE = LINE + 1
      CALL GETLIN (IDATA, LINE, IBUFF)
      K = INT(FFIN (1, 80, IBUFF, M, IFL))
C
C IFL SHOULD EQUAL 'Z' OR 'S'
C
      IF(.NOT.(IFL.NE. KUZ))GOTO 23033
      GOTO 23032
C

```

- 145 -

```

C  NZ EQUALS THE NUMBER OF THE ZERO TO BE READ
C
23033  CONTINUE
      NZ = INT(FFIN (M+1, 80, IBUFF, M, IFL))
C
C  IF M>15, THE NEXT VALUE READ WILL
C  BE THE IMAGINARY PART OF THE ZERO.
C  THIS MEANS NO DELIMITER (,) WAS USED
C  TO SEPARATE THE REAL PART (WHICH WAS
C  BLANK) AND THE IMAGINARY PART.
C
      IF(.NOT.(M .GT. 15))GOTO 23035
      ITF = 1
C
23035  CONTINUE
      A(1) = 0.0
      A(2) = 0.0
      DO 23037 J = 1,L
        A(J) = FFIN(M, 80, IBUFF, M2, IFL)
        M = M2 + 1
        IF(.NOT.(IFL .EQ. KUS))GOTO 23039
        GOTO 23032
23039  CONTINUE
        IF(.NOT.(M .GE. 80))GOTO 23041
        GOTO 23038
23041  CONTINUE
23037  CONTINUE
23038  CONTINUE
C
C  IF J == 1 THE LINE JUST READ LOOKS LIKE THIS -
C
C  Z01  -.126E+01
C  IF J == 2 THE LINE JUST READ LOOKS LIKE THIS -
C
C  Z04      ,-.105E+01
C
      IF(.NOT.( ( (J .EQ. 1) .OR. (J .EQ. 2) ) .AND. (ICHAN .EQ. 1)))
1      GOTO 23043
        IF(.NOT.(ITF .EQ. 0))GOTO 23045
        ZEROES(NZ,1) = CMPLX(A(1), A(2))
        GOTO 23046
C      ELSE
23045  CONTINUE
        ZEROES(NZ,1) = CMPLX(0.0, A(1))
23046  CONTINUE
C
        GOTO 23044
C      ELSE
23043  CONTINUE
        IF(.NOT.(J .EQ. 1 .OR. J .EQ. 2))GOTO 23047
        DO 23049 K = 1,ICHAN
          ZEROES(NZ,K) = CMPLX(A(1),A(2))
23049  CONTINUE
C
C  IF J == 3 AND ITF == 0 THE LINE JUST READ LOOKS LIKE THIS -
C
C  Z01  -.126E+00      -.126E+00      -.126E+00
C
C  IF J == 3 AND ITF == 1 THE LINE JUST READ LOOKS LIKE THIS -
C
C  Z03      +.105E+01      +.105E+01      +.105E+01
C
        GOTO 23048
C      ELSE
23047  CONTINUE

```

- 146 -

```

      IF(.NOT.(J.EQ.3))GOTO 23051
      DO 23053 K = 1,ICHAN
      IF(.NOT.(ITF.EQ.0))GOTO 23055
      ZEROES(NZ,K) = CMPLX(A(K), 0.0)
      GOTO 23056
C      ELSE
23055      CONTINUE
      ZEROES(NZ,K) = CMPLX(0.0, A(K))
23056      CONTINUE
23053      CONTINUE
C
C IF J == 6 THE LINE JUST READ LOOKS LIKE THIS -
C
C Z04      ,-.105E+01      ,-.105E+01      ,-.105E+01
C
      GOTO 23052
C      ELSE
23051      CONTINUE
      J = 1
      DO 23057 K = 1,ICHAN
      ZEROES(NZ,K) = CMPLX(A(J), A(J+1))
      J = J + 2
23057      CONTINUE
23052      CONTINUE
23048      CONTINUE
23044      CONTINUE
23031      CONTINUE
23032 CONTINUE
C
C IF IFL == 'S' THE LINE JUST READ LOOKS LIKE THIS -
C
C Z05      S**5      S**5      S**5
C
      IF(.NOT.(IFL.EQ.KUS))GOTO 23059
C
C READ THE NUMBER OF ZEROES TO BE SET
C TO CMPLX(0.0, 0.0)
C
      M = M + 2
      K = INT(FFIN (M, B0, IBUFF, M2, IFL))
      DO 23061 J = 1,K
      DO 23063 I = 1,ICHAN
      ZEROES(NZ,I) = (0.0, 0.0)
23063      CONTINUE
      NZ = NZ + 1
23061      CONTINUE
C
      NZ = NZ -1
C
23059 CONTINUE
      RETURN
C
      END

```

- 147 -

REQ.FORTRAN

```
      INTEGER FUNCTION REQ(CODE, INDX, RSTART)
C
C FUNCTION REQ LOOPS THROUGH THE REQUESTS
C AND CHECKS TO SEE IF A REQUEST CAN BE
C FILLED BY DATA IN THIS RECORD. REQ RETURNS
C 1 IF A REQUEST CAN BE SATISFIED, 0 OTHERWISE.
C
C
C CALLS:
C   DOY
C   ISTREQ
C
C   PROGRAMMED BY MADELEINE ZIRBES
C   SEPTEMBER 15, 1980
C
C STATION CODE - INPUT
C   INTEGER CODE(4)
C REQUEST INDEX - OUTPUT
C   INTEGER INDX
C STARTING DATA POINT IN RECORD - OUTPUT
C   REAL RSTART
C
C
C TAPE HEADER INFORMATION
C
C STATION ID
C   INTEGER ID
C INSTRUMENT
C   INTEGER INSTR
C YEAR
C   INTEGER YEAR
C DAY OF YEAR
C   INTEGER DOFY
C HOUR
C   INTEGER HOUR
C MINUTE
C   INTEGER MIN
C SECOND
C   INTEGER SEC
C MILLISECONDS
C   REAL MSS
C FORMAT ID
C   INTEGER NFORM
C NUMBER OF CHANNELS
C   INTEGER NCHAN
C NUMBER OF SAMPLES
C   INTEGER NSAMP
C SAMPLING RATE
C   REAL RATE
C
C REQUEST INFORMATION
C 50 - MAXIMUM NUMBER OF REQUESTS ALLOWED
C
C REQUEST INFORMATION
C NUMBER OF REQUESTS
C   INTEGER NREQ
C STATION CODE - CHARACTER STRING
C   INTEGER RCODE(50,4)
C INSTRUMENT ID
C   INTEGER RINSTR(50)
C YEAR
C   INTEGER RYEAR(50)
```

- 148 -

```

C MONTH
  INTEGER RMONTH(50)
C DAY
  INTEGER RDAY(50)
C HOUR
  INTEGER RHOUR(50)
C MINUTE
  INTEGER RMIN(50)
C SECONDS
  INTEGER RSEC(50)
C LENGTH IN SECONDS
  REAL RLEN(50)
C LOGICAL UNIT NUMBER
  INTEGER RLUN(50,3,3)
C INSTRUMENT CODE - CHARACTER STRING
  INTEGER RCHN(50,3,3,4)
C STATION FLAG
  INTEGER RFLG(50)
C CHARATER STRING ALL
  INTEGER KALL(4)
C FUNCTION
  INTEGER DOY
C FUNCTION
  INTEGER LPYR
C DAY OF YEAR
  INTEGER RDOFY
C INDEX LOOP
  INTEGER I
C FUNCTION
  INTEGER ISTREQ
C CURRENT TIME IN HEADER
  REAL TIME
C END TIME OF CURRENT RECORD
  REAL TUP
C START TIME OF REQUEST
  REAL RTIME
C END TIME OF REQUEST
  REAL RUP
C
  COMMON /HEADER/ ID, INSTR, YEAR, DOFY, HOUR, MIN, SEC, MSS, NFORM,
  1 NCHAN, NSAMP, RATE
C
  COMMON /REQSTS/ NREQ,RCODE,RINSTR,RYEAR,RMONTH,RDAY, RHOUR,RMIN,
  1 RSEC,RLEN,RLUN,RCHN,RFLG
  DATA KALL /'A', 'L', 'L', ' '/
C
C
  INDX = 0
C
C LOOP OVER NUMBER OF USER REQUESTS
C
  DO 23000 I = 1,NREQ
C
  IF(.NOT.(RFLG(I) .EQ. 0))GOTO 23002
  GOTO 23000
C
C IF RCODE = ALL, USER WANTS ALL STATIONS
C IF RINSTR = 0, USER WANTS ALL CHANNELS
C
23002 CONTINUE
  IF(.NOT.( (ISTREQ(RCODE, CODE, I) .EQ. 0) .AND.(ISTREQ(RCODE,
  1 KALL, I) .EQ. 0) ))GOTO 23004
  GOTO 23000
23004 CONTINUE
  IF(.NOT.(INSTR .NE. RINSTR(I) .AND. RINSTR(I) .NE. 0))GOTO 2300

```

- 149 -

```

1 6
  GOTO 23000
C
C
23008 CONTINUE
  IF(.NOT.(YEAR .NE. RYEAR(I)))GOTO 23008
  GOTO 23000
23008 CONTINUE
  RDOFY = DOY(RMONTH(I), RDAY(I), RYEAR(I))
  TIME = FLOAT(DOFY)*86400. + FLOAT(HOUR)*3600. + FLOAT(MIN)*60.
1   + FLOAT(SEC)
  RTIME = FLOAT(RDOFY)*86400. + FLOAT(RHOUR(I))*3600. + FLOAT(
1   RMIN(I))*60. + FLOAT(RSEC(I))
C
  TUP = TIME + FLOAT(NSAMP)/(RATE*FLOAT(NCHAN))
  RUP = RTIME + FLOAT(RLEN(I))
C
C IS CURRENT TIME GREATER THAN LENGTH OF REQUEST
C OR
C IS END OF RECORD TIME LESS THAN REQUEST TIME
C
  IF(.NOT.( (TIME.GT.RUP) .OR. (TUP.LE.RTIME) ))GOTO 23010
  GOTO 23000
C
23010 CONTINUE
  RSTART = (RTIME-TIME)*RATE*FLOAT(NCHAN)
  IF(.NOT.(RSTART .LT. 0.))GOTO 23012
  RSTART = 0.
23012 CONTINUE
  IF(.NOT.(RSTART .GT. FLOAT(NSAMP)))GOTO 23014
  GOTO 23000
23014 CONTINUE
  INDX = I
C
C RECORD HAS BEEN FOUND TO
C SATISFY REQUEST
C
  REQ = (1)
  RETURN
23000 CONTINUE
C
C NO REQUEST SATISFIED BY THIS RECORD
C
  REQ = (0)
  RETURN
C
  END

```

- 150 -

FILREQ.FORTRAN

```
SUBROUTINE FILREQ(DR,INDX,RSTART,RDFLAG,IData,IERR)
C
C A RECORD SATISFYING A REQUEST HAS BEEN FOUND.
C FILREQ FILLS THIS REQUEST.
C
C
C CALLS:
C DTPFMT
C FLSBUF
C GBYTES - USER SUPPLIED
C HEAD
C MAGRD - USER SUPPLIED
C PRHEAD
C STNDRD
C TSET
C
C PROGRAMMED BY MADELEINE ZIRBES
C SEPTEMBER 15, 1980
C
C TAPE DRIVE LOGICAL UNIT - INPUT
C   INTEGER DR
C INDEX OF REQUEST - INPUT
C   INTEGER INDX
C STARTING DATA POINT IN RECORD - INPUT
C   REAL RSTART
C READING FLAG - OUTPUT
C   INTEGER RDFLAG
C DATA RECORD - INPUT
C   INTEGER IDATA(1)
C SET TO HOLD 16000 BITS OF TAPE INPUT RECORD
C ERROR CODE
C   INTEGER IERR
C
C
C TAPE HEADER INFORMATION
C
C STATION ID
C   INTEGER ID
C INSTRUMENT
C   INTEGER INSTR
C YEAR
C   INTEGER YEAR
C DAY OF YEAR
C   INTEGER DOFY
C HOUR
C   INTEGER HOUR
C MINUTE
C   INTEGER MIN
C SECOND
C   INTEGER SEC
C MILLISECONDS
C   REAL MSS
C FORMAT ID
C   INTEGER NFORM
C NUMBER OF CHANNELS
C   INTEGER NCHAN
C NUMBER OF SAMPLES
C   INTEGER NSAMP
C SAMPLING RATE
C   REAL RATE
C
C REQUEST INFORMATION
```


C 50 - MAXIMUM NUMBER OF REQUESTS ALLOWED
C
C REQUEST INFORMATION
C NUMBER OF REQUESTS
 INTEGER NREQ
C STATION CODE - CHARACTER STRING
 INTEGER RCODE(50,4)
C INSTRUMENT ID
 INTEGER RINSTR(50)
C YEAR
 INTEGER RYEAR(50)
C MONTH
 INTEGER RMONTH(50)
C DAY
 INTEGER RDAY(50)
C HOUR
 INTEGER RHOUR(50)
C MINUTE
 INTEGER RMIN(50)
C SECONDS
 INTEGER RSEC(50)
C LENGTH IN SECONDS
 REAL RLEN(50)
C LOGICAL UNIT NUMBER
 INTEGER RLUN(50,3,3)
C INSTRUMENT CODE - CHARACTER STRING
 INTEGER RCHN(50,3,3,4)
C STATION FLAG
 INTEGER RFLG(50)
C
C STATION INFORMATION
C
C STATION CODE - CHARACTER STRING
 INTEGER CODE(4)
C NUMBER OF POLES, 20 LARGEST NUMBER OF SRO POLES
 INTEGER NP
C NUMBER OF ZEROES, 10 LARGEST NUMBER OF SRO ZEROES
 INTEGER NZ
C NUMBER OF CHANNELS
 INTEGER ICHAN
C CONSTANT
 REAL AO(3)
C CALIBRATION CONSTANT
 REAL CAL(3)
C STATION ELEVATION
 REAL ELEV
C STATION LATITUDE
 REAL LAT
C STATION LONGITUDE
 REAL LON
C POLES
 COMPLEX POLES(20,3)
C ZEROES
 COMPLEX ZEROES(10,3)
C
C START TIME OF DATA
C
C YEAR
 INTEGER SYEAR
C DAY OF YEAR
 INTEGER SDOFY
C HOUR
 INTEGER SHOUR
C MINUTES
 INTEGER SMIN

C SECONDS
REAL SSECS
C
C 500 - BUFFER SIZE OF DATA RECORD ON DISK
C
C VERTICAL BUFFER
REAL Z(500)
C NORTH-SOUTH BUFFER
REAL N(500)
C EAST-WEST BUFFER
REAL E(500)
C NUMBER OF POINTS IN BUFFERS
REAL SPTS
C TOTAL NUMBER OF POINTS READ TO FILL REQUEST
REAL PTS
C LOOP LIMITS
INTEGER N1,N2
C EXPECTED TIME OF NEXT RECORD
C YEAR
INTEGER UYEAR
C DAY OF YEAR
INTEGER UDOFY
C HOUR
INTEGER UHOUR
C MINUTE
INTEGER UMIN
C SECONDS
INTEGER USEC
C MILLISECONDS
REAL UMS
C FUNCTION
INTEGER MAGRD
C SECONDS
INTEGER SSEC
C NUMBER OF FRAMES OF DATA TO READ
INTEGER NWORDS
C NUMBER OF FRAMES READ
INTEGER NR
C SIZE OF 990 DETERMINED BY DATA RECORD ON TAPE
C MANTISSA
INTEGER MANT(990)
C CHARACTERISTIC
INTEGER NCHAR(990)
C LOOP INDEX
INTEGER I
C INT OF SPTS
INTEGER LPTS
C FUNCTION
REAL DTPFMT
C MILLISECONDS
REAL FMS
C MILLISECONDS
REAL SMS
C TOTAL NUMBER OF POINTS TO EXTRACT
REAL TPTS
C
COMMON /HEADER/ ID, INSTR, YEAR, DOFY, HOUR, MIN, SEC, MSS, NFORM,
1 NCHAN, NSAMP, RATE
C
COMMON /REQSTS/ NREQ,RCODE,RINSTR,RYEAR,RMONTH,RDAY, RHOUR,RMIN,
1 RSEC,RLEN,RLUN,RCHN,RFLG
C
COMMON /STINFO/ CODE, ICHAN, NP, NZ, LAT, LON, ELEV, AO, CAL,
1 POLES, ZEROES
C

- 153 -

```

COMMON /SSTART/ SYEAR, SDOFY, SHOUR, SMIN, SSECS
COMMON /BUFFER/ Z, N, E, SPTS, PTS
DATA NWORDS/1000/
C
C SET START TIME OF DATA
C
  CALL TSET(SYEAR,SDOFY,SHOUR,SMIN,SSEC,SMS)
  FMS = (RSTART*1000.)/(RATE*FLOAT(NCHAN))
  SMS = SMS + FMS
  CALL STNDRD(SYEAR,SDOFY,SHOUR,SMIN,SSEC,SMS)
  SSECS = FLOAT(SSEC) + SMS/1000.0
C
  SPTS = 0.
C
C PRINT FILE HEADER
C
  CALL PRHEAD(RLUN,RCHN,INDX,INSTR)
C
C TPTS - TOTAL NUMBER OF POINTS TO RETRIEVE
C   TO SATISFY REQUEST
C
  TPTS = RATE*FLOAT(NCHAN)*RLEN(INDX)
  TPTS = RSTART + TPTS
  N1 = INT(RSTART) + 1
C
C SET EXPECTED TIME OF NEXT RECORD TO BE READ
C
  CALL TSET(UYEAR,UDOFY,UHOUR,UMIN,USEC,UMS)
  FMS = FLOAT(NSAMP)*1000./(RATE*FLOAT(NCHAN))
  UMS = UMS + FMS
  CALL STNDRD(UYEAR,UDOFY,UHOUR,UMIN,USEC,UMS)
C
C LOOP
C KEEP READING AND DECODING BINARY DATA UNTIL
C   1.) REQUEST IS SATISFIED
C   2.) END OF FILE
C   3.) ERROR
C   4.) NEXT RECORD IS NOT CONTINUOUS
C
C   FOR
23000 CONTINUE
      IF(.NOT.(NFORM.EQ.1))GOTO 23003
C SRO FORMAT
      CALL GBYTES(IDATA,MANT,164,12,4,NSAMP)
      CALL GBYTES(IDATA,NCHAR,160,4,12,NSAMP)
      GOTO 23004
C   ELSE
23003 CONTINUE
      IF(.NOT.(NFORM.EQ.2))GOTO 23005
C DWSSN FORMAT
      CALL GBYTES(IDATA,MANT,160,16,0,NSAMP)
C
23005 CONTINUE
23004 CONTINUE
      IF(.NOT.(TPTS.GT. FLOAT(NSAMP)))GOTO 23007
      N2 = NSAMP
      GOTO 23008
C   ELSE
23007 CONTINUE
      N2 = INT(TPTS)
23008 CONTINUE
C
C DECODE BINARY DATA AND FILL BUFFERS
C
  DO 23009 I = N1,N2,NCHAN

```

```

SPTS = SPTS + 1.
LPTS = INT(SPTS)
Z(LPTS) = DTPFMT(NFORM,MANT(I),NCHAR(I))
IF(.NOT.(NCHAN.EQ. 3))GOTO 23011
  N(LPTS) = DTPFMT(NFORM,MANT(I+1),NCHAR(I+1))
  E(LPTS) = DTPFMT(NFORM,MANT(I+2),NCHAR(I+2))
C
C   BUFFERS FULL - FLUSH OUTPUT
C
23011  CONTINUE
      IF(.NOT.(SPTS.EQ. 500.))GOTO 23013
      CALL FLSBUF(RLUN,INDX,INSTR,0)
      SPTS = 0.
C
23013  CONTINUE
23009  CONTINUE
C
C   USERS REQUEST IS SATISFIED - RETURN
C
      IF(.NOT.(TPTS.EQ.FLOAT(N2)))GOTO 23015
      CALL FLSBUF(RLUN,INDX,INSTR,1)
C
C   SET READING FLAG TO FALSE -
C   LEAVE RECORD IN BUFFER,
C   IT MAY SATISFY ANOTHER REQUEST
C
      RDFLAG = 0
C
C   SET REQUEST FLAG TO FALSE -
C   REQUEST SATISFIED
C
      RFLG(INDX) = 0
      RETURN
C
C   READ NEXT RECORD
C
23015  CONTINUE
      IERR = MAGRD(DR,NWORDS,IDATA,NR)
C
C   END-OF-FILE
C
      IF(.NOT.(IERR.EQ. 0))GOTO 23017
      CALL FLSBUF(RLUN,INDX,INSTR,1)
C
C   SET REQUEST FLAG TO FALSE -
C   REQUEST SATISFIED
C
      RFLG(INDX) = 0
      RETURN
C
C   ERROR
C
C   ELSE
23017  CONTINUE
      IF(.NOT.(IERR.EQ. -1 ))GOTO 23019
      CALL FLSBUF(RLUN,INDX,INSTR,1)
C
C   SET REQUEST FLAG TO TRUE -
C   REQUEST NOT SATISFIED
C
      RDFLAG = 1
      RFLG(INDX) = 1
      RETURN
C
C   DECODE HEADER INFORMATION

```

```

C
23019  CONTINUE
23018  CONTINUE
      CALL HEAD(IDATA)
C
C  CONTINUOUS DATA
C
      IF(.NOT.((UYEAR.EQ.YEAR) .AND. (UDOFY.EQ.DOFY) .AND. (UHOURL.EQ.
1  HOUR) .AND. (UMIN.EQ.MIN) .AND. (USEC.EQ.SEC) .AND. (UMS.EQ.MSS)
1  ))GOTO 23021
C
C  SET LOOP LIMITS FOR DECODING BINARY DATA
C
      N1 = 1
      TPTS = TPTS - FLOAT(N2)
C
C  SET NEXT EXPECTED TIME
C
      FMS = FLOAT(NSAMP)*1000./(RATE*FLOAT(NCHAN))
      UMS = MSS + FMS
      CALL STNDRD(UYEAR,UDOFY,UHOURL,UMIN,USEC,UMS)
C
C  DISCONTINUOUS DATA
C
      GOTO 23022
C  ELSE
23021  CONTINUE
C
C  SET READING FLAG TO FALSE -
C  LEAVE RECORD IN BUFFER,
C  IT MAY SATISFY ANOTHER REQUEST
C
      RDFLAG = 0
      CALL FLSBUF(RLUN,INDX,INSTR,1)
C
C  SET REQUEST FLAG TO TRUE -
C  REQUEST NOT SATISFIED
C
      RFLG(INDX) = 1
      RETURN
23022  CONTINUE
      GOTO 23000
C  ENDFOR
23002  CONTINUE
      END

```

PRHEAD.FORTRAN

```
SUBROUTINE PRHEAD(FID,CHAN,L,M)
C
C PRHEAD WRITES A HEADER RECORD TO
C THE APPROPRIATE OUTPUT FILES.
C
C
C CALLS NO OTHER ROUTINE.
C
C   PROGRAMMED BY MADELEINE ZIRBES
C   SEPTEMBER 15, 1980
C
C LOGICAL UNIT NUMBER - INPUT
C   INTEGER FID(50,3,3)
C INSTRUMENT CODE - INPUT
C   INTEGER CHAN(50,3,3,4)
C REQUEST INDEX - INPUT
C   INTEGER L
C INSTRUMENT INDEX - INPUT
C   INTEGER M
C
C
C STATION INFORMATION
C
C STATION CODE - CHARACTER STRING
C   INTEGER CODE(4)
C NUMBER OF POLES, 20 LARGEST NUMBER OF SRO POLES
C   INTEGER NP
C NUMBER OF ZEROES, 10 LARGEST NUMBER OF SRO ZEROES
C   INTEGER NZ
C NUMBER OF CHANNELS
C   INTEGER ICHAN
C CONSTANT
C   REAL AO(3)
C CALIBRATION CONSTANT
C   REAL CAL(3)
C STATION ELEVATION
C   REAL ELEV
C STATION LATITUDE
C   REAL LAT
C STATION LONGITUDE
C   REAL LON
C POLES
C   COMPLEX POLES(20,3)
C ZEROES
C   COMPLEX ZEROES(10,3)
C
C START TIME OF DATA
C
C YEAR
C   INTEGER SYEAR
C DAY OF YEAR
C   INTEGER SDOFY
C HOUR
C   INTEGER SHOUR
C MINUTES
C   INTEGER SMIN
C SECONDS
C   REAL SSECS
C
C TAPE HEADER INFORMATION
C
C STATION ID
```

```

      INTEGER ID
C INSTRUMENT
      INTEGER INSTR
C YEAR
      INTEGER YEAR
C DAY OF YEAR
      INTEGER DOFY
C HOUR
      INTEGER HOUR
C MINUTE
      INTEGER MIN
C SECOND
      INTEGER SEC
C MILLISECONDS
      REAL MSS
C FORMAT ID
      INTEGER NFORM
C NUMBER OF CHANNELS
      INTEGER NCHAN
C NUMBER OF SAMPLES
      INTEGER NSAMP
C SAMPLING RATE
      REAL RATE
C LOOP INDEX
      INTEGER I, J
C LOGICAL UNIT NUMBER
      INTEGER LL
C
      COMMON /STINFO/ CODE, ICHAN, NP, NZ, LAT, LON, ELEV, AO, CAL,
1 POLES, ZEROES
C
      COMMON /SSTART/ SYEAR, SDOFY, SHOUR, SMIN, SSECS
C
      COMMON /HEADER/ ID, INSTR, YEAR, DOFY, HOUR, MIN, SEC, MSS, NFORM,
1 NCHAN, NSAMP, RATE
C
      DO 23000 J = 1,3
        IF(.NOT.(FID(L,M,J) .NE. 0))GOTO 23002
        LL = FID(L,M,J)
        WRITE(LL) (CODE(I), I=1,4),(CHAN(L,M,J,I), I=1,4), LAT,LON,
1 ELEV, SYEAR,SDOFY,SHOUR,SMIN,SSECS, RATE,AO(J)*CAL(J), NP,
1 (POLES(I,J), I = 1,NP), NZ, (ZEROES(I,J), I = 1,NZ)
23002 CONTINUE
23000 CONTINUE
C
      RETURN
C
      END

```

- 158 -

FLSBUF.FORTRAN

```

      SUBROUTINE FLSBUF(FID, L, M, ITF)
C
C FLSBUF WRITES DATA BUFFERS TO THE
C APPROPRIATE OUTPUT FILES.
C
C
C CALLS NO OTHER ROUTINE.
C
C   PROGRAMMED BY MADELEINE ZIRBES
C   SEPTEMBER 15, 1980
C
C LOGICAL UNIT NUMBER - INPUT
      INTEGER FID(50,3,3)
C REQUEST INDEX - INPUT
      INTEGER L
C INSTRUMENT INDEX - INPUT
      INTEGER M
C DATA FLAG
      INTEGER ITF
C
C
C 500 - BUFFER SIZE OF DATA RECORD ON DISK
C
C VERTICAL BUFFER
      REAL Z(500)
C NORTH-SOUTH BUFFER
      REAL N(500)
C EAST-WEST BUFFER
      REAL E(500)
C NUMBER OF POINTS IN BUFFERS
      REAL SPTS
C TOTAL NUMBER OF POINTS READ TO FILL REQUEST
      REAL PTS
      INTEGER I
C LOGICAL UNIT NUMBER
      INTEGER LL
      REAL BIG
      REAL ONE
      COMMON /BUFFER/ Z, N, E, SPTS, PTS
      DATA BIG /100000000000./
      DATA ONE /1./
C
C TOTAL NUMBER OF DATA VALUES WRITTEN TO OUTPUT FILES
C
      PTS = PTS + SPTS
C
C
C IF ITF = 1, THIS IS THE LAST DATA RECORD TO
C BE WRITTEN FOR THIS REQUEST
C
C VERTICAL BUFFER
C
      IF(.NOT.(FID(L,M,1) .NE. 0))GOTO 23000
      LL = FID(L,M,1)
      WRITE(LL) SPTS, (Z(I), I=1,SPTS)
      IF(.NOT.(ITF .EQ. 1))GOTO 23002
      WRITE(LL) ONE, BIG
23002  CONTINUE
C
C NORTH/SOUTH BUFFER
C
23000 CONTINUE

```


- 159 -

```
IF(.NOT.(FID(L,M,2) .NE. 0))GOTO 23004
  LL = FID(L,M,2)
  WRITE(LL) SPTS, (N(I), I=1,SPTS)
  IF(.NOT.(TTF .EQ. 1))GOTO 23006
  WRITE(LL) ONE, BIG
23006  CONTINUE
C
C EAST/WEST BUFFER
C
23004 CONTINUE
  IF(.NOT.(FID(L,M,3) .NE. 0))GOTO 23008
  LL = FID(L,M,3)
  WRITE(LL) SPTS, (E(I), I=1,SPTS)
  IF(.NOT.(TTF .EQ. 1))GOTO 23010
  WRITE(LL) ONE, BIG
23010  CONTINUE
C
C
23008 CONTINUE
  RETURN
C
  END
```

- 160 -

TIME HANDLING ROUTINES

```
                SUBROUTINE TSET(SYEAR, SDOFY, SHOUR, SMIN, SSEC, SMS)
C
C TSET SETS THE TIME VARIABLES EQUAL TO THOSE
C IN COMMON BLOCK /HEAD/
C
C
C CALLS NO OTHER ROUTINE.
C
C   PROGRAMMED BY MADELEINE ZIRHES
C   SEPTEMBER 15, 1980
C
C YEAR - OUTPUT
C   INTEGER SYEAR
C DAY OF YEAR - OUTPUT
C   INTEGER SDOFY
C HOUR - OUTPUT
C   INTEGER SHOUR
C MINUTE - OUTPUT
C   INTEGER SMIN
C SECONDS - OUTPUT
C   INTEGER SSEC
C MILLISECONDS - OUTPUT
C   REAL SMS
C
C
C TAPE HEADER INFORMATION
C
C STATION ID
C   INTEGER ID
C INSTRUMENT
C   INTEGER INSTR
C YEAR
C   INTEGER YEAR
C DAY OF YEAR
C   INTEGER DOFY
C HOUR
C   INTEGER HOUR
C MINUTE
C   INTEGER MIN
C SECOND
C   INTEGER SEC
C MILLISECONDS
C   REAL MSS
C FORMAT ID
C   INTEGER NFORM
C NUMBER OF CHANNELS
C   INTEGER NCHAN
C NUMBER OF SAMPLES
C   INTEGER NSAMP
C SAMPLING RATE
C   REAL RATE
C
C   COMMON /HEADER/ ID, INSTR, YEAR, DOFY, HOUR, MIN, SEC, MSS, NFORM,
C   1 NCHAN, NSAMP, RATE
C
C   SYEAR = YEAR
C   SDOFY = DOFY
C   SHOUR = HOUR
C   SMIN = MIN
C   SSEC = SEC
```

- 161 -

SMS = MSS

C

RETURN

C

END

STNDRD.FORTRAN

```

SUBROUTINE STNDRD(YEAR, DOFY, HOUR, MINUTE, SEC, MS)
C
C STNDRD CHECKS TO SEE THAT THE
C TIME VALUES ARE WITHIN LEGAL LIMITS.
C
C
C CALLS:
C LPYR
C
C PROGRAMMED BY MADELEINE ZIRBES
C SEPTEMBER 15, 1980
C
C YEAR - INPUT/OUTPUT
C INTEGER YEAR
C DAY OF YEAR - INPUT/OUTPUT
C INTEGER DOFY
C HOUR - INPUT/OUTPUT
C INTEGER HOUR
C MINUTE - INPUT/OUTPUT
C INTEGER MINUTE
C SECOND - INPUT/OUTPUT
C INTEGER SEC
C MILLISECONDS - INPUT/OUTPUT
C REAL MS
C
C FUNCTION
C INTEGER LPYR
C
C FOR
23000 CONTINUE
    IF(.NOT.((MS .GE. 1000.) .OR.(SEC .GE. 60) .OR.(MINUTE .GE. 60)
1    .OR.(HOUR .GE. 24) .OR.((LPYR(YEAR) .EQ. 1) .AND. (DOFY .GT.
1    365)) .OR.((LPYR(YEAR) .EQ. 0) .AND. (DOFY .GT. 365)))GOTO 2
1    3003
C
    IF(.NOT.(MS .GE. 1000.))GOTO 23005
    SEC = SEC + 1
    MS = MS - 1000.
23005 CONTINUE
    IF(.NOT.(SEC .GE. 60))GOTO 23007
    MINUTE = MINUTE + 1
    SEC = SEC - 60
23007 CONTINUE
    IF(.NOT.(MINUTE .GE. 60))GOTO 23009
    HOUR = HOUR + 1
    MINUTE = MINUTE - 60
23009 CONTINUE
    IF(.NOT.(HOUR .GE. 24))GOTO 23011
    DOFY = DOFY + 1
    HOUR = HOUR - 24
23011 CONTINUE
    IF(.NOT.(LPYR(YEAR) .EQ. 1 .AND. (DOFY .GT. 365)))GOTO 23013
    YEAR = YEAR + 1
    DOFY = DOFY - 365
C
23013 CONTINUE
    IF(.NOT.(LPYR(YEAR) .EQ. 0 .AND. (DOFY .GT. 365)))GOTO 23015
    YEAR = YEAR + 1
    DOFY = DOFY - 365
C
23015 CONTINUE
    GOTO 23004

```

- 163 -

```
C      ELSE
23003      CONTINUE
          GOTO 23002
23004      CONTINUE
          GOTO 23000
C      ENDFOR
23002 CONTINUE
      RETURN
C
      END
```

DAYMO.FORTRAN

```

      INTEGER FUNCTION DAYMO (DOFY, MONTH, DAY, YEAR)
C
C FUNCTION DAYMO DETERMINES THE MONTH AND DAY
C OF THE MONTH, GIVEN THE YEAR AND DAY OF YEAR.
C IT RETURNS 1 IF IT WAS SUCCESSFUL, 0 OTHERWISE.
C IF DOFY IS NOT WITHIN LEGAL LIMITS, MONTH AND
C DAY WILL BE RETURNED AS ZERO.
C
C
C CALLS:
C  LPYR
C
C  PROGRAMMED BY MADELEINE ZIRBES
C    SEPTEMBER 15, 1980
C
C DAY OF YEAR - INPUT
      INTEGER DOFY
C MONTH - OUTPUT
      INTEGER MONTH
C DAY OF MONTH - OUTPUT
      INTEGER DAY
C YEAR - INPUT
      INTEGER YEAR
C
C DAY OF YEAR
      INTEGER IDAY
C FUNCTION
      INTEGER LPYR
C NUMBER OF DAYS IN MONTH
      INTEGER MDAYS(12)
      DATA MDAYS/31,28,31,30,31,30,31,31,30,31,30,31/
C
      IDAY = DOFY
      IF(.NOT.(IDAY.LT.1))GOTO 23000
      MONTH = 0
      DAY = 0
      DAYMO = (0)
      RETURN
C
23000 CONTINUE
      IF(.NOT.(LPYR(YEAR) .EQ. 1))GOTO 23002
      MDAYS(2) = 29
      GOTO 23003
C  ELSE
23002 CONTINUE
      MDAYS(2) = 28
23003 CONTINUE
C
      DO 23004 MONTH = 1,12
      DAY = IDAY
      IDAY = IDAY - MDAYS(MONTH)
      IF(.NOT.(IDAY.LE.0))GOTO 23006
      DAYMO = (1)
      RETURN
23006 CONTINUE
23004 CONTINUE
C
      MONTH = 0
      DAY = 0
      DAYMO = (0)
      RETURN
C

```

- 165 -

END

- 166 -

DOY.FORTRAN

```
      INTEGER FUNCTION DOY (MONTH, DAY, YEAR)
C
C FUNCTION DOY DETERMINES THE DAY OF THE
C YEAR, GIVEN THE MONTH, DAY AND YEAR.
C IF MONTH OR DAY ARE ILLEGAL, THE RETURN
C VALUE OF THE FUNCTION IS ZERO.
C
C
C CALLS:
C  LPYR
C
C   PROGRAMMED BY MADELEINE ZIRBES
C   SEPTEMBER 15, 1980
C
C MONTH - INPUT
C   INTEGER MONTH
C DAY OF MONTH - INPUT
C   INTEGER DAY
C YEAR - INPUT
C   INTEGER YEAR
C FUNCTION
C   INTEGER LPYR
C   INTEGER INC
C   INTEGER NDAYS(12)
C   DATA NDAYS /0,31,59,90,120,151,181,212,243,273,304,334/
C
C   IF(.NOT.(MONTH.LT.1.OR.MONTH.GT.12))GOTO 23000
C     DOY = (0)
C     RETURN
23000 CONTINUE
C   IF(.NOT.(DAY.LT.1.OR.DAY.GT.31))GOTO 23002
C     DOY = (0)
C     RETURN
23002 CONTINUE
C   IF(.NOT.(LPYR(YEAR).EQ.1.AND.MONTH.GT.2))GOTO 23004
C     INC = 1
C     GOTO 23005
C   ELSE
23004 CONTINUE
C     INC = 0
23005 CONTINUE
C     DOY = (NDAYS(MONTH) + DAY + INC)
C     RETURN
C   END
```


LPYR.FORTRAN

```
      INTEGER FUNCTION LPYR(YEAR)
C
C FUNCTION LPYR DETERMINES IF YEAR
C IS A LEAP YEAR.
C
C THIS FUNCTION USES THE INTRINSIC
C FUNCTION MOD. IF YOUR MACHINE
C DOES NOT SUPPLY THIS FUNCTION,
C MAKE ONE -
C  $MOD(I,J) = IABS(I - (I/J)*J)$ 
C
C
C CALLS:
C MOD - INTRINSIC FUNTION
C
C PROGRAMMED BY MADELEINE ZIRBES
C SEPTEMBER 15, 1980
C
C YEAR - INPUT
      INTEGER YEAR
      IF(.NOT.(MOD(YEAR, 400) .EQ. 0))GOTO 23000
      LPYR = (1)
      RETURN
23000 CONTINUE
      IF(.NOT.(MOD(YEAR, 4) .NE. 0))GOTO 23002
      LPYR = (0)
      RETURN
23002 CONTINUE
      IF(.NOT.(MOD(YEAR, 100) .EQ. 0))GOTO 23004
      LPYR = (0)
      RETURN
23004 CONTINUE
      LPYR = (1)
      RETURN
      END
```

- 168 -

CHARACTER HANDLING ROUTINES

GETLIN.FORTRAN

```

SUBROUTINE GETLIN (IDATA, LINE, IBUFF)
C
C GETLIN READS A LINE(80 CHARACTERS)
C FROM IDATA, STORING THE RESULT IN
C IBUFF. THEN GETLIN CONVERTS THE
C CHARACTER SET ON THE NETWORK DAY
C TAPE TO THE INTERNAL CHARACTER CODE
C OF THE HOST MACHINE.
C
C
C CALLS:
C  GBYTES - USER SUPPLIED
C
C  PROGRAMMED BY MADELEINE ZIRBES
C    SEPTEMBER 15, 1980
C
C DATA BUFFER - INPUT
C   INTEGER IDATA(1)
C SET TO HOLD 16000 BITS OF TAPE RECORD INPUT
C LINE OF BUFFER DESIRED - INPUT
C   INTEGER LINE
C LINE OF BUFFER - OUTPUT
C   INTEGER IBUFF(80)
C
C   INTEGER I, N
C   INTEGER NTAB(128)
C   DATA NTAB /33* ' ', '"', '#', '$', '%', '&', "'", '(', ')',
C 1* '!', '+', ',', '-', '.', '/', '0', '1', '2', '3', '4', '5', '6',
C 1* '7', '8', '9', ':', ';', '<', '=', '>', '?', '@', 'A', 'B', 'C',
C 1* 'D', 'E', 'F', 'G', 'H', 'I', 'J', 'K', 'L', 'M', 'N', 'O', 'P',
C 1* 'Q', 'R', 'S', 'T', 'U', 'V', 'W', 'X', 'Y', 'Z', '[', ']',
C 1* '^', '_', '`', 'a', 'b', 'c', 'd', 'e', 'f', 'g', 'h', 'i', 'j',
C 1* 'k', 'l', 'm', 'n', 'o', 'p', 'q', 'r', 's', 't', 'u', 'v', 'w',
C 1* 'x', 'y', 'z', '{', '|', '}', '~', ' ', '/'
C
C
C   CALL GBYTES (IDATA, IBUFF, (LINE-1)*640, 8, 0, 80)
C
C   DO 23000 I = 1, 80
C     N = IBUFF(I) + 1
C     IBUFF(I) = NTAB(N)
C 23000 CONTINUE
C
C   RETURN
C
C   END

```

- 169 -

FFIN.FORTRAN

```

      REAL FUNCTION FFIN(N1,N,IA,M,IFL)
C
C
C FUNCTION FFIN SCANS THE N CHARACTER STRING IA FOR A NUMERIC CONSTANT.
C IT WILL CORRECTLY INTERPRET A NUMBER IN E OR F FORMAT,
C AND RETURN IT AS THE FUNCTION VALUE. IFL = IA(M)
C IS THE FIRST NON-BLANK CHARACTER THAT CAN'T BE A PART OF THE
C CONSTANT.
C
C
C CALLS NO OTHER ROUTINE.
C
C   PROGRAMMED BY RAY BULAND
C   AUGUST 21, 1980
C
C START INDEX - INPUT
      INTEGER N1
C STOP INDEX - INPUT
      INTEGER N
C CHARACTER STRING - INPUT
      INTEGER IA(80)
C THE CHARACTER STRING IS STORED IN THE USERS
C INTERNAL CHARACTER CODE, ONE CHARACTER
C (BLANK PADDED TO THE LEFT) PER INTEGER WORD.
C INDEX IN IA OF FIRST ILLEGAL CHARACTER - OUPUT
      INTEGER M
C ILLEGAL CHARACTER - OUTPUT
      INTEGER IFL
C
      INTEGER IB(10)
      INTEGER KBL, KPL, KMN, KDP, KUE
      INTEGER I, J, K
      INTEGER MIN
      INTEGER MEX
      INTEGER LFL
      REAL SC1
      REAL SC2
      REAL EX
      DATA IB /'0','1','2','3','4','5','6','7','8','9'/
      DATA KBL, KPL, KMN, KDP /' ','+', '-', '.'/
      DATA KUE /'E'/
C
C   SET UP SOME DEFAULTS.
C
      FFIN = 0.
      SC1 = 10.
      SC2 = 1.
      MIN = 1
      EX = 0.
      MEX = 1
C
C   SKIP THE LEADING BLANKS.
C
      DO 23000 K = N1,N
         IF(.NOT.(IA(K).NE.KBL))GOTO 23002
         GO TO 10
      23002  CONTINUE
      23000  CONTINUE
      GO TO 80
C
C   CHECK FOR UNARY PLUS.
C

```

- 170 -

```

10  LFL = K
   IF(.NOT.(IA(K).EQ.KPL))GOTO 23004
      K = K+1
      GOTO 23005
C   ELSE
23004  CONTINUE
C
C   CHECK FOR UNARY MINUS.
C
   IF(.NOT.(IA(K).EQ.KMN))GOTO 23008
      MIN = 2
      K = K+1
23006  CONTINUE
23005  CONTINUE
      DO 23008 I = K,N
         IF(.NOT.(IA(I).NE.KBL))GOTO 23010
            GOTO 23009
23010  CONTINUE
23008  CONTINUE
23009  CONTINUE
      K = I
C
C   ACCUMULATE THE NUMERIC CONSTANT.
C
      DO 23012 I = K,N
C
C   CHECK FOR A DECIMAL POINT.
C
         IF(.NOT.(IA(I).NE.KDP))GOTO 23014
C
C   SEE IF THE NEXT CHARACTER IS A DIGIT.
C
            DO 23016 J = 1,10
               IF(.NOT.(IA(I).EQ.IB(J)))GOTO 23018
                  GO TO 20
23018  CONTINUE
23016  CONTINUE
            GO TO 30
C
C   CONSTRUCT THE CONSTANT.
C
20     IF(.NOT.(SC1.LT.5.))GOTO 23020
        SC2 = SC2*.1
23020  CONTINUE
        FFIN = FFIN*SC1+(J-1)*SC2
        GOTO 23015
C   ELSE
23014  CONTINUE
        IF(.NOT.(SC1.LT.5.))GOTO 23022
        GO TO 60
23022  CONTINUE
        SC1 = 1.
23015  CONTINUE
23012  CONTINUE
      GO TO 60
C
C   CHECK FOR SCIENTIFIC NOTATION.
C
30     IF(.NOT.(LFL.NE.I.AND.IA(I).EQ.KUE))GOTO 23024
        K = I+1
        LFL = K
C
C   CHECK FOR UNARY PLUS IN THE EXPONENT.
C
      IF(.NOT.(IA(K).EQ.KPL))GOTO 23028

```

- 171 -

```

      K = K+1
      GOTO 23027
C     ELSE
23026  CONTINUE
C
C     CHECK FOR UNARY MINUS IN THE EXPONENT.
C
      IF(.NOT.(IA(K).EQ.KMN))GOTO 23028
      MEX = 2
      K = K+1
C
C     ACCUMULATE THE EXPONENT.
C
23028  CONTINUE
23027  CONTINUE
      DO 23030 I = K,N
C
C     SEE IF THE NEXT CHARACTER IS A DIGIT.
C
      DO 23032 J = 1,10
      IF(.NOT.(IA(I).EQ.IB(J)))GOTO 23034
      GO TO 40
23034  CONTINUE
23032  CONTINUE
      GO TO 50
C
C     CONSTRUCT THE EXPONENT.
C
C
40     EX = EX*10.+(J-1)
23030  CONTINUE
      GO TO 80
C
C     SEE IF THE 'E' AFTER THE NUMBER WAS REALLY THE START OF
C     AN EXPONENT.
C
50     IF(.NOT.(LFL.EQ.I))GOTO 23036
      I = I-1
23036  CONTINUE
C
C     SKIP TRAILING BLANKS
C
23024  CONTINUE
60     DO 23038 J = I,N
      IF(.NOT.(IA(J).NE.KBL))GOTO 23040
      GO TO 70
23040  CONTINUE
23038  CONTINUE
      J = N
70     IFL = IA(J)
      M = J
      GO TO 90
80     IFL = KBL
      M = I+1
C
C     CHECK FOR A NEGATIVE EXPONENT.
C
90     IF(.NOT.(MEX.GT.1))GOTO 23042
      EX = -EX
C
C     APPLY THE EXPONENT TO THE CONSTANT.
C
23042  CONTINUE
      FFIN = FFIN*(10.**EX)
C
C     CHECK FOR A NEGATIVE CONSTANT.

```

C
IF(.NOT.(MIN.GT.1))GOTO 23044
FFIN = -FFIN
23044 CONTINUE
RETURN
C
END

GETSTR.FORTRAN

```

SUBROUTINE GETSTR (I1, I2, IBUFF, M, IFL, K, L, OUTSTR)
C
C
C GETSTR SCANS THE CHARACTER STRING IBUFF FOR A
C CHARACTER STRING. IFL = IBUFF(M) IS THE FIRST
C CHARACTER THAT CAN NOT BE PART OF THE STRING.
C
C
C CALLS NO OTHER ROUTINE.
C
C   PROGRAMMED BY MADELEINE ZIRBES
C   SEPTEMBER 15, 1980
C
C START INDEX - INPUT
C   INTEGER I1
C STOP INDEX - INPUT
C   INTEGER I2
C CHARACTER STRING - INPUT
C   INTEGER IBUFF(80)
C INDEX IN IBUFF OF FIRST ILLEGAL CHARACTER - OUTPUT
C   INTEGER M
C ILLEGAL CHARACTER - OUTPUT
C   INTEGER IFL
C LENGTH OF OUTSTR - OUTPUT
C   INTEGER K
C LENGTH OF OUTSTR - INPUT
C   INTEGER L
C CHARACTER STRING - OUTPUT
C   INTEGER OUTSTR(L)
C
C   INTEGER I, II
C   INTEGER KBL, KUA, KUZ
C   DATA KBL, KUA, KUZ / ' ', 'A', 'Z' /
C
C SKIP LEADING BLANKS
C
C   K = 0
C   DO 23000 I = I1, I2
C     IF (.NOT. (IBUFF(I) .NE. KBL)) GOTO 23002
C     GOTO 23001
C 23002 CONTINUE
C 23000 CONTINUE
C 23001 CONTINUE
C   II = I
C
C   DO 23004 I = II, I2
C
C   CHECK IF CHARACTER IS ALPHABETIC
C
C   IF (.NOT. (IBUFF(I) .LT. KUA .OR. IBUFF(I) .GT. KUZ)) GOTO 23006
C     M = I
C     IFL = IBUFF(I)
C     RETURN
C 23006 CONTINUE
C     K = K + 1
C     OUTSTR(K) = IBUFF(I)
C 23004 CONTINUE
C     M = I2 + 1
C     IFL = KBL
C     RETURN
C
C   END

```

ICPYCH.FORTRAN

SUBROUTINE ICPYCH (I1, I2, I, J, K)
C
C ICPYCH COPIES ARGUMENT I2 TO I1.
C IT COPIES EXACTLY 4 CHARACTERS.
C
C
C CALLS NO OTHER ROUTINE.
C
C PROGRAMMED BY MADELEINE ZIRBES
C SEPTEMBER 15, 1980
C
C INSTRUMENT CODE - OUTPUT
C INTEGER I1(50,3,3,4)
C INSTRUMENT CODE - INPUT
C INTEGER I2(3,3,4)
C REQUEST INDEX - INPUT
C INTEGER I
C INSTRUMENT INDEX - INPUT
C INTEGER J
C CHANNEL INDEX - INPUT
C INTEGER K
C
C INTEGER L
C
C DO 23000 L = 1,4
C I1(L,J,K,L) = I2(J,K,L)
23000 CONTINUE
C
C RETURN
C
C END

ISTREQ.FORTRAN

```
      INTEGER FUNCTION ISTREQ (I1, I2, L)
C
C  ISTREQ COMPARES ARGUMENTS I1 AND I2
C  AND RETURNS 1 IF THEY ARE EQUAL,
C  0 OTHERWISE.
C
C
C  CALLS NO OTHER ROUTINE.
C
C    PROGRAMMED BY MADELEINE ZIRBES
C    SEPTEMBER 15, 1980
C
C  CHARACTER STRING - INPUT
C    INTEGER I1(50,4)
C  CHARACTER STRING - INPUT
C    INTEGER I2(4)
C  ARRAY INDEX - INPUT
C    INTEGER L
C
C    INTEGER I
C
C    DO 23000 I = 1,4
C      IF(.NOT.(I1(L,I) .NE. I2(I)))GOTO 23002
C      ISTREQ = (0)
C      RETURN
23002  CONTINUE
23000  CONTINUE
C      ISTREQ = (1)
C      RETURN
C
C    END
```

- 176 -

BINARY DATA HANDLING ROUTINES

HEAD.FORTRAN

```

SUBROUTINE HEAD(IDATA)
C
C HEAD DECODES HEADER INFORMATION
C AND SETS APPROPRIATE VALUES IN COMMON
C BLOCK /HEADER/
C
C
C CALLS:
C GBYTES - USER SUPPLIED
C
C PROGRAMMED BY MADELEINE ZIRBES
C SEPTEMBER 15, 1980
C
C DATA RECORD - INPUT
C INTEGER IDATA(1)
C
C
C TAPE HEADER INFORMATION
C
C STATION ID
C INTEGER ID
C INSTRUMENT
C INTEGER INSTR
C YEAR
C INTEGER YEAR
C DAY OF YEAR
C INTEGER DOFY
C HOUR
C INTEGER HOUR
C MINUTE
C INTEGER MIN
C SECOND
C INTEGER SEC
C MILLISECONDS
C REAL MSS
C FORMAT ID
C INTEGER NFORM
C NUMBER OF CHANNELS
C INTEGER NCHAN
C NUMBER OF SAMPLES
C INTEGER NSAMP
C SAMPLING RATE
C REAL RATE
C INTEGER IB(40)
C
C COMMON /HEADER/ ID, INSTR, YEAR, DOFY, HOUR, MIN, SEC, MSS, NFORM,
C 1 NCHAN, NSAMP, RATE
C
C AT THIS TIME, NOT ALL OF THE HEADER HAS INFORMATION.
C THE FIRST 20 FRAMES HAVE BEEN SET ASIDE FOR THE HEADER,
C OF WHICH ONLY 14 FRAMES ARE CURRENTLY USED.
C
C CALL GBYTES(IDATA, IB, 0, 4, 0, 40)
C
C ID = (IB(1)*10 + IB(2))*10 + IB(3)
C YEAR = IB(4)*10 + IB(5) + 1900
C DOFY = (IB(6)*10 + IB(7))*10 + IB(8)
C HOUR = IB(9)*10 + IB(10)
C MIN = IB(11)*10 + IB(12)

```

- 177 -

```
SEC = IB(13)*10 + IB(14)
MSS = FLOAT((IB(15)*10 + IB(16))*10 + IB(17))
NFORM = IB(18)
NCHAN = IB(21)*10 + IB(22)
RATE = (10. ** (5 - IB(23))) * FLOAT(IB(24)*10 + IB(25))
NSAMP = (IB(26)*10 + IB(27))*10 + IB(28)
C
C SHORT-PERIOD DATA
C
  IF(.NOT.(RATE.EQ. 20.))GOTO 23000
    INSTR = 1
C
C LONG-PERIOD DATA
C
  GOTO 23001
C ELSE
23000 CONTINUE
  IF(.NOT.(RATE.EQ. 1.))GOTO 23002
    INSTR = 2
C
C INTERMEDIATE-PERIOD DATA
C
  GOTO 23003
C ELSE
23002 CONTINUE
  IF(.NOT.(RATE.EQ. 10.))GOTO 23004
    INSTR = 3
C
C ERROR
C
  GOTO 23005
C ELSE
23004 CONTINUE
  INSTR = -1
23005 CONTINUE
23003 CONTINUE
23001 CONTINUE
C
  RETURN
C
  END
```

- 178 -

DTPFMT.FORTRAN

```

      REAL FUNCTION DTPFMT(NFORM, MANT, CHAR)
C
C FUNCTION DTPFMT DECODES ONE DATA WORD FROM
C A NETWORK DAY TAPE, AND RETURNS IT AS
C THE FUNCTION VALUE.
C IF NFORM = 1, THE DATA IS IN SRO FORMAT;
C IF NFORM = 2, THE DATA IS IN DWWSSN FORMAT.
C
C SRO AND ASRO DATA SAMPLES ARE RECORDED AS
C 16 BIT (2 FRAMES) WORDS USING A GAIN-RANGE
C FORMAT. THE FOUR MOST SIGNIFICANT BITS OF
C FRAME 1 DEFINE THE GAIN FACTOR(GF) WHICH IS
C AN UNSIGNED INTEGER HAVING A VALUE FROM
C 0 TO 10. THE FOLLOWING BIT DEFINES THE SIGN
C OF THE MANTISSA, AND THE 3 REMAINING BITS
C PLUS THE 8 BITS OF FRAME 2 CONTAIN SEISMIC
C DATA IN TWOS COMPLEMENT BINARY INTEGER FORM.
C ABSOLUTE AMPLITUDE IN DIGITAL COUNTS IS
C DERIVED AS FOLLOWS -
C
C   AMPLITUDE = MANTISSA * 2 ** (10 - GF)
C
C THIS GIVES A DYNAMIC RANGE OF 72 DB, AN
C OPERATING RANGE OF 120 DB AND A MAXIMUM
C AMPLITUDE OF +2,096,128 TO -2,097,152
C DIGITAL COUNTS.
C
C DWWSSN DATA SAMPLES ARE RECORDED IN A
C 16-BIT TWOS COMPLEMENT INTEGER FORMAT. THIS
C GIVES A DYNAMIC RANGE OF 96 DB AND
C A MAXIMUM AMPLITUDE OF +32,767 TO
C -32,768 DIGITAL COUNTS.
C
C DTPFMT ASSUMES THAT THE USERS MACHINE HAS
C A WORD LENGTH OF AT LEAST 16 BITS.
C
C FRAME IS DEFINED AS 8 CONTIGUOUS BYTE
C ALIGNED BITS BY THE TAPE DRIVE.
C
C
C CALLS NO OTHER ROUTINE.
C
C   PROGRAMMED BY MADELEINE ZIRBES
C   SEPTEMBER 15, 1980
C
C FORMAT ID - INPUT
C   INTEGER NFORM
C MANTISSA - INPUT
C   INTEGER MANT
C CHARACTERISTIC INPUT
C   INTEGER CHAR
C
C   REAL PWR(16)
C   DATA PWR/1024., 512., 256., 128., 64., 32., 16., 8., 4., 2., 1., .
C   15., .25., .125., .0625., .03125/
C
C SRO FORMAT
C
C   IF(.NOT.(NFORM.EQ.1))GOTO 23000
C   IF(.NOT.(MANT.GE.2048))GOTO 23002
C   MANT = MANT - 4096
23002  CONTINUE

```

- 179 -

```
DTPFMT = FLOAT(MANT)*PWR(CHAR+1)
RETURN
C
C DWWSSN FORMAT
C
C ELSE
23000 CONTINUE
      IF(.NOT.(NFORM.EQ. 2))GOTO 23004
      DTPFMT = FLOAT(MANT)
      IF(.NOT.(DTPFMT.GE. 32768.))GOTO 23008
      DTPFMT = DTPFMT - 65536.0
23008 CONTINUE
      RETURN
C
C ELSE
23004 CONTINUE
      DTPFMT = 0.
23005 CONTINUE
23001 CONTINUE
      RETURN
C
      END
```

USER CALLABLE ROUTINES

IASNLU.FORTRAN

```

      INTEGER FUNCTION IASNLU (LUN, INDX)
C
C IASNLU ASSOCIATES A LOGICAL UNIT NUMBER
C WITH AN INDEX TO THE HEAD AND DATA ARRAYS.
C CURRENTLY, THERE IS BUFFER SPACE TO BE
C ABLE TO READ 3 FILES SIMULTANEOUSLY.
C IASNLU RETURNS 1 IF AN INDEX WAS ASSIGNED,
C OR -1 IF ALL THE BUFFER SPACE HAS BEEN
C ALLOCATED.
C
C
C CALLS:
C   SAVE - MACHINE DEPENDENT
C
C   PROGRAMMED BY MADELEINE ZIRBES
C   SEPTEMBER 15, 1980
C
C LOGICAL UNIT NUMBER - INPUT
      INTEGER LUN
C INDEX OF DATA BUFFER - OUTPUT
      INTEGER INDX
C
C
C HEADER RECORD FLAG
      INTEGER HFLG(3)
C DATA RECORD FLAG
      INTEGER DFLG(3)
C NUMBER OF LOGICAL UNIT NUMBERS ASSIGNED
      INTEGER NLUN
C LOGICAL UNIT NUMBERS ASSOCIATED WITH DATA INDEXES
      INTEGER LLUN(20)
C INDEX ASSOCIATED WITH A LOGICAL UNIT NUMBER
      INTEGER ILUN(3)
C INDEX OF NEXT DATA VALUE TO BE RETURNED
      INTEGER NPTS(3)
C
      COMMON /FLAGS/ HFLG, DFLG, NLUN, LLUN, ILUN, NPTS
C
C*****
C*          MACHINE DEPENDENT          *
C*****
      SAVE /FLAGS/
C
      INDX = LLUN(LUN)
C
      IF(.NOT.(INDX .GT. 0))GOTO 23000
      IASNLU = (1)
      RETURN
C
C   ELSE
23000  CONTINUE
      IF(.NOT.(NLUN .LT. 3))GOTO 23002
      NLUN = NLUN + 1
      LLUN(LUN) = NLUN
      INDX = NLUN
      ILUN(INDX) = LUN
      IASNLU = (1)
      RETURN
C

```

- 181 -

```
C      ELSE
23002      CONTINUE
          IASNLU = (-1)
          RETURN
23003      CONTINUE
23001 CONTINUE
C
      END
```

INTTFL.FORTRAN

```

SUBROUTINE INTTFL
C
C INITIALIZATION OF FLAGS USED BY
C IRDHD AND IRDDAT IS DONE BY INTTFL.
C INTTFL MUST BE CALLED BEFORE ANY
C REFERENCE TO IRDHD OR IRDDAT TO
C INSURE READING THE HEADER AND
C DATA RECORD OF THE OUTPUT FILES
C PRODUCED BY RETRV SUCCESSFULLY.
C
C
C CALLS NO OTHER ROUTINE.
C
C   PROGRAMMED BY MADELEINE ZIRBES
C   SEPTEMBER 15, 1980
C
C
C
C HEADER RECORD FLAG
C   INTEGER HFLG(3)
C DATA RECORD FLAG
C   INTEGER DFLG(3)
C NUMBER OF LOGICAL UNIT NUMBERS ASSIGNED
C   INTEGER NLUN
C LOGICAL UNIT NUMBERS ASSOCIATED WITH DATA INDEXES
C   INTEGER LLUN(20)
C ASSOCIATES AN INDEX WITH A LOGICAL UNIT NUMBER
C   INTEGER ILUN(3)
C INDEX OF NEXT DATA VALUE TO BE RETURNED
C   INTEGER NPTS(3)
C
C THE DATA READ FROM DISK IS SET TO ALLOW
C ACCESS TO THREE FILES SIMULTANEOUSLY
C
C NUMBER OF VALUES READ INTO DATA BUFFER BUFF
C   REAL PTS(3)
C DATA BUFFER
C   REAL BUFF(3,500)
C
C   COMMON /FLAGS/ HFLG, DFLG, NLUN, LLUN, ILUN, NPTS
C
C   COMMON /DATA/ PTS, BUFF
C
C   DATA HFLG, DFLG /3*1, 3*0/
C   DATA NPTS, PTS /3*1, 3*0.0/
C   DATA NLUN, LLUN /0, 20*0/
C
C RETURN
C
C END

```


- 183 -

RDDATA.FORTRAN

```
      SUBROUTINE RDDATA(LUN, INDX)
C
C RDDATA READS A DATA RECORD FROM
C LOGICAL UNIT NUMBER LUN.
C
C
C CALLS NO OTHER ROUTINE.
C
C   PROGRAMMED BY MADELEINE ZIRBES
C   SEPTEMBER 15, 1980
C
C LOGICAL UNIT NUMBER - INPUT
C   INTEGER LUN
C ARRAY INDEX INTO WHICH THE DATA WILL BE READ - INPUT
C   INTEGER INDX
C
C   INTEGER I
C
C THE DATA READ FROM DISK IS SET TO ALLOW
C ACCESS TO THREE FILES SIMULTANEOUSLY
C
C NUMBER OF VALUES READ INTO DATA BUFFER BUFF
C   REAL PTS(3)
C DATA BUFFER
C   REAL BUFF(500, 3)
C
C   COMMON /DATA/ PTS, BUFF
C
C   READ(LUN) PTS(INDX), (BUFF(I,INDX), I=1,PTS(INDX))
C
C   RETURN
C
C   END
```

RDHEAD.FORTRAN

```

SUBROUTINE RDHEAD(LUN, INDX, TF)
C
C RDHEAD READS A HEADER RECORD FROM
C LOGICAL UNIT NUMBER LUN. TF = 1
C IF THIS IS THE LAST RECORD OF
C THE FILE.
C
C
C CALLS NO OTHER ROUTINE.
C
C   PROGRAMMED BY MADELEINE ZIRBES
C   SEPTEMBER 15, 1980
C
C LOGICAL UNIT NUMBER - INPUT
  INTEGER LUN
C ARRAY INDEX INTO THE DATA WILL BE READ - INPUT
  INTEGER INDX
C END OF DATA FLAG - OUTPUT
  INTEGER TF
C
  INTEGER I
C
C THE DATA READ FROM DISK IS SET TO ALLOW
C ACCESS TO THREE FILES SIMULTANEOUSLY
C
C STATION CODE - CHARACTER STRING
  INTEGER CODE(4,3)
C INSTRUMENT CODE - CHARACTER STRING
  INTEGER CHN(4,3)
C STATION LATITUDE
  REAL LAT(3)
C STATION LONGITUDE
  REAL LON(3)
C STATION ELEVATION
  REAL ELEV(3)
C START TIME OF DATA
C YEAR
  INTEGER SYEAR(3)
C DAY OF YEAR
  INTEGER SDOFY(3)
C HOUR
  INTEGER SHOUR(3)
C MINUTE
  INTEGER SMIN(3)
C SECONDS
  REAL SSECS(3)
C SAMPLING RATE
  REAL RATE(3)
C NORMALIZATION CONSTANT
  REAL A0(3)
C NUMBER OF POLES
  INTEGER NP(3)
C POLES
  COMPLEX POLES(20,3)
C NUMBER OF ZEROES
  INTEGER NZ(3)
C ZEROES
  COMPLEX ZEROES(10,3)
C
  COMMON /HEAD/ CODE, CHN, LAT, LON, ELEV, SYEAR, SDOFY, SHOUR,
  1 SMIN, SSECS, RATE, A0, NP, POLES, NZ, ZEROES
C

```

- 185 -

```
      TF = 0
C
  READ(LUN) (CODE(I,INDX), I=1,4), (CHN(I,INDX), I=1,4), LAT(INDX),
  1 LON(INDX), ELEV(INDX), SYEAR(INDX), SDOFY(INDX), SHOUR(INDX),
  1 SMIN(INDX), SSECS(INDX), RATE(INDX), AO(INDX), NP(INDX), (POLES(
  1 I,INDX), I=1,NP(INDX)), NZ(INDX), (ZEROES(I,INDX), I=1,NZ(INDX))
C
C IF TF EQUALS ONE,
C THIS IS A NULL HEADER RECORD -
C LAST RECORD IN THE FILE
C
  IF(.NOT.(AO(INDX) .EQ. 0.0))GOTO 23000
    TF = 1
C
23000 CONTINUE
  RETURN
C
  END
```

- 186 -

IRDDAT.FORTRAN

```

      INTEGER FUNCTION IRDDAT (INDX, VALU)
C
C FUNCTION IRDDAT SEQUENTIALLY READS
C THE NEXT DATA POINT OF A DATA RECORD
C ON EACH CALL, RETURNING IT IN VALU.
C IRDDAT RETURNS 1 ON A SUCCESSFUL
C READ, 0 FOR END OF DATA, OR END OF
C FILE, AND -1 FOR AN ERROR.
C
C
C CALLS:
C  RDDATA
C  SAVE - MACHINE DEPENDENT
C
C  PROGRAMMED BY MADELEINE ZIRBES
C  SEPTEMBER 15, 1980
C
C ARRAY INDEX - INPUT
C   INTEGER INDX
C DATA VALUE - OUTPUT
C   REAL VALU
C
C LOGICAL UNIT NUMBER
C   INTEGER LUN
C   INTEGER I
C
C THE DATA READ FROM DISK IS SET TO ALLOW
C ACCESS TO THREE FILES SIMULTANEOUSLY
C
C NUMBER OF VALUES READ INTO DATA BUFFER BUFF
C   REAL PTS(3)
C DATA BUFFER
C   REAL BUFF(500, 3)
C
C HEADER RECORD FLAG
C   INTEGER HFLG(3)
C DATA RECORD FLAG
C   INTEGER DFLG(3)
C NUMBER OF LOGICAL UNIT NUMBERS ASSIGNED
C   INTEGER NLUN
C LOGICAL UNIT NUMBERS ASSOCIATED WITH DATA INDEXES
C   INTEGER LLUN(20)
C INDEX ASSOCIATED WITH A LOGICAL UNIT NUMBER
C   INTEGER ILUN(3)
C INDEX OF NEXT DATA VALUE TO BE RETURNED
C   INTEGER NPTS(3)
C
C   COMMON /DATA/ PTS, BUFF
C
C   COMMON /FLAGS/ HFLG, DFLG, NLUN, LLUN, ILUN, NPTS
C*****
C*               MACHINE DEPENDENT               *
C*****
C   SAVE /DATA/, /FLAGS/
C
C   VALU = 0.0
C   LUN = ILUN(INDX)
C
C
C READ IN NEXT DATA RECORD
C
C   IF(.NOT.(FLOAT(NPTS(INDX)) .GT. PTS(INDX)))GOTO 23000

```

```
C
C  NEXT RECORD IS A DATA RECORD
C
  IF(.NOT.(DFLG(INDX) .EQ. 1))GOTO 23002
  CALL RDDATA(LUN, INDX)
  IF(.NOT.((PTS(INDX) .EQ. 1.0) .AND. (BUFF(1,INDX) .GT.
1    1000000000.0)))GOTO 23004
    HFLG(INDX) = 1
    DFLG(INDX) = 0
    NPTS(INDX) = 1
    PTS(INDX) = 0.
C
C  END OF DATA
C
  IRDDAT = (0)
  RETURN
C
C  ELSE
23004  CONTINUE
  VALU = BUFF(1,INDX)
  NPTS(INDX) = 2
C
C  SUCCESSFUL READ
C
  IRDDAT = (1)
  RETURN
23005  CONTINUE
C
C
C
C  END OF FILE
C
  GOTO 23003
C  ELSE
23002  CONTINUE
  IF(.NOT.(HFLG(INDX) .EQ. 0))GOTO 23006
  IRDDAT = (0)
  RETURN
C
C  NEXT RECORD IS NOT A DATA RECORD
C
C  ELSE
23006  CONTINUE
  IRDDAT = (-1)
  RETURN
23007  CONTINUE
23008  CONTINUE
C
  GOTO 23001
C  ELSE
23000  CONTINUE
  I = NPTS(INDX)
  VALU = BUFF(I,INDX)
  NPTS(INDX) = NPTS(INDX) + 1
C
C  SUCCESSFUL READ
C
  IRDDAT = (1)
  RETURN
23001  CONTINUE
C
  END
```

IRDHD.FORTRAN

```

      INTEGER FUNCTION IRDHD (INDX)
C
C FUNCTION IRDHD READS THE NEXT HEADER
C RECORD FROM LOGICAL UNIT NUMBER LUN.
C IT WILL ALWAYS TRY TO RETURN THE
C NEXT HEADER RECORD, READING OVER
C INTERMEDIATE DATA RECORDS IF
C NECESSARY. IT RETURNS 1 ON A
C SUCCESSFUL READ, 0 ON END OF FILE.
C
C
C CALLS:
C  IRDDAT
C  RDHEAD
C  SAVE - MACHINE DEPENDENT
C
C   PROGRAMMED BY MADELEINE ZIRHES
C   SEPTEMBER 15, 1980
C
C ARRAY INDEX - INPUT
      INTEGER INDX
C
C LOGICAL UNIT NUMBER
      INTEGER LUN
C
C THE DATA READ FROM DISK IS SET TO ALLOW
C ACCESS TO THREE FILES SIMULTANEOUSLY
C
C STATION CODE - CHARACTER STRING
      INTEGER CODE(4,3)
C INSTRUMENT CODE - CHARACTER STRING
      INTEGER CHN(4,3)
C STATION LATITUDE
      REAL LAT(3)
C STATION LONGITUDE
      REAL LON(3)
C STATION ELEVATION
      REAL ELEV(3)
C START TIME OF DATA
C YEAR
      INTEGER SYEAR(3)
C DAY OF YEAR
      INTEGER SDOFY(3)
C HOUR
      INTEGER SHOUR(3)
C MINUTE
      INTEGER SMIN(3)
C SECONDS
      REAL SSECS(3)
C SAMPLING RATE
      REAL RATE(3)
C NORMALIZATION CONSTANT
      REAL AO(3)
C NUMBER OF POLES
      INTEGER NP(3)
C POLES
      COMPLEX POLES(20,3)
C NUMBER OF ZEROES
      INTEGER NZ(3)
C ZEROES
      COMPLEX ZEROES(10,3)
C

```

- 189 -

```

C HEADER RECORD FLAG
  INTEGER HFLG(3)
C DATA RECORD FLAG
  INTEGER DFLG(3)
C NUMBER OF LOGICAL UNIT NUMBERS ASSIGNED
  INTEGER NLUN
C LOGICAL UNIT NUMBERS ASSOCIATED WITH DATA INDEXES
  INTEGER LLUN(20)
C INDEX ASSOCIATED WITH A LOGICAL UNIT NUMBER
  INTEGER ILUN(3)
C INDEX OF NEXT DATA VALUE TO BE RETURNED
  INTEGER NPTS(3)
C
  COMMON /HEAD/ CODE, CHN, LAT, LON, ELEV, SYEAR, SDOFY, SHOUR,
    1 SMIN, SSECS, RATE, AO, NP, POLES, NZ, ZEROES
C
  COMMON /FLAGS/ HFLG, DFLG, NLUN, LLUN, ILUN, NPTS
C*****
C*          MACHINE DEPENDENT          *
C*****
  SAVE /FLAGS/
  REAL DATA
C FUNCTION
  INTEGER IRDDAT
C END OF FILE FLAG
  INTEGER TF
C
  LUN = ILUN(INDX)
C
C THIS IS A DATA RECORD
C
  IF(.NOT.(DFLG(INDX) .EQ. 1))GOTO 23000
C   FOR
23002  CONTINUE
C
C   READ RECORDS UNTIL A HEADER RECORD IS FOUND
C
  IF(.NOT.(IRDDAT(LUN,DATA) .NE. 1))GOTO 23005
    GOTO 23004
23005  CONTINUE
    GOTO 23002
C  ENDFOR
23004  CONTINUE
C
23000 CONTINUE
  CALL RDHEAD(LUN, INDX, TF)
C
C END OF FILE
C
  IF(.NOT.(TF .EQ. 1))GOTO 23007
    HFLG(INDX) = 0
    DFLG(INDX) = 0
    IRDHD = (0)
    RETURN
C
C SUCCESSFULLY READ A HEADER RECORD
C
C ELSE
23007  CONTINUE
    HFLG(INDX) = 0
    DFLG(INDX) = 1
    IRDHD = (1)
    RETURN
23008 CONTINUE
C

```

- 190 -

END

RESP.FORTRAN

```

COMPLEX FUNCTION RESP(INDX,OMEGA,IFL)
C
C RESP RETURNS  $T(S)=A0*(S-Z(1))*...*(S-Z(M))/(S-P(1))*...*(S-P(N))$ .
C WHERE P, Z, AND S ARE COMPLEX. S = CMPLX(0.,OMEGA).
C IFL FLAGS THE CALLERS DESIRE FOR
C DISPLACMT (IFL=1), VELOCITY (IFL=2),
C OR ACCELERATION (IFL=3).
C
C
C CALLS NO OTHER ROUTINE.
C
C   PROGRAMMED BY R. BULAND
C   AUGUST 23, 1979
C
C ARRAY INDEX - INPUT
C   INTEGER INDX
C ANGULAR FREQUENCY - INPUT
C   REAL OMEGA
C FLAG - DETERMINES OUTPUT UNITS - INPUT
C   INTEGER IFL
C
C   COMPLEX S
C   COMPLEX D
C   INTEGER J
C
C THE DATA READ FROM DISK IS SET TO ALLOW
C ACCESS TO THREE FILES SIMULTANEOUSLY
C
C STATION CODE - CHARACTER STRING
C   INTEGER CODE(4,3)
C INSTRUMENT CODE - CHARACTER STRING
C   INTEGER CHN(4,3)
C STATION LATITUDE
C   REAL LAT(3)
C STATION LONGITUDE
C   REAL LON(3)
C STATION ELEVATION
C   REAL ELEV(3)
C START TIME OF DATA
C YEAR
C   INTEGER SYEAR(3)
C DAY OF YEAR
C   INTEGER SDOFY(3)
C HOUR
C   INTEGER SHOUR(3)
C MINUTE
C   INTEGER SMIN(3)
C SECONDS
C   REAL SSECS(3)
C SAMPLING RATE
C   REAL RATE(3)
C NORMALIZATION CONSTANT
C   REAL A0(3)
C NUMBER OF POLES
C   INTEGER NP(3)
C POLES
C   COMPLEX POLES(20,3)
C NUMBER OF ZEROES
C   INTEGER NZ(3)
C ZEROES
C   COMPLEX ZEROES(10,3)
C

```

APPENDIX C

GBYTES

Gbytes is one of the routines used by the commands *retrv* and *ndtsum* that is machine dependent.

We have obtained examples of *gbytes* for several machines. The documentation preceeding the code for each example lists the machines on which the code can be run.

We would like to thank Dr. Steve Pazan at Scripps Institution of Oceanography for his help in supplying some of the examples.

```
COMMON /HEAD/ CODE, CHN, LAT, LON, ELEV, SYEAR, SDOFY, SHOUR,  
1 SMIN, SSECS, RATE, A0, NP, POLES, NZ, ZEROES  
C  
  IF(.NOT.(NP(INDX).LE.0))GOTO 23000  
    RESP = (0.0)  
    RETURN  
23000 CONTINUE  
  D = (1.,0.)  
  S = CMPLX(0., OMEGA)  
C  
C COMPUTE THE CONTRIBUTION OF THE ZEROES IF ANY  
C  
  DO 23002 J = 1,NZ(INDX)  
    D = D*(S-ZEROES(J,INDX))  
23002 CONTINUE  
C  
C COMPUTE THE CONTRIBUTION OF THE POLES  
C  
  DO 23004 J = 1,NP(INDX)  
    D = D/(S-POLES(J,INDX))  
23004 CONTINUE  
C  
C  
C DISPLACEMENT  
C  
  IF(.NOT.(IFL.EQ. 1))GOTO 23006  
    RESP = (A0(INDX)*D)  
    RETURN  
C  
C VELOCITY  
C  
C ELSE  
23006 CONTINUE  
  IF(.NOT.(IFL.EQ. 2))GOTO 23008  
    RESP = (A0(INDX)*D/S)  
    RETURN  
C  
C ACCELERATION  
C  
C ELSE  
23008 CONTINUE  
  IF(.NOT.(IFL.EQ. 3))GOTO 23010  
    RESP = (A0(INDX)*D/(S*S))  
    RETURN  
23010 CONTINUE  
23009 CONTINUE  
23007 CONTINUE  
END
```

IBM 360 VERSION

```

*
* **** DOCUMENTATION ****
* NATIONAL CENTER FOR ATMOSPHERIC RESEARCH, BOULDER, COLORADO
* GBYTE/GBYTES WRITTEN BY JORDAN HASTINGS AND DENNIS JOSEPH
* REWORKED TO BECOME GBYTE/GBYTES IN SCRIBIT PACKAGE BY WESLEY HILTON
* SBIT/SBITS ALSO ADDED BY WESLEY HILTON - JULY 1975
* AT SCRIPPS INSTITUTION OF OCEANOGRAPHY, LA JOLLA, CALIFORNIA
* ALL REFERENCES TO SBIT/SBITS REMOVED BY MADELEINE ZIRBES
* JANUARY 1981
* SBIT/SBITS DID THE INVERSE OF GBYTE/GBYTES.
*
* THE FOLLOWING ROUTINES ALLOW FORTRAN ACCESS TO BIT STRINGS (BYTES)
* OF ARBITRARY LENGTH AND POSITION, PERHAPS CROSSING WORD BOUNDARIES,
* IN THE MANNER SPECIFIED BELOW:
*
* CALL GBYTE (PCKD,UNPK,INOFST,NBIT)
* CALL GBYTES (PCKD,UNPK,INOFST,NBIT, NSKIP,ITER)
*
* PCKD:  THE FULLWORD IN MEMORY FROM WHICH UNPACKING IS TO
*        BEGIN; SUCCESSIVE FULLWORDS WILL BE FETCHED AS
*        REQUIRED.
* UNPK:  THE FULLWORD IN MEMORY INTO WHICH THE INITIAL BYTE
*        OF UNPACKED DATA IS TO BE STORED; SUBSEQUENT BYTES
*        WILL BE STORED INTO SUCCESSIVE FULLWORDS AS
*        REQUIRED.
* INOFST: A FULLWORD INTEGER SPECIFYING THE INITIAL OFFSET
*        IN BITS OF THE FIRST BYTE, COUNTED FROM THE
*        LEFTMOST BIT IN PCKD.
* NBIT:  A FULLWORD INTEGER SPECIFYING THE NUMBER OF BITS
*        IN EACH BYTE TO BE UNPACKED.  LEGAL BYTE WIDTHS
*        ARE IN THE RANGE 1 - 32; BYTES OF WIDTH .LT. 32
*        WILL BE RIGHT JUSTIFIED IN THE LOW-ORDER POSITIONS
*        OF THE UNPK FULLWORDS, WITH HIGH-ORDER ZERO FILL.
* NSKIP: A FULLWORD INTEGER SPECIFYING THE NUMBER OF BITS
*        TO SKIP BETWEEN SUCCESSIVE BYTES.  ALL NON-NEGATIVE
*        SKIP COUNTS ARE LEGAL.
* ITER:  A FULLWORD INTEGER SPECIFYING THE TOTAL NUMBER OF
*        BYTES TO BE UNPACKED, AS CONTROLLED BY INOFST,
*        NBIT AND NSKIP ABOVE.  ALL NON-NEGATIVE ITERATION
*        COUNTS ARE LEGAL.
*
* NOTES ...
* 1) A MULTIPLE-BYTE ACCESS (GBYTES ) WITH ITER=0 WILL
*    DO NOTHING.
* 2) AN ERROR DETECTED IN THE CALLING SEQUENCE WILL CAUSE
*    AN ERROR PRINTOUT VIA A 'PRINT' STATEMENT IN FORTRAN
*    SUBROUTINE 'ERMSG', A PART OF THE 'SCRIBIT' PACKAGE.
*    CONTROL WILL THEN RETURN TO THE CALLING PROGRAM.
* CALLING SEQUENCE ERRORS ARE--NEGATIVE ITERATION COUNT, NEGATIVE
* BIT COUNT OR SKIP.
*
* *****
* MACHINES:
*   IBM 360
*   IBM 370
*   AMDAHL
*   ITTEL
* *****
*
* GBYTE  TITLE 'IBM S/360 VERSION OF GBYTE(S)'
*

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- 195 -

• **** REGISTER USAGE ****

ZERO	EQU	X'0'	CONSTANT ZERO
PCKD	EQU	X'1'	ADDR OF PACKED ARY ELEMENT
UNPK	EQU	X'2'	ADDR OF UNPACKED ARY ELEMENT
OFST	EQU	X'3'	INITIAL BIT OFFSET
NBIT	EQU	X'4'	BYTE LENGTH IN BITS (.LE.32)
NSKP2	EQU	X'4'	SAME REG USED FOR (NSKP+2*NBIT) IF
•	LOOPING		
NSKP	EQU	X'5'	ITERATIVE BIT SKIP
ITER	EQU	X'6'	ITERATION COUNT (.GE.0)
BITR	EQU	X'7'	BITS REMAINING IN HIWD
BITS	EQU	X'8'	BITS TO SHIFT (OFST OR NSKP)
WORK	EQU	X'9'	WORK REGISTER
HIWD	EQU	X'A'	HI-ORDER WORD (EVEN REGISTER)
LOWD	EQU	X'B'	LO-ORDER WORD (ODD REGISTER)
BASE	EQU	X'C'	BASE ADDR REGISTER
•	EQU	X'E'	RETURN ADDR (NOT MODIFIED)
•	EQU	X'D'	SAVE AREA ADDR (NOT MODIFIED)
BYTE	EQU	X'F'	RESULTANT BYTE
NBFW	EQU	4	NUMBER OF BYTES/FULL WORD
•			
•			
•	****	CODE	****
•			
	EXTRN	ERMSG	
	B	10(15)	
	DC	X'5'	
	DC	CL5'ERMSG'	
GBYTES	CSECT ,	PRIME ENTRY POINT	
	ENTRY	GBYTE	ALTERNATE ENTRY POINT
•			
	USING	GBYTES,15	ENTRY PT ADR ESTB IN R15 BY CALLER
	SAVE	(14,12)	SAVE ALL REGS EXCEPT 13
	LM	NSKP,ITER,4*NBFW(1)	PICK UP NSKP, ITER PARM ADDRESSES
	L	NSKP,0,(NSKP)	PICK UP BIT SKIP COUNT
	L	ITER,0,(ITER)	PICK UP ITERATION COUNT
	B	INIT	JUMP INTO CODE PROPER
•			
GBYTE	DS	0H	FORCE HALFWD ALIGNMENT
	USING	GBYTE,15	ALT ENTRY ADDR ESTB IN R15 BY CALLER
	SAVE	(14,12)	SAVE ALL REGS EXCEPT 13
	LH	ITER,=H'1'	MAKE ITERATION COUNT ONE
•			
INIT	BALR	BASE,0	RE-ESTABLISH ADDRESSABILITY
	USING	*,BASE	
	LM	PCKD,NBIT,0(1)	PICK UP ARY AND PARAMETER ADDRESSES
	L	OFST,0,(OFST)	PICK UP INITIAL OFFSET BIT COUNT
	L	NBIT,0,(NBIT)	PICK UP NO. OF BITS/BYTE TO UNPACK
	SR	ZERO,ZERO	ZERO OUT REG 0
	CR	ITER,ZERO	TEST ITERATION COUNT
	BE	EXIT	RETURN,DO NOTHING,IF ITER COUNT ZERO
	BL	FAIL	FAIL ON NEGATIVE ITERATION COUNT
	AR	NSKP,NBIT	ADD NBIT TO NSKP FOR MULT ACCESS
	LH	WORK,=H'32'	MAKE WORK =32
	SR	WORK,NBIT	COMPLEMENT NBITS (MODULO 32)
	BM	FAIL	IF NOT .LE.32, FAIL
	STH	WORK,RJUST+2	ELSE USE TO SET UP BYTE SHIFT COUNT
•			
	AR	NBIT,NSKP	OF SRL (RX) INSTR IN STORE SEQ
•			
	LR	BITS,OFST	REG NOW BECOMES NSKP2=
	LH	WORK,=H'64'	(NSKP+2*NBIT) FOR LOOP TEST
• TOP OF ITERATION			MAKE BITS TO SHIFT = INITIAL OFFSET
TOP	LR	OFST,BITS	MAKE WORK=64
	SRA	OFST,5	COPY BITS REMAINING TO SHIFT TO OFST
			DIVIDE BY 32 TO GET WORDS TO SKIP

CDC VERSION

*
 * **** DOCUMENTATION ****
 * NATIONAL CENTER FOR ATMOSPHERIC RESEARCH, BOULDER, COLORADO
 * GBYTE/GBYTES WRITTEN BY JORDAN HASTINGS AND DENNIS JOSEPH
 * REWORKED BY WESLEY HILTON TO ALLOW FORTRAN ACCESS TO
 * BIT STRINGS (BYTES) OF ARBITRARY LENGTH AND POSTION,
 * CROSSING WORD BOUNDARIES.
 *

* SYNTAX

* CALL GBYTE (PCKD,UNPK,INOFST,NBIT)
 * CALL GBYTES (PCKD,UNPK,INOFST,NBIT, NSKIP,ITER)
 *
 * PCKD: THE FULLWORD IN MEMORY FROM WHICH UNPACKING IS TO
 * BEGIN; SUCCESSIVE FULLWORDS WILL BE FETCHED AS
 * REQUIRED.
 * UNPK: THE FULLWORD IN MEMORY INTO WHICH THE INITIAL BYTE
 * OF UNPACKED DATA IS TO BE STORED; SUBSEQUENT BYTES
 * WILL BE STORED INTO SUCCESSIVE FULLWORDS AS
 * REQUIRED.
 * INOFST: A FULLWORD INTEGER SPECIFYING THE INTIAL OFFSET
 * IN BITS OF THE FIRST BYTE, COUNTED FROM THE
 * LEFTMOST BIT IN PCKD.
 * NBIT: A FULLWORD INTEGER SPECIFYING THE NUMBER OF BITS
 * IN EACH BYTE TO BE UNPACKED. LEGAL BYTE WIDTHS
 * ARE IN THE RANGE 1 - 32; BYTES OF WIDTH .LT. 32
 * WILL BE RIGHT JUSTIFIED IN THE LOW-ORDER POSITIONS
 * OF THE UNPK FULLWORDS, WITH HIGH-ORDER ZERO FILL.
 * NSKIP: A FULLWORD INTEGER SPECIFYING THE NUMBER OF BITS
 * TO SKIP BETWEEN SUCCESSIVE BYTES. ALL NON-NEGATIVE
 * SKIP COUNTS ARE LEGAL.
 * ITER: A FULLWORD INTEGER SPECIFYING THE TOTAL NUMBER OF
 * BYTES TO BE UNPACKED, AS CONTROLLED BY INOFST,
 * NBIT AND NSKIP ABOVE. ALL NON-NEGATIVE ITERATION
 * COUNTS ARE LEGAL.

* NOTES ...

* 1) A MULTIPLE-BYTE ACCESS (GBYTES) WITH ITER=0 WILL
 * DO NOTHING.
 * 2) AN ERROR DETECTED IN THE CALLING SEQUENCE WILL CAUSE
 * AN ERROR PRINTOUT VIA A 'PRINT' STATEMENT IN FORTRAN
 * SUBROUTINE 'ERMSG',A PART OF THE 'SCRIBIT' PACKAGE.
 * CONTROL WILL THEN RETURN TO THE CALLING PROGRAM.

* CALLS

* ERMSG

* MACHINES:

* CYBER 6000'S
 * CYBER 7000'S
 * CYBER 170'S

	IDENT	GBYTE
	ENTRY	GBYTE,GBYTES
	EXT	ERMSG
GBYTES	CON	0
	SA4	GBYTES
	BX6	X4
	SA6	GBYTE

- 196 -

	SLA	OFST,2	CONVERT TO BYTES
	AR	PCKD,OFST	INCR PACKED ARRAY POINTER
	L	HIWD,0(PCKD)	AND LOAD NEW HIWD
	SLA	OFST,3	MULTIPLY BYTES BY 8 TO GET BITS
	SR	BITS,OFST	AND DECR BITS REMAINING TO SHIFT
	L	LOWD,NBFW(,PCKD)	PICK UP NEXT PACKED WORD
	LR	BITR,WORK	RESET BITR TO 64
* NOW LEFT JUSTIFY DESIRED SUBSTRING IN HIWD			
SHIFT	STH	BITS,*+6	SET UP BITS AS SLDL SHIFT COUNT
	SLDL	HIWD,*	SHIFT LEFT DOUBLE LOGICAL, HIWD/LOWD
* RIGHT JUSTIFY DESIRED SUBSTRING IN CALLING PROGRAM UNPACKED ARRAY			
	LR	BYTE,HIWD	COPY HIWD TO BYTE
RJUST	SRL	BYTE,*	SHIFT RIGHT(WITH HI-ORDER ZERO FILL)
* BY SHIFT COUNT SET UP AT INITIALIZATION SEQUENCE			
	ST	BYTE,0(UNPK)	FILL BYTE INTO UNPACKED ARRAY
	BCT	ITER,MORE	DECR ITER COUNT, CONTINUE TILL ZERO
EXIT	MVI	12(13),X'FF'	FLAG RETURN LINKAGE
	RETURN	(0,12)	RESTORE CALLING PROG REGS (MACRO)
MORE	SR	BITR,BITS	DECR BITS REMAINING BY BITS SHIFTED
	LA	UNPK,NBFW(UNPK)	AND INCR UNPACKED ARY POINTER
	LR	BITS,NSKP2	GET (NSKP+2*NBITS)
	SR	BITS,BITR	SUBTRACT BITS REMAINING
	CR	BITS,ZERO	COMPARE TO ZERO
	LR	BITS,NSKP	IN ANY CASE,SET BITS TO SKIP TO
			(NSKP+NBIT)
	BNH	SHIFT	DATA IS ALREADY IN REGS,NO FETCH
	SR	BITS,BITR	SUBTRACT CURRENT REMAINING BITS
	AR	BITS,WORK	ADD 64 TO RESET TO PCKD POINTER
	B	TOP	GO FETCH MORE DATA FROM MEMORY
FAIL	ST	UNPK,GBARR	PUT UNPACKED ARRAY ADR AS ARG
	ST	PCKD,GBERR+2*NBFW	POINT TO PACKED ARRAY AS ARG
	ST	14,GBRTN	RETURN ADDRESS IS ARG
	LA	1,GBERR	POINT TO ARG LIST WITH REG ONE
	LR	2,13	SAVE CALLING PROGRAM SAVE AREA PTR
	LA	13,GAREA	POINT TO LOCAL SAVE AREA
	ST	13,8(0,2)	LEFT-RIGHT LINK LOCAL SAVE AREA
	ST	2,4(0,13)	INTO CHAIN OF SAVE AREAS
	L	15,=A(ERMSG)	SET UP BRANCH
	BALR	14,15	GO PRINT ERROR MESSAGE
	L	13,GAREA+4	RELOAD CALLING SAVE AREA ADR
	L	14,12(13)	RECOVER RETURN ADDRESS
	B	EXIT	
GAREA	DS	18F	
GSAVE	DS	2F	
GBRTN	DS	1F	
GMSG	DC	F'11'	SELECT GBYTE DIAGNOSTIC MESSAGE
GBARR	DS	1F	
GBERR	DC	A(GBRTN)	POINT TO RETURN ADDRESS
	DC	A(GMSG)	POINT TO MESSAGE SELECT
	DS	1F	WILL POINT TO PACKED DATA
	DC	A(GBARR)	POINTS TO UNPACKED ARRAY ADDRESS
	LTORG		

```

      BX1      X0*X1      .GET THE BYTE ISOLATED IN X1
      PL      B1,RTJST    .IF WE ARE DONE,JUMP
      MX0      1          .IF
      SB3      -B1
      SB3      B3-1
      AX0      B3,X0
      BX2      X2*X0      .ISOLATE 2ND PART OF BYTE
      BX1      -X0*X1     .CHOP OFF TRASH IN 1ST PART OF BYTE
      BX1      X1+X2      .COMBINE PORTIONS
RTJST  ZR      X4,LEFT    .IF SIGN BIT IS INVOLVED,JUMP
      AX6      B1,X1      .RIGHT JUSTIFY THE BYTE
STR    SA6      B7        .STORE IT IN OUTPUT FIELD
      ZR      B6,GBYTE    .IF DONE,LEAVE
      SB6      B6-1      .IF NOT DONE COUNT
      SB7      B7+1
      IX4      X4+X5
      SX4      X4+B5      .COFFSET = OLD OFFSET+ BYTE SIZE +SKIP SIZE
      JP      LOOP      .GO LOOP
LEFT  SB1      X5        .GET BYTE SIZE
      LX6      B1,X1      .RIGHT JUSTIFY THE BYTE
      JP      STR        .GO STORE IT
* SET UP ARGUMENTS FOR ERROR PRINTOUT
      IFEQ     *F,1      ASSEMBLE IF MNF/RUN CALLED
GBERR  SB3      B1        STRING POINTER
      SX6      B2        PUT ARRAY ADDRESS IN MEMORY
      SA6      ADR        AT ADR
      SB4      ADR        AND POINT AT IT
      SB1      GBYTE     RETURN ADDRESS
      SB2      =11       MESSAGE SELECT
      RJ      ERMSG      GO PRINT OUT MESSAGE
      JP      GBYTE      SHOULD NOT BE HERE
      ENDIF
      IFEQ     *F,2      ASSEMBLE IF FTN CALLED
ARGLST CON     GBYTE     ARG 1 IS RETURN ADDRESS
      CON     =11       .ARG 2 IS MESSAGE SELECT
      CON     0         ARG 3 WILL BE STRING
      CON     ADR        ARG 4 WILL BE ARRAY ADDRESS
GBERR  SA1      ARGLST   POINT TO ARG LIST FTN STYLE
      SX6      B1        GET STRING POINTER
      SA6      ARGLST+2  MAKE STRING ARG 3
      SX6      B2        GET ARRAY ADDRESS
      SA6      ADR        MAKE ARG 4 ARRAY ADDRESS
      RJ      ERMSG      GO PRINT OUT MESSAGE
      JP      GBYTE      SHOULD NOT BE HERE
      ENDIF
ADR    CON     0
      LIT
      END

```


- 198 -

	IFEQ	*F,2	ASSEMBLE IF FTN CALLED COMPASS
	SA1	A1	ADR OF FIRST ARG TO X1
	SB1	X1	NOW TO B1
	SA1	A1+1	STEP X1 TO NEXT ARG
	SB2	X1	
	SA1	A1+1	STEP X1 TO NEXT ARG
	SB3	X1	
	SA1	A1+1	STEP X1 TO NEXT ARG
	SB4	X1	
	SA1	A1+1	STEP X1 TO NEXT ARG
	SB5	X1	
	SA1	A1+1	STEP X1 TO NEXT ARG
	SB6	X1	
	ENDIF		
	SA2	B5	.GET SKIP
	SB5	X2	.SAVE SKIP
	JP	REG	
GBYTE	CON	0	
	IFEQ	*F,2	ASSEMBLE IF FTN CALLED COMPASS
	SA1	A1	ADR OF FIRST ARG TO X1
	SB1	X1	NOW TO B1
	SA1	A1+1	STEP X1 TO NEXT ARG
	SB2	X1	
	SA1	A1+1	STEP X1 TO NEXT ARG
	SB3	X1	
	SA1	A1+1	STEP X1 TO NEXT ARG
	SB4	X1	
	ENDIF		
REG	SB6	=1	SINGLE ITERATION
	SA1	B1	.POINT A1 AT START OF SOURCE STRING
	SB7	B2	.MOVE DESTINATION ADDRESS
	SA4	B3	.GET CALCULATED OFFSET IN X4
	SA5	B4	.GET BYTE SIZE IN X5
	NG	X5,GBERR	.NEGATIVE BITS IS ERROR
	SX3	X5-61	.IF TRYING TO GET SUBSTRING GREATER
	PL	X3,GBERR	.THAN 60 BITS,ERROR EXT
	SA3	B6	
	ZR	X3,GBYTE	.ZERO ITERATIONS MEANS NO ACTION
	NG	X3,GBERR	.NEGATIVE ITERATIONS IS ERROR
	SB6	X3-1	.SET UP LOOP COUNTER
	SB2	X5-1	.B2=BYTE SIZE-1 (SET FOR GENERATING MASK)
LOOP	SX3	60	.CONSTANT OF 60
	PX7	X3	.FLOAT 60
	NX7	X7	.NORMALIZE B
	PX6	X4	.FLOAT NEW COFFSET (IN BITS)
	NX6	X6	.NORM
	FX2	X6/X7	.Q = A/B
	UX2	B1,X2	.
	LX2	B1,X2	.GET INTEGER QUOTIENT
	SB1	X2	.PUT IN B1
	PX2	X2	.REPACK AND
	NX2	X2	.
	FX4	X7*X2	.X4 = B*Q
	FX4	X6-X4	.R = A - B*Q
	UX4	B3,X4	.GET INTEGER
	LX4	B3,X4	.
	SA1	A1+B1	.GET NEW WORD IN
	SA2	A1+1	.GET SECOND WORD (WHETHER NEEDED OR NOT)
	IX7	X3-X4	.ACTUAL OFFSET = 60-CALC OFFSET
	SB3	X7	.PUT INTO B3
	MX0	1	.FORM THE
	AX0	B2,X0	.
	IX6	X7-X5	.FIND IF BYTE IS JUST IN WORD
	SB1	X6	.
	LX0	B3,X0	.LINE UP MAXX

- 201 -

IBM 1130 VERSION

- * W.HILTON - SCRIPPS INST.OF OCEANOGRAPHY-NORPAX PROJECT
- * LEVEL 5 OF NORPAX BINARY DATA MGMT SCHEME
- * JAN74 - CALLING SEQUENCES TAKEN FROM
- * NATIONAL CENTER FOR ATMOSPHERIC RESEARCH TN/1A-93
- * TECHNIQUES FOR THE PROCESSING, STORAGE AND
- * EXCHANGE OF DATA
- * BY ROY JENNE AND DENNIS JOSEPH.
- * THESE ROUTINES ATTEMPT TO HELP TRANSLATION
- * BETWEEN SOME STRING OF BITS IN SOME ALIEN PATTERN
- * AND AN ARRAY OF VALUES OR CHARACTERS IN THE NATIVE
- * (IN THIS CASE, IBM 1800) INTERNAL FORMAT.
- * FORTRAN CALLING SEQUENCES -
- * CALL GBYTE (NPACK,ISAM,NSKIP,NBITS)
- * CALL GBYTES(NPACK,ISAM,NSKIP,NBITS,ISKIP,ITER)
- * WHERE -
- * AS A RESULT OF ANY OF THE ABOVE CALLS, BITS ARE
- * TRANSFERRED BETWEEN ARRAYS NPACK AND ISAM.
- * NPACK IS THOUGHT OF AS ONE LONG STRING OF BITS.
- * NPACK IS THOUGHT OF AS ONE LONG STRING OF BITS.
- * ISAM IS THOUGHT OF AS GROUPS OF UP TO 16 BITS
- * RIGHT-JUSTIFIED IN EACH ELEMENT.
- * NSKIP=THE NUMBER OF BITS IN NPACK TO SKIP BEFORE
- * ANY TRANSFER.
- * NBITS=THE NUMBER OF BITS TO TRANSFER.
- * GBYTE(IE. 'GET BIT STRING') DOES ONE TRANSFER FROM
- * NPACK TO ISAM.
- * ITER=THE NUMBER OF TRANSFERS TO BE MADE.
- * ISKIP=THE NUMBER OF BITS IN NPACK TO SKIP BETWEEN
- * TRANSFERS.
- * NOTE THAT A TRANSFER TO NPACK WILL DISTURB ONLY THE
- * EXACT NUMBER OF BITS TRANSFERRED, AND THE TRANSFER
- * MAY STRADDLE TWO WORDS IN NPACK.
- * HOWEVER, A TRANSFER TO ISAM WILL DISTURB EXACTLY
- * ONE WORD IN ISAM, NO MORE AND NO LESS, SINCE
- * THE (16-NBITS) LEADING BITS WILL BE ZEROED, NO
- * MORE THAN 16 BITS MAY BE TRANSFERRED, AND WORD
- * BOUNDARIES IN ISAM WILL NOT BE STRADDLED.
- * ERRORS IN THE CALLING SEQUENCE WILL CAUSE A
- * SYSTEM ERROR MESSAGE TO BE OUTPUT, AND THE JOB TO
- * KILLED. THE MESSAGE FORMAT IS...
- * HEX WORD 2 ADDRESS OF CALL
- * 3 NUMBER OF BITS REQUESTED FOR TRANSFER
- * 4 ADDRESS OF PACKED ARRAY
- * 5 ADDRESS OF UNPACKED ARRAY
- * 6 NUMBER OF ITERATIONS REQUESTED IF
- * APPLICABLE
- * THE REMAINDER OF THE MESSAGE IS AS DOCUMENTED IN
- * 'ERROR MESSAGES AND RECOVERY PROCEDURES'
- * NOTE THAT ITERATION COUNT MAY BE ZERO, IN WHICH
- * CASE NOTHING IS DONE. SKIPS MAY BE NEGATIVE WHICH
- * MAY CAUSE YOU TO MOVE THROUGH THE PACKED ARRAY IN
- * ASSEMBLER SEQUENCE, BUT IF A BIT FETCH OR STORE
- * STRADDLES A WORD BOUNDARY IN THE PACKED ARRAY, THE
- * STRADDLE WILL BE HANDLED IN A FORTRAN ARRAY SE-
- * QUENCE, NOT ASSEMBLER SEQUENCE.
- ENT GBYTE GET ONE BIT STRING
- ENT GBYTES GET SEQUENCE OF BIT STRING
- *****
- *
- * 21 JANUARY 1981
- * PROGRAM MODIFIED BY MADELEINE ZIRBES.
- * ALL REFERENCES TO SBIT AND SBITS WERE REMOVED.

- 200 -

ERMSG.FORTRAN

```

      SUBROUTINE ERMSG(LEVEL,MSG,LUN,IARG)
C W. HILTON - NORPAX PROJECT - SCRIPPS INST. OF OCEANOGRAPHY - OCT74
C NORPAX DATA MANAGEMENT BINARY PACKED DATA CALLING SEQUENCE DEFINITION
C GLOBAL LEVEL
C SEE NORPAX DATA MANAGEMENT TECH.MEMO NUMBER FOR EXTENSIVE
C DETAILS OF THE WHOLE SYSTEM.
C PRINTS ALL ERROR MESSAGES, DETERMINES WHETHER FATAL OR WARNING, ACTS
C ACCORDINGLY.
      INTEGER LVDTA(4),EN,DE
C *** MACHINE DEPENDENT HOUSEKEEPING INFORMATION ***
C HOST MACHINE - CDC 7600
      COMMON/DMGLBL/MACH,MXLUN,LUNCT,LISTP,IERRP,LUNS(5)
      DATA EN,DE/2HEN,2HDE/
      DATA LVDTA/6HPHYSCI,6H BLOCK,6HREPORT,6H USER/
      DATA LT,GT/2HLT,2HGT/
C COMPUTE CALL ADDRESS IF THAT IS GIVEN INSTEAD OF LEVEL
      ICALL=SHIFT(LEVEL,-30)-400000004B
C *** END MACHINE DEPENDENT HOUSEKEEPING ***
      ICHAR=LEVEL-1
      GO TO (1000,2000,3000,4000,5000,6000,7000,8000,10000,9100,9200,
1 9300),MSG
1000 WRITE(IERRP,1010)LVDTA(ICCHAR),LUN
1010 FORMAT( 1XA6,* ACCESS ATTEMPTED ON NON-EXISTENT LOGICAL UNIT *,
1 I2)
      GO TO 10000
2000 WRITE(IERRP,2020) LVDTA(ICCHAR),LUN,MXLUN
2020 FORMAT( 1XA6,* LOGICAL UNIT *,I2,* OVERFLOWS TABLE CAPACITY OF *,
1 I2,* LOGICAL UNITS.*)
      GO TO 10000
3000 WRITE(IERRP,3010)IARG,LVDTA(ICCHAR),LUN,LT
3010 FORMAT(* SPECIFICATION *,I2,* FOR *, A6,* LOGICAL UNIT *,I2,
1 * IS *,A2,* THAN ALLOWED BY OTHER SPECS OR BY SYSTEM.*)
      GO TO 10000
4000 WRITE(IERRP,3010) IARG,LVDTA(ICCHAR),LUN,GT
      GO TO 10000
5000 IF(LISTP) 20000,20000,5005
5005 WRITE(LISTP,5010) LVDTA(ICCHAR),DE,LUN
5010 FORMAT( 1XA6,1XA2,*CODING ERROR ON LOGICAL UNIT *,I2)
      GO TO 20000
6000 WRITE(IERRP,5010)LVDTA(ICCHAR),EN,LUN
      GO TO 10000
7000 WRITE(IERRP,7010)LVDTA(ICCHAR),DE,LUN
7010 FORMAT( 1XA6,1XA2,*CODE ARGUMENT ERROR ON LOGICAL UNIT *,I2)
      GO TO 10000
8000 WRITE(IERRP,7010)LVDTA(ICCHAR),EN,LUN
      GO TO 10000
9100 WRITE(IERRP,9110)LUN
9110 FORMAT(* BLOCK INPUT CHECKSUM ERROR ON UNIT *,I2)
      GO TO 10000
9200 PRINT 9210,ICALL,LUN,IARG
9210 FORMAT(* ILLEGAL CALL TO GBYTE(S) FROM *,O7,* MOVING DATA FROM STRI
1 NG BEGINNING *,O20,* TO ARRAY WORD AT *,O7,*.*)
      GO TO 10000
9300 PRINT 9310,ICALL,LUN,IARG
9310 FORMAT(* ILLEGAL CALL TO SBIT(S) FROM *,O7,* MOVING DATA TO STRING
1 AT *,O7,* FROM ARRAY WORD CONTAINING *,O20,*.*)
C10000 STOP
10000 RETURN
20000 RETURN
      END

```

* SBIT (STORE BIT STRING) WAS THE EXACT INVERSE
* OF GBYTE.

* MACHINES:

* IBM 1130
* IBM 1800

* BEGIN MACRO DEFINITIONS FOR GBYTES,ETC.

	MAC		
	STUP	ENTRY,SAVE,RTRN,NARGS,UNP	
	LIST	OFF	
* SAVE REGS,GET ARGS,CHECK BIT CNT,SET UP RET			
	STX	1 SAVE+1	SAVE REG ONE
	STX	2 SAVE+3	SAVE REG TWO
	LDX	11 ENTRY	PTR TO ARG ADRS TO REG ONE
	LD	1 0	GET ADR OF PACKED ARRAY
	STO	ENTRY	USE ENTRY AS STORAGE
	LD	1 1	GET ADR OF DESTINATION WORD
	STO	UNP+1	
	LD	11 3	GET NUMBER OF BITS
	STO	NBITS	AND SAVE IT.
	BN	ERR	BR IF NO.OF BITS NEG,ERROR
	AIF	(NARGS LE 5),IFEND	
	LD	11 4	GET SKIP TO USE IN LOOP
	STO	ISKIP	AND SAVE IT.
	STX	3 SAVE+5	SAVE REG 3
	LD	11 5	GET ITERATION COUNT
	STO	*+1	PUT IN REG 3 LOAD
	LDX	13 *-*	ITER TO REG 3 AS LOOP CTR
	BN	ERR	BR IF ITERATION NEG,ERROR
IFEND	ANOP		
	LD	=16	VALUE 16 TO A-REG
	S	NBITS	SUBTRACT NUMBER OF BITS
	STO	NB16	SAVE 16-NBITS
	BN	ERR	ERR IF .GT.16
	MDX	1 NARGS	POINT REG ONE AT RETURN
	STX	1 RTRN+1	
	AIF	(NARGS LE 5),IFEND	
	MDX	3 0	TEST ITERATION COUNT FOR ZERO
	B	*+1	CONTINUE IF POSITIVE
	B	SAVE	RETURN IF ZERO
IFEND	ANOP		
	LIST	ON	
	MEND		

MAC
CPDSP ENTRY
LIST OFF

* COMPUTE DISPLACEMENT IN PACKED ARRAY

SRT	4	DIVIDE BY 16
RTE	16	SWAP DISP AND SKIP
SRA	12	RIGHT JUSTIFY SKIP
STD	SKIP	SAVE SKIP AND DISP
LD	ENTRY	GET ADR OF PACKED ARRAY
S	DISP	SUBTRACT DISPLACEMENT
STO	ENTRY	
LDX	12 ENTRY	PTR TO PACKED ARRAY TO R2
LIST	ON	
MEND		

MAC
GBYT SRA6,STUNP

- 203 -

* MACRO TO GET ONE BIT STRING

	LIST	OFF	
	LDX	I1 SKIP	SKIP IN REG ONE
	LD	2 -1	GET SECOND PACKED WORD
	SRT	16	IN Q REG.
	LD	2 0	GET FIRST PACKED WORD.
	SLT	1	LEFT SHIFT BY SKIP
SRA6	DC	*.*	WILL RT SHFT BY 16-NBITS
STUNP	STO	L *.*	RETURN RESULT
	LIST	ON	
	MEND		

	MAC	
	SBYT	SSLA,SSRA,GTUNP
	LIST	OFF

* MACRO TO STORE ONE BIT STRING

	SLT	16	CLEAR Q-REG
GTUNP	LD	L *.*	GET UNPACKED WORD
SSLA	DC	*.*	WILL SHFT LEFT 16-NBITS
	LDX	I1 SKIP	SKIP TO REG ONE
	RTE	1	SHIFT BY SKIP
	STD	NUBTS	SAVE TWO WORDS,MAY STRADDLE
	LDD	ONES	GET 32 ONES
SSRA	DC	*.*	WILL SHFT,GEN NBITS ZEROES
	RTE	1	MOVE THEM OVER BY SKIP
	AND	2 0	AND SAVE PACKED DATA,OR IN
	OR	NUBTS	NEW DATA.
	STO	2 0	RETURN FIRST WORD OF RSLT
	SLT	16	RETRIEVE REST OF MASK FM Q
	AND	2 -1	AND REPEAT FOR SECOND WORD
	OR	NUBTS+1	OF RESULT.
	STO	2 -1	RETURN POSSIBLE OTHER WORD
	LIST	ON	
	MEND		

* * END MACRO DEFINITIONS,BEGIN EXECUTABLE CODE

* HERE BEGINS ACTUAL BODY OF SUBROUTINE GBYTE

GBYTE	EQU	*	
GETYB	DC	*.*	GET ONE BIT STRING
	STUP	GETYB,GSAVE,GRET,4,GUNP	
	LD	NB16	GET 16-NBITS,MAKE UP SHIFT
	OR	SRA	INSTRUCTION
	STO	GSRA	
	LD	I1 -2	GET SKIP
	CPDSP	GETYB	
	GBYT	GSRA,GUNP	
GSAVE	LDX	L1 *.*	
	LDX	L2 *.*	
GRET	B	L *.*	

GBYTES	EQU	*	
GBYTS	DC	*.*	GET SEQUENCE OF BITS
	STUP	GBYTS,GSRAVS,GRETS,6,GUNPS	
	LD	NB16	GET 16-NBITS,MAKE UP SHIFT
	OR	SRA	INSTRUCTION
	STO	GSRAS	
	LD	I1 -4	GET SKIP
GLOOP	EQU	*	TOP OF LOOP
	CPDSP	GBYTS	
	GBYT	GSRAS,GUNPS	
	LD	ISkip	
	A	SKIP	STEP AHEAD ISkip BITS
	A	NBITS	PLUS NUMBER OF BITS
	MDX	L GUNPS+1,-1	STEP THRU UNPACKED ARRAY

- 204 -

	MDX	3 -1	DECR,TEST REG 3
	B	GLOOP	
GSAVS	LDX	L1 *.*	RESTORE REG ONE
	LDX	L2 *.*	RESTORE REG TWO
	LDX	L3 *.*	RESTORE REG THREE
GRETS	B	L *.*	RETURN

	LORG		
SRA	SRA	0	TEMPLATE INSTRUCTION
	BSS	E	
NB18	DC	*.*	18-NBITS,EVEN ADDRESS
NB1TS	DC	*.*	SLOT FOR BIT COUNT
SKIP	DC	*.*	
DISP	DC	*.*	
ISKIP	DC	*.*	SLOT FOR SKIP WITHIN LOOP

NUBTS	BSS	E	2
SLA	SLA	0	TEMPLATE INSTRUCTION
ONES	DC	/FFFF	AT ODD ADDRESS
ERR	STX	1 HEXNO+1	PUT CALL ADDRESS IN MSG
	LD	L	NBITS
	STO	HEXNO+2	
	LD	1 0	GET PACKED ARR ADR
	STO	HEXNO+3	
	LD	1 1	GET UNPACKED ARR ADR
	STO	HEXNO+4	
	STX	3 HEXNO+5	STORE ITERATION COUNT IF ANY
	CALL	EACPT	
	DC	NAME	
	DC	ERROR	
	DC	HEXNO	
	DMES	RS'E	
	CALL	EACRL	CAUSE RESTART
	DC	HEXNO	POINT TO LEVEL/AREA
NAME	DMES	G/SBIT'E	
ERROR	DMES	CALL ERROR'E	
HEXNO	DC	/FF18	ASSUME VCORE/BASIC LEVEL
	BSS	5	
	END		

- 205 -

PDP11 VERSION

```

.title gbyte
;gbyte/gbytes are byte unpacking subroutines which are fortran
;callable thusly:
; call gbyte(ia,ib,ns,nb)
;or
; call gbytes(ia,ib,ns,nb,ls,n)
;where
; ia is a bit string from which bytes will be taken
; ib is an array where bytes will be put (each byte in
;   the low order end of one 16 bit word)
; ns is the number of bits to skip before the first
;   byte (ns.ge.0)
; nb is the number of bits in the byte (0.le.nb.le.16)
; ls is the number of bits to skip between successive
;   bytes (ls.ge.0)
; n is the number of bytes to get (n.ge.1)
;note:
; gbyte is identical to gbytes with n = 1.
;
; Written circa 1976 By Ray Buland
;
;*****
; Machines:
;   PDP 11's under RT11 or RSX11
;*****
;
r0=%0
r1=%1
r2=%2
r3=%3
r4=%4
r5=%5
sp=%6
pc=%7

        .macro min a,b,c           ;set a to min(a,b)
        cmp a,b
        ble c
        mov b,a
c:

        .endm min
        .macro max a,b,c           ;set a to max(a,b)
        cmp a,b
        bge c
        mov b,a
c:

        .endm max
        .macro mask a,b,c,d        ;build a b bit mask (of ones) in a
        clr a
        tst b                       ;if b.le.0 we are done
        beq c
        bmi c
        mov #100000,a               ;set the sign bit of a to 1
        mov b,r0                    ;set a counter in r0
        dec r0
        tst r0                      ;see if we are done
        beq c
d:      asr a                        ;extend the mask another bit
        sob r0,d
c:

        .endm mask

```

```

        .macro shift a,b,?c,?d,?e,?f,?g    ;shift a by b bits (+left,-right)
        tst b                                ;find direction of shift
        beq c                                ;no shift
        mov b,r0                             ;put the counter in r0
        bmi d                                ;shift right
        cmp r0,#20                           ;a is zero if b.ge.16
        bge g
e:      asl a                                ;shift one bit left
        sob r0,e
        br c                                ;exit
d:      neg r0                               ;shift right
        cmp r0,#20                           ;a is zero if b.le.16
        bge g
        asr a                                ;shift one bit right
        bic #100000,a                       ;clear possible sign extension
        dec r0
        tst r0                               ;if b was -1 we are done
        beq c
f:      asr a                                ;shift one bit right
        sob r0,f
        br c                                ;exit
g:      clr a                                ;the shift was so big it zeroed a
c:
        .endm shift

gbyte::  clr ifl                            ;set the ifl flag to zero
        br start
gbytes:: mov n1,ifl                        ;set the ifl flag to one
start:   inc r5
        inc r5
        mov (r5)+,ia                       ;save address of input array in ia
        mov (r5)+,ib                       ;save address of output array in ib
        mov@ (r5)+,r1                      ;save bit pointer in r1
        mov@ (r5)+,r2                      ;save byte size in r2
        mov r5,ls                          ;save r5 for later
        max r1,n0                          ;initial bit skip must be non-negative
        max r2,n0                          ;byte size must be non-negative
        min r2,n16                         ;byte size must be no bigger than 16 bits
        mov r2,n                           ;save byte size in n
        sub n16,r2                        ;subtract 16 from byte size
        mov r2,r3
        neg r3
        mask r4,r3                        ;r4 contains all ones with nb zeros
                                           ;in the low order part
                                           ;save the mask in mak

loop:    mov r4,mak
        mov r1,r3
        asr r3
        asr r3
        asr r3
        asr r3                            ;r3 = r1/16
        asl r3                            ;multiply by 2 for an even byte address
        add r3,ia                         ;bump the pointer to the input array
        bic #177760,r1                   ;r1 = mod(r1,16)
        mov @ia,r5                       ;load the right input word into r5
        mov r1,r3
        add r2,r3                         ;calculate the shift
        shift r5,r3                      ;shift the byte into the low order end of r5
        tst r3                            ;if the shift was right we are done
        bmi cont
        inc ia                            ;bump input pointer to the next word
        inc ia
        sub n16,r1                       ;decrement the bit pointer one word
        mov @ia,r4                       ;load the rest of the byte
        sub n16,r3                       ;correct the shift count
        shift r4,r3                      ;shift the rest of the byte into the low end of r4
        bis r4,r5                        ;or r4 and r5 together

```


- 207 -

```

cont:    blic msk,r5           ;and out the high order part of r5
         mov r5,@ib          ;move r5 into the output array
         inc ib              ;bump the output pointer to the next word
         inc ib
         tst ifl             ;if ifl is zero we are finished
         bmi lnd             ;go around again
         beq out             ;gbyte exit
         mov #-1,ifl         ;set ifl to -1
         mov ls,r5           ;reset r5 to pick up the other arguments of gbytes
         mov@ (r5)+,ls       ;move secondary bit skip to ls
         max ls,n0           ;ls must be non-negative
         add n,ls            ;add in the byte size
         mov@ (r5)+,n        ;move the number of bytes to n
         max n,n1            ;n must be at least one
lnd:     add ls,r1            ;bump bit pointer to next byte
         dec n
         tst n
         beq out             ;if n is still positive go around again
         br loop
out:     rts pc              ;return
ia:      .blkw 1
ib:      .blkw 1
ls:      .blkw 1
n:       .blkw 1
msk:     .blkw 1
ifl:     .blkw 1
n0:      .word 0
n1:      .word 1
n16:     .word 20
         .end

```

- 208 -

VAX VERSION

```

      SUBROUTINE GBYTES(IA,IB,NS,NB,IS,N)
C
C GBYTES IS A BYTE UNPACKING SUBROUTINE.
C
C THE SYNTAX IS:
C
C   CALL GBYTES (IA, IB, NS, NB, IS, N)
C
C   WHERE:
C
C       IA IS THE BIT STRING FROM WHICH THE
C         BYTES WILL B TAKEN,
C
C       IB IS AN ARRAY WHERE THE BYTES WILL
C         BE PUT,
C
C       NS IS THE NUMBER OF BITS TO SKIP
C         BEFORE THE FIRST BYTE,
C
C       NB IS THE NUMBER OF BITS IN THE BYTE,
C
C       IS IS THE NUMBER OF BITS TO SKIP
C         BETWEEN SUCCESSIVE BYTES, AND
C
C       N IS THE NUMBER OF BYTES TO EXTRACT.
C
C CALLS GBYTE
C*****
C MACHINES:
C   VAX 11/780
C   VAX 11/750 UNDER VMS
C   ASSUMING INTEGERS ARE INTEGER*4
C*****
C
C   PROGRAMMED SEPTEMBER 17, 1980 BY RAY HULAND
C
C
C   DIMENSION IA(1),IB(1)
C   KB=NB+IS
C   KS=NS
C   DO 1 I=1,N
C     CALL GBYTE(IA,IB(I),KS,NB)
1  KS=KS+KB
C   RETURN
C   END

      SUBROUTINE GBYTE(IA,IB,NS,NB)
C
C GBYTE IS A BYTE UNPACKING SUBROUTINE.
C
C THE SYNTAX IS:
C
C   CALL GBYTE (IA, IB, NS, NB)
C
C   WHERE ALL PARAMETERS ARE AS DEFINED
C     IN GBYTES. IN THIS CASE, N = 1.
C
C
C   DIMENSION IA(1)
C   IF(NB.LE.0) GO TO 13

```

```
NSIZ=MIN0(NB,32)
NBIT=MAX0(NS,0)+NSIZ
NWD=(NBIT+31)/32
IB=LIB$EXTZV(32*NWD-NBIT,NSIZ,IA(NWD))
RETURN
13 IB=0
RETURN
END
```

- 211 -

C VERSION

/* Gbytes- treats ia as a bit string.
 n bytes each ibits long are extracted from ia
 and placed in the low order end of successive
 words of ib (zero padded to the left).
 is bits are skipped before the first byte.
 ns bits are skipped between successive bytes.

SYNTAX:

C:

```
int ia[10], ib[10];
int is, ibits, ns, n;
```

```
gbytes- (ia, ib, &is, &ibits, &ns, &n);
```

Fortran:

```
integer ia(10), ib(10)
integer is, ibits, ns, n
```

```
call gbytes (ia, ib, is, ibits, ns, n)
```

Calls `getbits`

MACHINES:

Unix

Programmed 15 September 1980
 by Madeleine Zirbes

*/

```
gbytes-(ia, ib, is, ibits, ns, n)
```

```
int *ia;
```

```
int *ib;
```

```
int *is;
```

```
int *ibits;
```

```
int *ns;
```

```
int *n;
```

```
{
```

```
int i;
```

```
int bit, word, bits;
```

```
bits = *is;
```

```
for (i=0; i<*n; i++) {
```

```
    bit = bits%16;
```

```
    word = (bits - bit)/16;
```

```
    bit = 15 - bit;
```

```
    *ib++ = getbits((unsigned)(ia[word]),
```

```
        (unsigned)(bit),
```

```
        (unsigned)(*ibits));
```

```
    bits = bits + *ibits + *ns;
```

```
}
```

```
}
```

```
getbits(x, p, n)
```

```
/* Getbits gets n bits from position p.
```

From:

The C Programming Language

Brian W. Kernighan

Dennis M. Ritchie

Bell Laboratories

PL1 VERSION

```
gbytes: proc (in, out, ns, nb, is, n);
```

```
/*
  GBYTES
```

Gbytes is a byte unpacking subroutine.

The syntax is:

```
declare (in, out, ns, nb, is, n) fixed bin (35);
```

```
call gbytes (in, out, ns, nb, is, n);
```

where:

in is the bit string from which bytes will be taken,
 out is the output array where bytes will be placed,
 ns is the number of bits to skip before the first byte,
 nb is the number of bits to retrieve,
 is is the number of bits to be skipped between successive bytes, and
 n is the number of bytes to extract from in.

Calls no other routine.

```
*****
```

MACHINES:

Honeywell Multics

```
*****
```

Programmed August, 1978 by Ray Buland

```
•/
```

```
dcl (in, out, ns, nb, is, n) fixed bin (35);
```

```
dcl 01 ia based (addr (in)) unaligned,
```

```
02 skip bit (ns),
```

```
02 na (n),
```

```
03 byte bit (nb),
```

```
03 skip bit (is);
```

```
dcl 01 ib (n) based (addr (out)) unaligned,
```

```
02 zero bit (36-nb),
```

```
02 byte bit (nb);
```

```
ib.zero = ""b;
```

```
ib.byte = na.byte;
```

```
return;
```

```
end;
```

Murray Hill, New Jersey

Prentice-Hall

Calls no other routine.

```
*/
unsigned x, p, n;
{
    return((x >> (p+1-n)) & ~(~0 << n));
}

/* Note:
   "Declaring the argument x to be unsigned
   ensures that when it is right-shifted,
   vacated bits will be filled with zeroes,
   not sign bits, regardless of the machine
   the program is run on."
*/
}
```

- 213 -

**Network-Day Tape Software Users Guide
Report Form**

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general comments below.**

Mail to:

Madeleine Zirbes
U.S. Geological Survey
MS 967 Box 25046
Denver Federal Center
Denver, CO 80225