SPIN SYSTEM USER'S GUIDE

J. Parmelee

DIVISION OF SEISMOLOGY AND GEOMAGNETISM

Earth Physics Branch
Energy, Mines and Resources Canada
Ottawa, Canada

Internal Report

1984-4 (G)

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1.0 INTRODUCTION

The paleomagnetic specimen information SPIN (system) is a database which consists of paleomagnetic observations from rock specimens.

The data for the database is obtained in the following way:

Samples are cored from an area under investigation. The sample cores are divided into smaller specimens. Each of these specimens is identified by a specimen identification number (id) which consists of the area under investigation (rock unit or collection), the site within the rock unit (site #), the sample number within the site (sample #),and the specimen identifier within the sample (A-E). The inclination, declination and intensity of magnetization can be measured for a specimen using either:

a) DIGITAL SPINNER MAGNETOMETER (DSM-1)
b) JR-4 SPINNER MAGNETOMETER
c) SCHOENSTEDT SPINNER MAGNETOMETER (SSM)
d) CHALT (continuous high and low temperature magnetometer)*
e) SQUID *

The results from the JR-4,DSM-1 and SSM are currently written on a Texas Instruments (TI) cassette. CHALT and SQUID results will be written on a floppy disk.

A base measurement called the Natural Remanent Magnetization (NRM) is taken for a specimen. After this measurement has been taken a specimen can be exposed to a series of treatments to determine the stability of magnetization. These treatments include thermal, alternating fields, and chemical. One specimen can be exposed to more than one treatement type.

The data collected on these specimens is used to determine the paleopole for a rock unit.

The SPIN system allows the following processing:
a) data entry (either from cassette or by hand)
b) data editing
c) plotting of selected data on a stereonet,intensity decay
    curve or vector graphs
d) vector addition or subtraction of specified results and
    plotting
e) Fisher statiscal analysis
f) verification of data
g) backup of data to tape

*   The CHALT and SQUID are instruments that are not presently available for use

SPIN SYSTEM USER GUIDE

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Appendix B - Data stored on Directory file
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Appendix E - Calculations used in Statistical Analysis
Appendix F - Calculation used to verify data

2.0 SYSTEM DESCRIPTION

2.1 HARDWARE

a) DEC LSI 11-23 computer
b) interactive terminal   – used to communicate with SPIN
   (VT100 or emulator)
c) graphics terminal   – used to display all
   (VT100 with retrographics)   graphics (plots)
d) tektronix 4612 hardcopier   – used to make a hardcopy of
        graphics terminal screen
e) high density magnetic tape drive – used to backup collections
        on tape
f) Texas Instruments cassette reader– used to read cassettes of
        data into SPIN
g) printer – 132 columns per line   – used to list data and results
        of mathematical computations
h) disk storage space of up to 15 Mbytes

2.2 SOFTWARE

The SPIN system is designed to run on a Digital Equipment computer with an RSX11-M V4.0 operating system and RMS-11 record management. The system is programmed in FORTRAN IV plus. The following utilities must be installed for the system to operate:

PIP – peripheral interchange program
AT – indirect command file processor
INI – initializes a device
ALL – allocates a device to a user
DEA – deallocates a device
MOU – mounts a device
DMO – dismounts a device
RMSBCK – backs up an RMS file to tape (each collection is an RMS file)
RMSRST – restores an RMS file to disk
DTR – datatrieve (the editor)

2.3 DATA STORAGE

The data for each rock collection is stored on a separate data file. See Appendix A for a description of data stored on each collection data file. The SPIN System can access only one collection at a time. The data files can be located either on magnetic tape or disk. When a rock collection is no longer being studied or there is insufficient room on the disk for the rock collection it can be copied to tape using the Archive (backup) function.

2.4 TAPE CONTROL

The tape control function was incorporated into the SPIN system for 2 reasons:

1) to ensure adequate backup of data for each collection
2) to provide sufficient disk space for rock collections being studied i.e. disk space is limited, therefore, a rock collection may have to be stored on tape so another rock collection can be analyzed.

There are a maximum of 3 tapes assigned to each rock unit. Each tape is identified by a label composed of the rock unit identifier (3 characters), the year the collection was first studied, and a sequence number between 1 and 3. The sequence number identifies the tape within the set of tapes for the rock unit.

A directory file is maintained that indicates where to find the most recent data for a rock collection (tape or disk) and the last tape that was used to back up the collection. See Appendix B for contents of directory file.   If the rock unit is on tape the tape control process tells the scientist the correct tape to mount and copies the data to disk before processing proceeds. When the collection is to be copied back to tape the tape control process tells the scientist to mount the next tape in the tape set. This is the tape that will be used the next time the rock collection is studied.

3.0 HOW TO USE THE SYSTEM

3.1 TURNING ON AND OFF THE SYSTEM

Turning the equipment on:

The SPIN system is currently part of the Blackburn lab software development system. A terminal is used to communicate with SPIN. This terminal is refered to as the interactive terminal. All plots are displayed on a second terminal known as the graphics terminal. Hardcopies of plots are produced on the hardcopy unit beside the graphics terminal. New data is entered by reading data cassettes using the TI cassette reader. Collections are backed up on magnetic tape.

To prepare the hardware:

a) turn on the paleomag interactive terminal

b) turn on the paleomag graphics terminal

c) turn on the hardcopy unit beside the graphics terminal

d) turn on the magtape drive

e) turn on the TI cassette reader

The following pages contain diagrams of these pieces of hardware.

```
*****************************************************************
*                                                               *
*   TO RUN SPIN you must :                                       *
*                                                               *
*   a)   Type on the SPIN Interactive terminal                  *
*   b)   HEL SPIN                                                *
*   c)   Password: <carriage return>                            *
*   d)   Enter Y to question "Do you want to use SPIN?"          *
*   e)   Type @SPIN when prompted                                *
*                                                               *
*                                                               *
*                                                               *
*****************************************************************
```

Turning the equipment off:

Simply turn off all the devices listed above

3.1 Turning the System On and Off
HEL SPIN
Password:

RSX-11M BL32   [1,54] System   BRN23M
13-APR-84 15:09 Logged on Terminal TT0:

Good Afternoon

>@LOGIN.CMD
>* Do you want to use the spin system ? [Y/N]: Y
>;
>;   system is set up to go
>;
>;   type @SPIN
>;
>@ <EOF>
>@SPIN
>;
>;
>;
>;
>;
>;
>;
>;
>;
>;
>;
>;
>;
>;
>;   WELCOME TO THE SPIN SYSTEM
>;
>;
>;
>;
>;
>;
>;
>;
>;
>;
>;
Enter rock unit X

        Screens displayed when logging on to SPIN.

power on—
switch
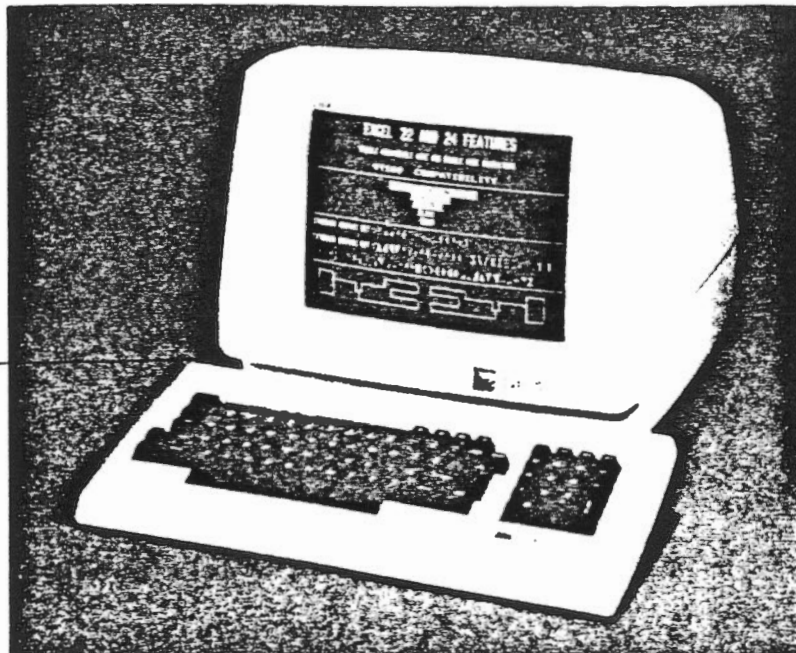
Interactive Terminal
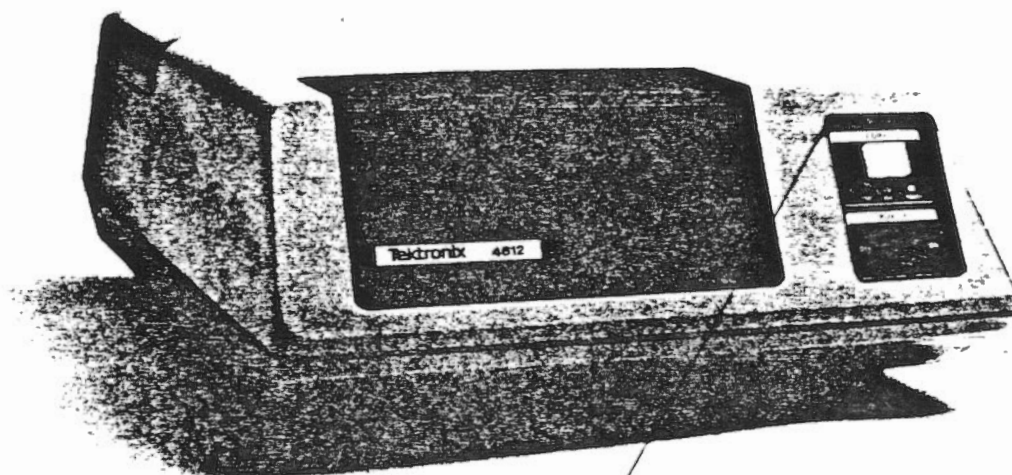
Graphics Hardcopy Unit

Copy light stops flashing
when unit is ready.

Magnetic Tape Drive

cipher
data products, inc.

┌ LOAD ┐   ┌ ┐   ┌ ┐   WRT EN   ┌ ┐
│REWIND│   UNLOAD   ON-LINE   TEST   HI DEN
└ ┘   └ ┘   └ ┘   └ ┘
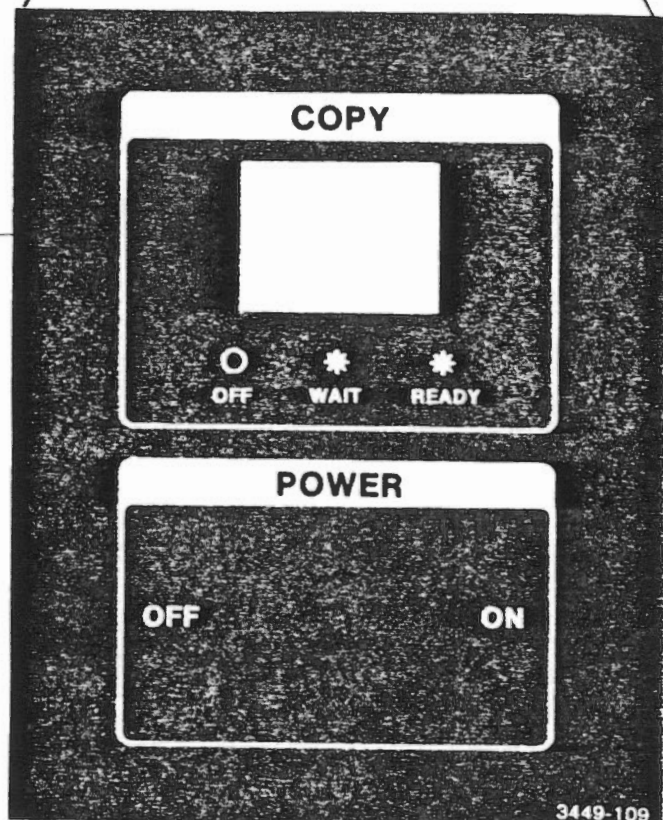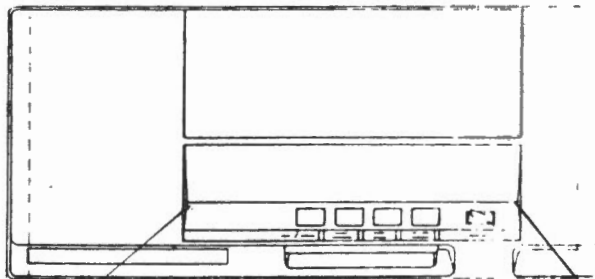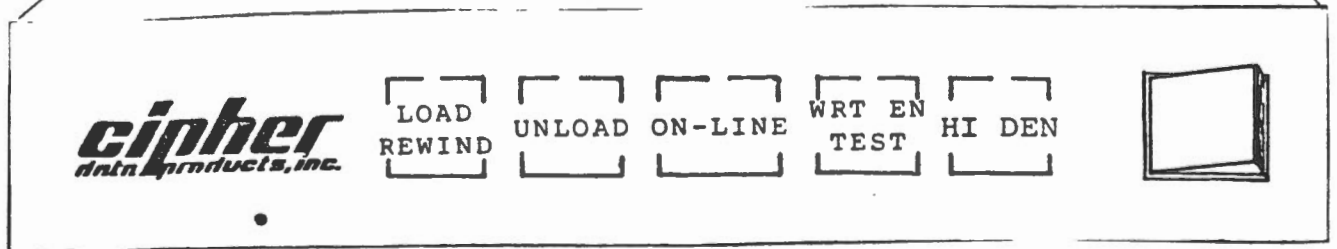
Front Panel   ON OFF

all switches must
in line position

LINE
OFF
LOCAL
KEYBOARD

LINE
OFF
LOCAL
PLAYBACK

RECORD

PRINTER
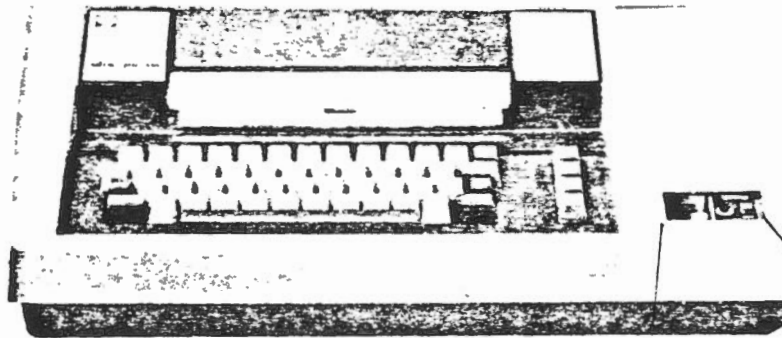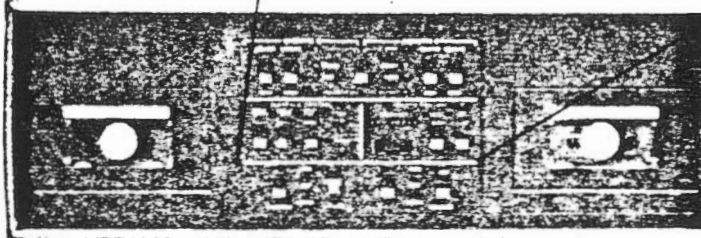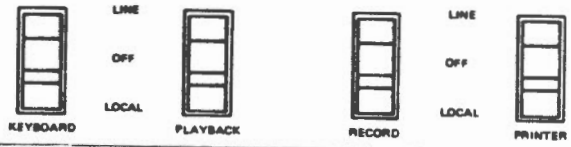
TI Cassette Reader

switch must be
in online
position

ON
LINE

POWER

ON

OFF
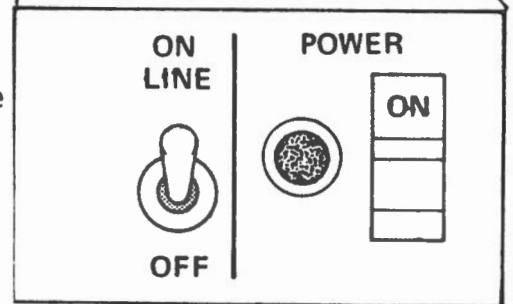
3.2 SYSTEM INITIALIZATION

Summary:

The SPIN system goes through an initialization procedure each time that it is used. First, it needs to know which rock unit is to be studied so it can find the correct file. If a new collection is being started the system creates a new file. If it is an existing collection the file may be on disk or tape. If the file is on tape it must be copied to disk before it can be accessed, otherwise, if it is on disk the system can proceed. The initialization procedure uses a directory file which contains a list of all rock units on the database and their location to determine what action to take. The initialization procedure also creates and defines a Datatrieve domain for the rock unit to be studied so that Datatrieve can access the correct data file when the SPIN editor is invoked.

3.2 System Initialization

```
‘ )
) ;
) ;
) ;
) ;
) ;
) ;
) ;
) ;
) ;                             WELCOME TO THE SPIN SYSTEM
) ;
) ;
) ;
) ;
) ;
) ;
) ;
) ;
) ;
) ;
) ;
Enter rock unit JIH
Rock unit doesn't exist,new rock unit [Y/N]
NB
Enter rock unit JIH
Rock unit doesn't exist,new rock unit [Y/N]
Y
Enter description (max 15 chars)SAMPLE NEW ROCK
DELETE ROCKUNIT;
DEFINE DOMAIN ROCKUNIT USING ROCKUNITS ON JIH000.DAT;
) ;
) ;
```

Screen displayed during the initialization procedure when a new rock collection
is being created. User resonses are underlined.

Screen 1/3

3.2 System Initialization

```
>;
>;
>;
>;
>;
>;
>;
>;
>;
>;
>;
>;
>;
>;                              WELCOME TO THE SPIN SYSTEM
>;
>;
>;
>;
>;
>;
>;
>;
>;
>;
>;
>;
Enter rock unit AL

AL  - TEST FOR DTR     DATE LAST USED 13-SEP-83

Current collection on disk
DELETE ROCKUNIT;
DEFINE DOMAIN ROCKUNIT USING ROCKUNITS ON AL000.DAT;
>;
>;
```

Screen displayed during system initialization when the rock collection is on disk.
User responses are underlined.

Screen 2/3

3.2 System Initialization

```
· ,
>;
>;
>;
>;
>;
>;
>;
>;
>;                                  WELCOME TO THE SPIN SYSTEM
>;
>;
>;
>;
>;
>;
>;
>;
>;
>;
Enter rock unit AL,

AL  - TEST FOR DTR    DATE LAST USED 14-SEP-83

Current collection on tape
The label of the tape to mount is :  AL832
>* What's the label of the tape [S]: AL832
>* Do you need help to mount tape? [Y/N]: N
>* Hit C when tape loaded [S]: C
>;        Restore in progress
>;        Restore completed
>* Do you need help to unload tape? [Y/N]: N
>* Hit C when tape is unloaded [S]: C
DMO -- TTO:    dismounted from MTO:    *** Final dismount initiated ***
MTAACP --  MTO: ** DISMOUNT COMPLETE **




DELETE ROCKUNIT;
DEFINE DOMAIN ROCKUNIT USING ROCKUNITS ON AL000.DAT;
```

Screen displayed during the system initialization procedure when the rock collection
must be copied from tape to disk.
User responses are underlined.

Screen 3/3

3.2   SYSTEM INITIALIZATION

Error messages:

ERROR opening directory file

Source: INITDIR.TSK or
        UPDATE.TSK
Expl: The directory file
      ROCDIR.DAT could not
      be opened.
Action: Exit the SPIN system
      Call a programmer

ERROR updating rock unit file
  with data accessed

Source: INITDIR.TSK
Expl: An attempt to update
      the directory file
      with today's date
      in variable BDATE
      failed.
Action: Exit SPIN system
      Call a programmer

ERROR creating new ISAM file

Source: INITDIR.TSK
Expl: An attempt to open a
      new indexed
      sequential access
      file failed
Action: Exit SPIN system
      Call programmer

ERROR writing INFO.DAT file

Source: INITDIR.TSK
Expl: an attempt to write
      the rock unit on the
      file INFO.DAT failed
Action: Exit SPIN system
      Call a programmer

ERROR opening INFO .DAT file

Source: INITDIR.TSK
Expl: An attempt to open
      a new file called
      INFO.DAT failed
Action: Exit SPIN system
      Call a programmer

ERROR writing Directory file

Source: INITDIR.TSK
Expl: an attempt to write
      a record on file
      ROCDIR.DAT failed
Action: Exit SPIN system
      Call a programmer

3.2   SYSTEM INITIALIZATION

Error Messages (contd):

ERROR initializing rock unit
data file
	Source: INIT.CMD
	Expl: an error occurred
	        in the task INITDIR
	Action: Exit SPIN
	        Call a programmer

Wrong tape mounted -
  Check the label of the tape
  Unload the tape and try again
  with another
	Source: INIT.CMD
	Expl: User is trying to
	        copy a rock
	        collection from
	        tape to disk. The
	        tape label entered
	        is not the same as
	        that on the tape
	Action: Tape is dismounted.
	        Mount the correct
	        tape or enter the
	        correct tape label.

ERROR restoring rock unit data
file from tape to disk
	Source: INIT.CMD
	Expl: There was an error
	        while the utility
	        RUSRST was running,
	        the restore failed.
	Action: Exit SPIN
	        Call programmer

ERROR updating directory file
after restoring file from tape
to disk (UPDATE.TSK)
	Source: INIT.CMD
	Expl: There was an error
	        in the task UPDATE.
	Action: Exit SPIN
	        Call programmer

ERROR opening intertask file	Source: UPDATE.TSK(get.ftn)
	Expl: An attempt to open
	        the file INFO.DAT
	        failed
	Action: Exit SPIN
	        Call programmer

ERROR reading intertask file	Source: UPDATE.TSK
	Expl: An attempt to read
	        the file INFO.DAT
	        failed.
	Action: Exit SPIN
	        Call programmer

3.2 SYSTEM INITIALIZATION

Error Messages (contd)) :

ERROR reading directory file

Source: UPDATE.TSK
Expl: An attempt to read
         the file ROCDIR.DAT
         failed.
Action: Exit SPIN
         Call programmer

ERROR rewriting directory file

Source: UPDATE.TSK
Expl: An attempt to update
         a record in
         ROCDIR.DAT
         failed
Action: Exit SPIN
         Call programmer

3.3 MAIN MENU

Summary:

This is a list of all the options available in the SPIN
system. If a more detailed explanation of any of the options
is required the user can enter H or HELP.

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3.3 Main Menu

```
>;                              Main Menu
>;                              ============
>;              Type                            For
>;              ----                            ---
>;
>;              'EC'                            Enter data by cassette
>;
>;              'EH'                            Enter data by hand
>;
>;              'EDI'                           Edit data
>;
>;              'P'                             Plot data
>;
>;              'V'                             Vector analysis
>;
>;              'F'                             Fisher statistics
>;
>;              'VE'                            Verify data
>;
>;              'A'                             Archive data
>;
>;              'H'                             Help
>;
>* Enter option (X for EXIT) > [S]: H
```

Screen 1/1

3.3 MAIN MENU

Error Messages:

Invalid Option Selected - try again   Source: SPIN.CMD
                                             Expl: Invalid option
                                                      entered
                                             Action: User is reprompted

3.4 DATA ENTRY

Summary:

      Data can be entered into the database in 2 ways:
        a) by hand
        b) by cassette

      When data is entered by cassette the TI cassette reader is
required. The cassette must be loaded into the reader first.
See Section 3.11 Help - Enter for details on how to set up the cassette
reader. The data from the cassette is read into the working file.
See Appendix C for the format of data on the TI cassette.
This is an intermediate file which is created when data is entered by
cassette. This working file can be edited before the database is
actually updated with the new data. The contents of the working file are
listed on the lineprinter after reading the cassette is complete.
There are two pieces of data, susceptibility and the error statistic
which are not recorded on the cassette. They must be entered by hand.

      When data is entered by hand the utility DATATRIEVE is used.
The user is prompted for each field of information.

NOTE: The update of the database with the working file can be aborted
by entering "X" when prompted with: Edit work file (Y/N/HELP/X)? >.

3.4 Data Entry (by hand)

```
>;
>* Enter option (X for EXIT) > [S]: EH
>DTR @ENTHND
READY ROCKUNIT WRITE
:I
Enter ROCK: AL
Enter SPECIMEN (010-999): 010
Enter SAMPLE (A-E): B
Enter TREATMENT VALUE: 0300C
Non-digit in string "0300C", ignoring character(s)
Re-enter TREATMENT VALUE: 0300
Enter TREATMENT TYPE: C
Enter TREATMENT SEQUENCE NUMBER: 1
Enter DH: 45
Enter IH: 36
Enter DB: 24
Enter IB: 34
ENTER INTENSITY: (MANTISSA (.999),<CR>,EXPONENT (-99)
Enter MANTISSA: .87
Enter EXPONENT: -6
Enter ERROR (K): .678
ENTER SUSCEPTIBILITY (MANTISSA (.99999),<CR>,EXPONENT (-99)
Enter MANTISSA: 0
Enter EXPONENT: 0
Enter RUN: 123
Enter MORE DATA TO INPUT? Y/N: N
```

Sample interactive session of data entry by hand

3.4 Data Entry (by cassette)

```
',
>* Hit C when tape loaded [S]: C
>;
>;


      ENTER RUN #:JAP



ED 260A    0500    C      101     51    128     44    0.514E-06    0    0.00000E+00    JAP
ED 258A    0500    C        0     57    332     81    0.782E-06    0    0.00000E+00    JAP
ED 240A    0500    C        1     -1    351     33    0.629E-06    0    0.00000E+00    JAP
ED 255B    0500    C       79    -28     69    -17    0.298E-06    0    0.00000E+00    JAP
ED 266A    0500    C       12     21     12     46    0.137E-05    0    0.00000E+00    JAP
ED 252B    0500    C       76    -53     54    -39    0.128E-05    0    0.00000E+00    JAP
ED 271A    0500    C      165      5    164    -17    0.121E-05    0    0.00000E+00    JAP
ED 262B    0500    C       97    -74     42    -60    0.191E-05    0    0.00000E+00    JAP
ED 281A    0500    C       28    -43     24    -19    0.420E-06    0    0.00000E+00    JAP
ED 235A    0500    C       37    -71     41    -21    0.601E-06    0    0.00000E+00    JAP
ED 230A    0500    C       24    -57     33     -8    0.726E-06    0    0.00000E+00    JAP
ED 185A    0500    C       87    -12     80     -7    0.116E-05    0    0.00000E+00    JAP
ED 283A    0500    C        9     35      9     60    0.410E-06    0    0.00000E+00    JAP
ED 192B    0500    C       54      4     61     52    0.737E-06    0    0.00000E+00    JAP
INVALID "SITE-CORE" IN SPECIMEN : ED31A
INVALID "SITE-CORE" IN SPECIMEN : ED34A
INVALID "SITE-CORE" IN SPECIMEN : ED41B
INVALID "SITE-CORE" IN SPECIMEN : ED43B
INVALID "SITE-CORE" IN SPECIMEN : ED61A
INVALID "SITE-CORE" IN SPECIMEN : ED50A
INVALID "SITE-CORE" IN SPECIMEN : ED64A
INVALID "SITE-CORE" IN SPECIMEN : ED66A
ED 166B    0500    C       84     -5     81      0    0.161E-05    0    0.00000E+00    JAP
INVALID "SITE-CORE" IN SPECIMEN : ED72B
INVALID "SITE-CORE" IN SPECIMEN : ED75A
INVALID "SITE-CORE" IN SPECIMEN : ED82A
INVALID "SITE-CORE" IN SPECIMEN : ED91B
INVALID "SITE-CORE" IN SPECIMEN : ED94A
ED 132A    0500    C       99     10    104      2    0.569E-06    0    0.00000E+00    JAP
ED 153A    0500    C       21    -47     14     -9    0.290E-06    0    0.00000E+00    JAP
ED 125A    0500    C      356     44    328     83    0.169E-05    0    0.00000E+00    JAP
ED 130A    0500    C       65    -12     63      5    0.520E-06    0    0.00000E+00    JAP
ED 100A    0500    C      224    -53    238    -66    0.242E-06    0    0.00000E+00    JAP
ED 103A    0500    C       56    -29     52    -16    0.241E-06    0    0.00000E+00    JAP
ED 111A    0500    C      157    -24    151    -35    0.423E-06    0    0.00000E+00    JAP
ED 155A    0500    C      313    -16    314     11    0.621E-06    0    0.00000E+00    JAP
ED 162A    0500    C      102    -39     69    -36    0.120E-05    0    0.00000E+00    JAP
ED 144A    0500    C      154     29    158     -7    0.632E-06    0    0.00000E+00    JAP
INVALID "SITE-CORE" IN SPECIMEN : ED72B
END OF TAPE REACH TURN OFF CASSETTE
```

Screen displayed while data read in from cassette. Note error messages.
User responses are underlined.

3.4 Data Entry (by cassette)

```
>* Edit work file (Y/N/HELP/X)? >          [S]: H
>;
>;                              Edit help
>;                              ---- ----
>;
>;          To enter or modify data on the current work file
>;      we use DATATRIEVE.
>;
>;      These options are available in the EDIT mode
>;
>;
>;                  IW    :    Insert a result
>;                  MW    :    Modify data
>;                  DW    :    Delete a result
>;                  LW    :    List working file on screen
>;                  PW    :    Print working file on lineprinter
>;                  KW    :    Delete a range of results
>;                  HW    :    Help menu display
>;                  EXIT  :    Exit - Database will be updated with
>;                                    data in working file
>;
>;
>;              Enter ":" + mnemonic to invoke option (except EXIT)
>;                      (e.g. :IW - invokes INSERT option)
>;
>* Hit <C> to continue [S]: C
>* Edit work file (Y/N/HELP/X)? >          [S]:
\.
```

Screen displayed when help is requested for editing work file prior
to updating database. User responses are underlined.

3.4   Data Entry (by cassette)

```
';
>;
>;
>* Edit work file (Y/N/HELP/X)? >        [S]: Y
>; .
>;
>;
>;                          SPIN SYSTEM - WORK FILE EDITOR
>;                          ------------------------------
>;
>;
>;
>;OPTIONS:   :IW,:MW,:DW,:LW,:PW,:KW,:HW,EXIT
>;
>;
>;Enter :HW for HELP MENU
>;
>;
>;        (See help option more explonation)
>;
>;
DATATRIEVE-11, DEC Query and Report System
Version: V02.04, 1-DEC-81
Type HELP for help
DTR> :IW
```

Screen displayed when choose to edit work file. User responses underlined.

3.4 Data Entry (by cassette)

```
Enter ROCK UNIT: ED
Enter SPECIMEN (010-999): 010
Enter SAMPLE (A-E): A
Enter TREATMENT VALUE: 0300
Enter TREATMENT TYPE: C
Enter DH: 0
Enter IH: 0
Enter DB: 0
Enter IB: 0
ENTER INTENSITY: (MANTISSA (.999),<CR>,EXPONENT (-99)
Enter MANTISSA: .33
Enter EXPONENT: -6
Enter ERROR (K): 0
ENTER SUSCEPTIBILITY (MANTISSA (.99999),<CR>,EXPONENT (-99)
Enter MANTISSA: 0
Enter EXPONENT: 0
Enter RUN: 0
Enter MORE DATA TO INPUT? Y/N: N
```

Sample interactive session of inserting a new record in work file.
Work file editor option :IW.
User responses are underlined.

3.4 Data Entry (by cassette)

```
Enter SPECIMEN NO: 010A
Enter TREATMENT: 0300C
```

```
SPEC                                                    SUS
 ID   TREAT DH  IH   DB   IB       M           K        PRINT          RUN

010A 0300C   0    0    0    0    0.330 E -06       0    0.00000 E +00    0
```

```
Enter ENTER FIELD TO MODIFY (DH,IH,DB,IB,K,M,SUS,RUN,X) : DB
Enter DB: -36
Validation error for DB
Re-enter DB: 36
```

```
SPEC                                                    SUS
 ID   TREAT DH  IH   DB   IB       M           K        PRINT          RUN

010A 0300C   0    0   36    0    0.330 E -06       0    0.00000 E +00    0
```

```
Enter ENTER FIELD TO MODIFY (DH,IH,DB,IB,K,M,SUS,RUN,X) : SUS
ENTER SUSCEPTIBILITY (MANTISSA (.99999),(CR),EXPONENT (-99)
Enter MANTISSA: .89
Enter EXPONENT: -6
010A 0300C   0    0   36    0    0.330 E -06       0    0.89000 E -06    0
```

```
Enter ENTER FIELD TO MODIFY (DH,IH,DB,IB,K,M,SUS,RUN,X) : X
ABORT:
Execution terminated by "ABORT" statement
```

  Sample modification session on work file.
  Spin work file editor option :MW.
  User responses are underlined.

3.4 Data Entry (by cassette)

LISTING OF DATA READ FROM CASSETTE
======= == ==== ==== ==== ========

ROCK	SPEC ID	TREAT	DH	IH	DB	IB	M			K	SUS			RUN
ED	100A	0500C	224	-53	238	-66	0.242	E	-06	0	0.00000	E	+00	JAP
ED	103A	0500C	56	-29	52	-16	0.241	E	-06	0	0.00000	E	+00	JAP
ED	111A	0500C	157	-24	151	-35	0.423	E	-06	0	0.00000	E	+00	JAP
ED	125A	0500C	356	44	328	83	0.169	E	-05	0	0.00000	E	+00	JAP
ED	130A	0500C	65	-12	63	5	0.520	E	-06	0	0.00000	E	+00	JAP
ED	132A	0500C	99	10	104	2	0.569	E	-06	0	0.00000	E	+00	JAP
ED	144A	0500C	154	29	158	-7	0.632	E	-06	0	0.00000	E	+00	JAP
ED	153A	0500C	21	-47	14	-9	0.290	E	-06	0	0.00000	E	+00	JAP
ED	155A	0500C	313	-16	314	11	0.621	E	-06	0	0.00000	E	+00	JAP
ED	162A	0500C	102	-39	69	-36	0.120	E	-05	0	0.00000	F	+00	JAP
ED	166B	0500C	84	-5	81	0	0.161	E	-05	0	0.00000	E	+00	JAP
ED	185A	0500C	87	-12	80	-7	0.116	E	-05	0	0.00000	E	+00	JAP
ED	192B	0500C	54	4	61	52	0.737	E	-06	0	0.00000	E	+00	JAP
ED	230A	0500C	24	-57	33	-8	0.726	E	-06	0	0.00000	E	+00	JAP
ED	235A	0500C	37	-71	41	-21	0.601	E	-06	0	0.00000	E	+00	JAP
ED	240A	0500C	1	-1	351	33	0.629	E	-06	0	0.00000	E	+00	JAP
ED	252B	0500C	76	-53	54	-39	0.128	E	-05	0	0.00000	E	+00	JAP
ED	255B	0500C	79	-28	69	-17	0.298	E	-06	0	0.00000	F	+00	JAP
ED	258A	0500C	0	57	332	81	0.782	E	-06	0	0.00000	E	+00	JAP
ED	260A	0500C	101	51	128	44	0.514	E	-06	0	0.00000	E	+00	JAP
ED	262B	0500C	97	-74	42	-60	0.191	E	-05	0	0.00000	E	+00	JAP
ED	266A	0500C	12	21	12	46	0.137	E	-05	0	0.00000	E	+00	JAP
ED	271A	0500C	165	5	164	-17	0.121	E	-05	0	0.00000	E	+00	JAP
ED	281A	0500C	28	-43	24	-19	0.420	E	-06	0	0.00000	E	+00	JAP
ED	283A	0500C	9	35	9	60	0.410	E	-06	0	0.00000	E	+00	JAP

Listing of data read in from a cassette that is output on printer.

3.4 DATA ENTRY

Error Messages:

ERROR reading cassette to working file   Source: ENTER.CMD
                                          Expl: There was an
                                                   error in the task
                                                   READCAS.
                                          Action: The SPIN database
                                                   has not been
                                                   updated. The
                                                   Main menu is
                                                   displayed.

ERROR opening intertask file   Source: READCAS.TSK or
                                                   TRANSFER.TSK(get.ftn)
                                          Expl: An attempt to open
                                                   the file INFO.DAT
                                                   failed
                                          Action: Exit SPIN
                                                   Call programmer

No character read therefore   Source: READCAS.TSK
cassette not ready   Expl: Nothing was read from

                                                   the cassette on the
                                                   first attempt,
                                                   therefore the
                                                   cassette
                                                   is not ready.
                                          Action: Check that cassette
                                                   is set up correctly
                                                   and try again.
                                                   Enter X to stop
                                                   trying to read
                                                   cassette.

SN: XXX999X different from   Source: READCAS.TSK
rock unit id   (takesn.ftn)
                                          Expl: The rock unit on
                                                   cassette is not the
                                                   same as that
                                                   specified
                                                   at the beginning
                                                   of SPIN.
                                          Action: Data for specimen
                                                   ignored

3.4 DATA ENTRY

Error Messages: (contd)

Too many letters in Specimen

Source: READCAS.TSK
(takesn.ftn)
Expl: The specimen on
cassette has too
many letters.
Action: Data for specimen
is ignored

Site out of range in Specimen: XXX999X

Source: READCAS.TSK
(takesn.ftn)
Expl: The site number on
cassette is out of
valid range
Action: Data for specimen
is ignored.

Core out of range in Specimen:XXX999X

Source: READCAS.TSK
(takesn.ftn)
Expl: The core number on
cassette is out of
valid range
Action: Data for specimen
is ignored.

Invalid Sample in specimen

Source: READCAS.TSK
(takesn.ftn)
Expl: The sample is not
between A-E on
cassette
Action: Data for specimen
is ignored.

Invalid separator in
specimen: XXX999X

Source: READCAS.TSK
(takesn.ftn)
Expl: There is an invalid
between the
specimen id and
the treatment on
the cassette
Action: Data for specimen
ignored

3.4 DATA ENTRY

Error Messages: (contd)

Invalid treatment: 9999X in
specimen: XXX999X

Source: READCAS.TSK
(takedn.ftn)
Expl: An invalid treatment
value is on the
cassette
Action: Data for the
specimen is ignored

Invalid separator in specimen: XXX999X
after treatment

Source: READCAS.TSK
(takedn.ftn)
Expl: There is an
invalid separator
between the treatment
value and the
demagnetization
value on the cassette
Action: Data for the
specimen is ignored

Invalid Demagn: .99E99 in specimen:
XXX999X

Source: READCAS.TSK
(takem.ftn)
Expl: The demagnetization
value is not a real
number
Action: Data for the
specimen is ignored

Invalid separator in specimen: XXX999X
after demagnetization

Source: READCAS.TSK
(takem.ftn)
Expl: There is an
invalid separator
between the
demagnetization
value and the
next field of data
on the cassette
Action: Data for specimen
ignored

Invalid DH(IH): 999 in
specimen: XXX999X

Source: READCAS.TSK
(takedi)
Expl: The inclination
or declination
value is not
integer
Action: Data for specimen
ignored

3.4 DATA ENTRY

Error Messages: (contd)

Invalid Separator in specimen: XXX999X
after DH(IH)

Source: READCAS.TSK
         (takedi)
Expl: There is an
         invalid
         separator after
         the inclination
         or declination
         value on the
         cassette
Action: Data for specimen
         ignored

DH(IH) out or range: 999 in
specimen: XXX999X

Source: READCAS.TSK
         (takedi)
Expl: DH is not between
         0-360 or
         IH is not between
         90 - -90
Action: Data for specimen
         ignored

Invalid end of sample in
specimen: XXX999X

Source: READCAS.TSK
         (eosamp.ftn)
Expl: end of sample
         marker missing on
         cassette
Action: Data for specimen
         ignored

ERROR in DTR - creation of
indexed workfile

Source: ENTER.CMD
Expl: An error occurred
         DTR was executing
         the file CREWORK1.CMD
Action: Exit SPIN
         Call programmer

Invalid response - try again

Source: ENTER.CMD
Expl: An invalid option
         was entered
Action: User is reprompted -
         try again

ERROR updating rock unit file
from work file. Work files
remain.

Source: ENTER.CMD
Expl: An error occurred
         in TRANSFER.TSK
Action: Exit SPIN
         Call programmer

3.4 DATA ENTRY

Error Messages: (contd)

ERROR opening rock unit file

Source: TRANSFER.TSK
Expl: An attempt to open
        the rock unit data
        file failed.
Action: Exit SPIN
        Call programmer

ERROR opening work file

Source: TRANSFER.TSK
Expl: An attempt to open
        the work file
        WORK01.DAT failed
Action: Exit SPIN
        Call programmer

Duplicate NRM record on rock unit
file. Specimen = 999X

Source: TRANSFER.TSK
Expl: An NRM record
        exists on the
        rock unit file for
        the specimen.
        Another one
        cannot be added
Action: The record from
        working file not
        added to database

Duplicate record on rock unit
file. Specimen = 999X

Source: TRANSFER.TSK
Expl: A record
        exists on the
        rock unit file for
        the specimen with
        the same treatment
        value as that read
        from the cassette
        Another one
        cannot be added
Action: The record from
        work file is ignored.

Invalid record: 999X

Source: TRANSFER.TSK
Expl: The treatment
        position number
        has exceeded
        3.
Action: Data not added to
        database

3.5 EDITOR

Summary:

The SPIN system editor consists of a set of DATATRIEVE procedures.
These procedures allow:
a)   addition of new data (:IW)
b)   modification of data (:MW) *
c)   deletion of one record of data (:DW) or a range
     of data for a site or specimen (:KW)
d)   listing of data for a site (:LN) or a specimen (:LS) on
     the terminal
e)   listing of data for a site (:PN) or a specimen (:PS) on
     the printer

*   The modification procedure does not allow 3 fields of data,
    specimen no., treatment, or sequence no to be modified. If
    there is an error in one of these fields the record must
    be deleted and reentered correctly.

Error messages:

Any error messages are produced by the DTR utility. They should
be self explanatory. If not contact a programmer.

3.5 Editor
```
'>
>;                              SPIN SYSTEM - EDITOR
>;                              --------------------
>;
>;
>;
>;
>;
>;
>;
>;
>;OPTIONS:    :I,:M,:D,:LN,:LS,:PN,:PS,:K,:H,EXIT
>;
>;
>;Enter :H for HELP MENU
>;
>;
DATATRIEVE-11, DEC Query and Report System
Version: V02.04, 1-DEC-81
Type HELP for help
DTR> :H
```

   Screen displayed when SPIN system editor invoked.

3.5 Editor

SPIN-SYSTEM EDITOR - HELP


```
I    : Insert a result
M    : Modify data
D    : Delete a result
LN   : List site NRM's on terminal
LS   : List specimen results on terminal
PN   : Print site NRM's on lineprinter
PS   : Print specimen results on lineprinter
PR   : Print entire rockunit on lineprinter
K    : Delete a range of results
H    : Help menu display
EXIT : Exit to main SPIN menu

 Enter : + mnemonic to invoke option (e.g. :I - invokes INSERT option)
```


Screen displayed when help for SPIN system editory requested.

3.5 Editor

DTR> :LN
Enter SITE-NO: 17

COLLECTION: ED

NRM RESULTS FOR SITE: 17

SITE CORE	SAMPLE	DH	IH	DB	IB	M	K	SUS	RUN
171	B	170	−52	0	0	0.611 E −06	0	0.00000 E +00	1
173	A	156	−56	54	−74	0.220 E −06	0	0.00000 E +00	1
173	B	218	−27	223	3	0.220 E −06	0	0.00000 E +00	1
174	B	124	−50	67	−55	0.835 E −06	0	0.00000 E +00	1
175	D	186	−59	344	−79	0.389 E −06	0	0.00000 E +00	1
175	E	152	−23	130	−55	0.359 E −06	0	0.00000 E +00	1
179	C	137	−60	49	−64	0.738 E −06	0	0.00000 E +00	1

Sample of screen displayed when a listing of NRM results requested
in editor (:LN). The option :PN produces an identical listing on
the printer.

3.5 Editor

DTR> :LS
Enter SPECIMEN-NO: 173B

COLLECTION: ED

SPECIMEN NO: 173B

TREAT VALUE	TREAT TYPE	TREAT SEQ	DH	IH	DB	IB	M	K	SUS	RUN
0	N	0	218	-27	223	3	0.220 E -06	0	0.00000 E +00	1
24	H	1	124	-50	67	-55	0.835 E -06	0	0.00000 E +00	1
48	H	1	137	-60	49	-64	0.738 E -06	0	0.00000 E +00	1
96	H	1	186	-59	344	-79	0.389 E -06	0	0.00000 E +00	1
163	H	1	152	-23	130	-55	0.359 E -06	0	0.00000 E +00	1
300	H	1	170	-52	0	0	0.611 E -06	0	0.00000 E +00	1
301	H	1	188	-69	0	0	0.390 E -06	0	0.00000 E +00	1
350	H	1	156	-56	54	-74	0.540 E -06	0	0.00000 E +00	0
500	H	1	156	-59	0	0	0.570 E -06	0	0.00000 E +00	1
550	H	1	142	-63	41	-65	0.352 E -06	0	0.00000 E +00	0
100	O	2	176	-49	166	-62	0.112 E -05	0	0.00000 E +00	0
300	O	2	160	-53	141	-63	0.978 E -06	0	0.00000 E +00	0
400	O	2	156	-55	136	-64	0.890 E -06	0	0.00000 E +00	0
700	O	2	152	-55	131	-63	0.912 E -06	0	0.00000 E +00	0
1000	O	2	153	-61	124	-69	0.805 E -06	0	0.00000 E +00	0
100	C	3	189	-54	181	-68	0.691 E -06	0	0.00000 E +00	0
318	C	3	148	-23	142	-32	0.430 E -06	0	0.00000 E +00	0
325	C	3	146	0	137	-38	0.415 E -06	0	0.00000 E +00	0
425	C	3	143	-3	141	-12	0.387 E -06	0	0.00000 E +00	0
540	C	3	138	20	142	12	0.300 E -06	0	0.00000 E +00	

Sample of screen displayed when a listing of data for a specimen
requested in editor (:LS). The option :PS produces an identical
listing on the printer.

3.5 Editor

```
DTR> :I
Enter ROCK: AL
Enter SPECIMEN (010-999): 010
Enter SAMPLE (A-E): C
Enter TREATMENT VALUE: 0301C
Non-digit in string "0301C", ignoring character(s)
Re-enter TREATMENT VALUE: 0301
Enter TREATMENT TYPE: C
Enter TREATMENT SEQUENCE NUMBER: 1
Enter DH: 45
Enter IH: 78
Enter DB: 80
Enter IB: 34
ENTER INTENSITY: (MANTISSA (.999),<CR>,EXPONENT (-99)
Enter MANTISSA: .7
Enter EXPONENT: -6
Enter ERROR (K): 56
ENTER SUSCEPTIBILITY (MANTISSA (.99999),<CR>,EXPONENT (-99)
Enter MANTISSA: 0
Enter EXPONENT: 0
Enter RUN: 0
Enter MORE DATA TO INPUT? Y/N: N
```

Sample interactive session of adding a new record to a rock collection.
Editor option :I

3.5 Editor

```
Enter SPECIMEN NO (999X): \010C
Truncation during assignment
Re-enter SPECIMEN NO (999X): 010C
Enter TREATMENT (9999X): 0301C
```

SPECIMEN NO	TREAT SEQ	TREAT VALUE	TREAT TYPE	DH	IH	DB	IB	M			K	SUSC			RUN
010C	1	301	C	45	78	80	34	0.700	E	−06	56	0.00000	E	+00	0

```
Enter ENTER FIELD TO MODIFY (DH,IH,DB,IB,K,M,SUS,RUN,X to exit) : DB
Enter DB: 33
```

SPECIMEN NO	TREAT SEQ	TREAT VALUE	TREAT TYPE	DH	IH	DB	IB	M			K	SUSC			RUN
010C	1	301	C	45	78	33	34	0.700	E	−06	56	0.00000	E	+00	0

```
Enter ENTER FIELD TO MODIFY (DH,IH,DB,IB,K,M,SUS,RUN,X to exit) : M
ENTER INTENSITY: (MANTISSA (.999),(CR),EXPONENT (-99)
Enter MANTISSA: .6
Enter EXPONENT: -6
```

010C	1	301	C	45	78	33	34	0.600	E	−06	56	0.00000	E	+00	0

```
Enter ENTER FIELD TO MODIFY (DH,IH,DB,IB,K,M,SUS,RUN,X to exit) : X
ABORT:
Execution terminated by "ABORT" statement
```

Sample session of modifying data in rock collection.
Editor option :M

3.5 Editor

Enter SPECIMEN NO: 010B
Enter TREATMENT: 0300C
Enter TREATMENT SEQUENCE: 1

```
SPECIMEN TREAT TREAT TREAT
   NO    SEQ  VALUE TYPE  DH  IH  DB  IB    M          K    SUSC         RUN

  010B    1    300    C   45  36  22  34 0.700 E -06   0 0.00000 E +00 123
```

Enter DELETE ARE YOU SURE Y/N?: YYY
Truncation during assignment
Re-enter DELETE ARE YOU SURE Y/N?: Y
DTR>
DTR>

   Sample session of deleting some data from rock collection.
   Editor option :D.

3.5 Editor

CAUTION!!! This procedure deletes ALL data for Site or Specimen chosen

Enter Kill (1) Site or (2) Specimen data (1,2,X)?: 2
Enter SPECIMEN-NO: 010C

LIST OF SPECIMEN RESULTS TO BE DELETED

SITE   TREAT TREAT
CORE SAMPLE VALUE TYPE

 10   C   301   C
Enter Kill - are you sure? Y/N: Y

LIST OF SPECIMEN RESULTS DELETED

SITE   TREAT TREAT
CORE SAMPLE VALUE TYPE

 10   C   301   C

   Sample interactive session of deleting a range of data from rock collection.
   Editor option :K
   The list of specimen results deleted is printed on the printer also.

3.6 PLOTTING

Summary:

There are 7 kinds of plots available:

1) Stereonet using NRM measurements for a range
    of specimens within a site

2) Stereonet using measurements for a range
    of treatments for a specimen

3) Intensity decay curve for a range of
    treatments for a specimen

4) Vector plot in the XY plane

5) Vector plot in the ZH plane

6) Vector plot in the ZX plane

7) Vector plot in the ZY plane

The plotting process begins by prompting the user to enter either a
SITE # or SPECIMEN # to plot. If a site is entered a site stereonet
is produced. If a specimen is entered the user can select the type of
specimen plot from the options: ST(stereonet), MT(intensity decay curve),
XY,ZH,ZX,ZY (Vector graphs) or AP. AP is a semi-automatic plotting
option. It sequentially goes through each of the plotting options
and generates plots according to selections made by the user.

A hardcopy of the graph on the graphics screen can be obtained by
pushing the copy button on the copier unit.

3.6 PLOTTING

STEREONET - The stereonet consists of a circle which represents
a sphere with 0 at the north pole and moving clockwise 90 ,
180 and 270 . For either the site or specimen stereonets two
plots are available; one with respect to the horizontal(H) one
with respect to bedding (B).

To find a point on the stereonet the inclination and declination values
are required. The declination is found on the circumference of the
circle and the inclination is then calculated on the radius starting
at the declination point.

$$A = (RAD * 1.4142) * SIN(I)$$

$$where \quad RAD = radius \ of \ circle$$
$$I = value \ of \ inclination$$

The symbol for representing a point is a square if the inclination angle
is positive or a plus sign if the inclination angle is negative.

Each point may be labelled with the treatment value (for specimen
stereonet)or the specimen id (for site stereonet). On the specimen
stereonet the first point is labelled with an N if the data is the
NRM result or an S if it is not. All data points are connected together
on a specimen stereonet using a straight line regardless of polarity
change.

INTENSITY DECAY CURVE - This is a graph of the intensity of magnetization
vs treatment. Intensity is on the vertical axis, treatment is on the
horizontal axis. The graph can be produced for a range of treatments
for a specimen.

Each data point is indicated by a small plus sign and they are connected
together. If more than one treatment type is displayed a dashed line is
used to indicate the change of scale on the horizontal axis.

The number at the top left of the plot is the maximum intensity value
labelled on the vertical axis.

3.6 PLOTTING

VECTOR GRAPHS - The vector graphs can be divided into 2 types:
a) 4 quadrant plot XY,ZX,ZY (A,B,C,D quadrants)
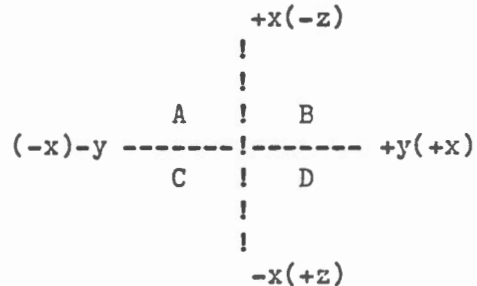
```
                        +x(-z)
                          !
                          !
                          !
                 A    !    B
      (-x)-y --------!-------- +y(+x)
                 C    !    D
                          !
                          !
                       -x(+z)
```
b) 2 section plot ZH (high & low section)

```
                       -z
                        !
                        !   HIGH
                        !
                        !------- h
                        !   LOW
                        !
                        !
                       +z
```
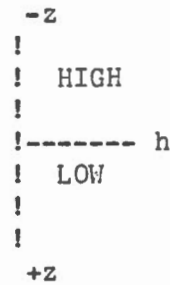
Each axis is the same length and can be labelled either as 1,2,3 or
2,4,6,8,10. There is a number in the top left corner of each plot
that indicates the value of the maximum labelled tic mark.

These graphs can be plotted:
a) with or without the NRM value
b) with respect to the horizontal or bedding
c) for a selected quadrant or section

The first point is always plotted using a square, the remainder
are plotted using a plus sign.

ENTER SITE OR SPECIMEN TO PLOT (99/999X/X(exit)) > <u>245B</u>

Enter plot option
(ST,MT,XY,ZH,ZX,ZY AP(all plots),XX(exit)) ><u>ST_</u>

Enter range of treatments
(Hit space bar for all treatments
Lower treatment (9999X or X to exit) > <u>___</u>

With labels (Y/N/X) > <u>Y</u>
Correction Horizontal or Bedding (H/B/X) > <u>H</u>

Screen Displayed When plot option chosen and Specimen Stereonet
plotted. User responses are underlined.

Hardcopy of site
stereonet for all NRM
results within site 24.
Horizontal correction

Collection: JNW

SITE JNW 24 SPECIMEN 0A TO 9E   H
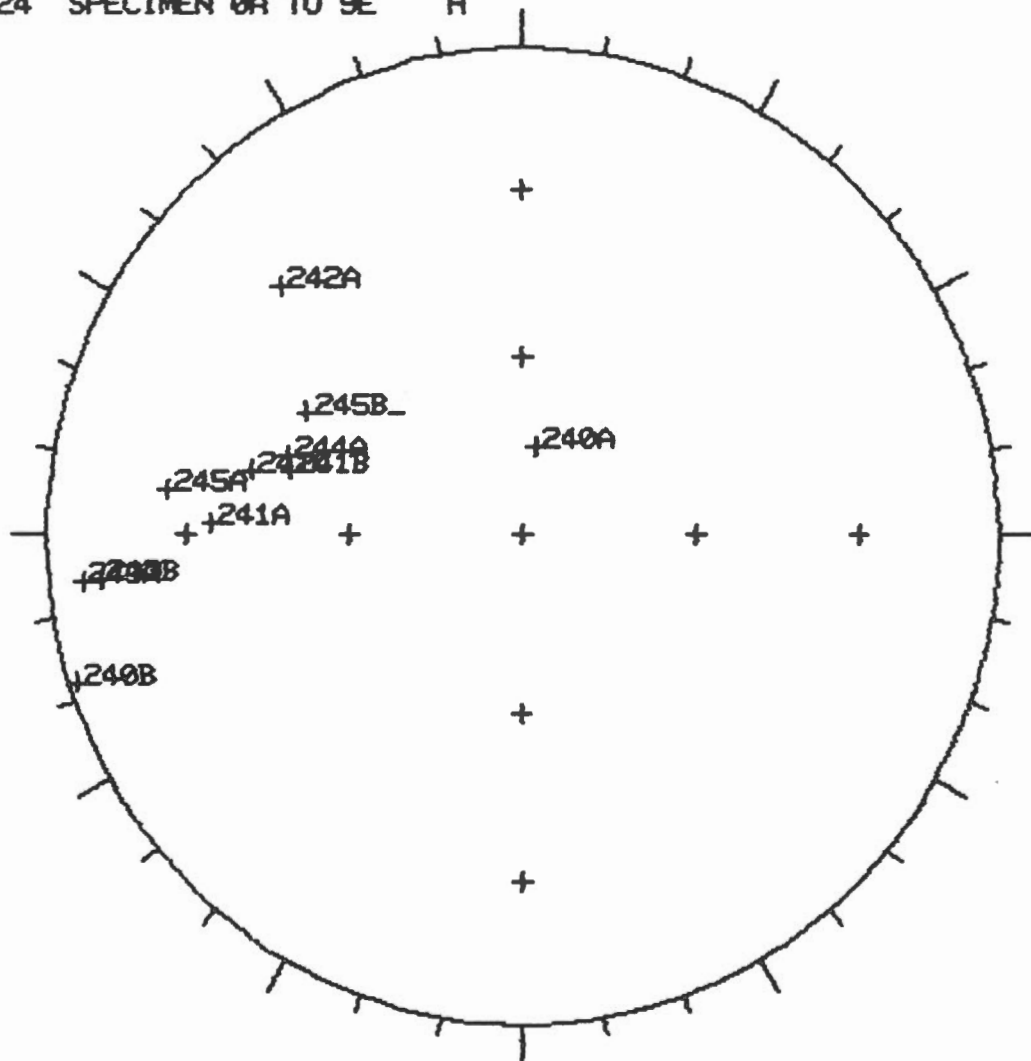
3.6 Plotting

Hardcopy of specimen stereonet.

Plot option: ST

Collection: JNW

Specimen:245B

This plot is for all treat-
ments, labels are not in-
cluded and the data used
is with respect to the
horizontal. The first point
plotted is the NRM result.

SPECIMEN JNW 245B   TREATMENTS   00000 TO 99999   H
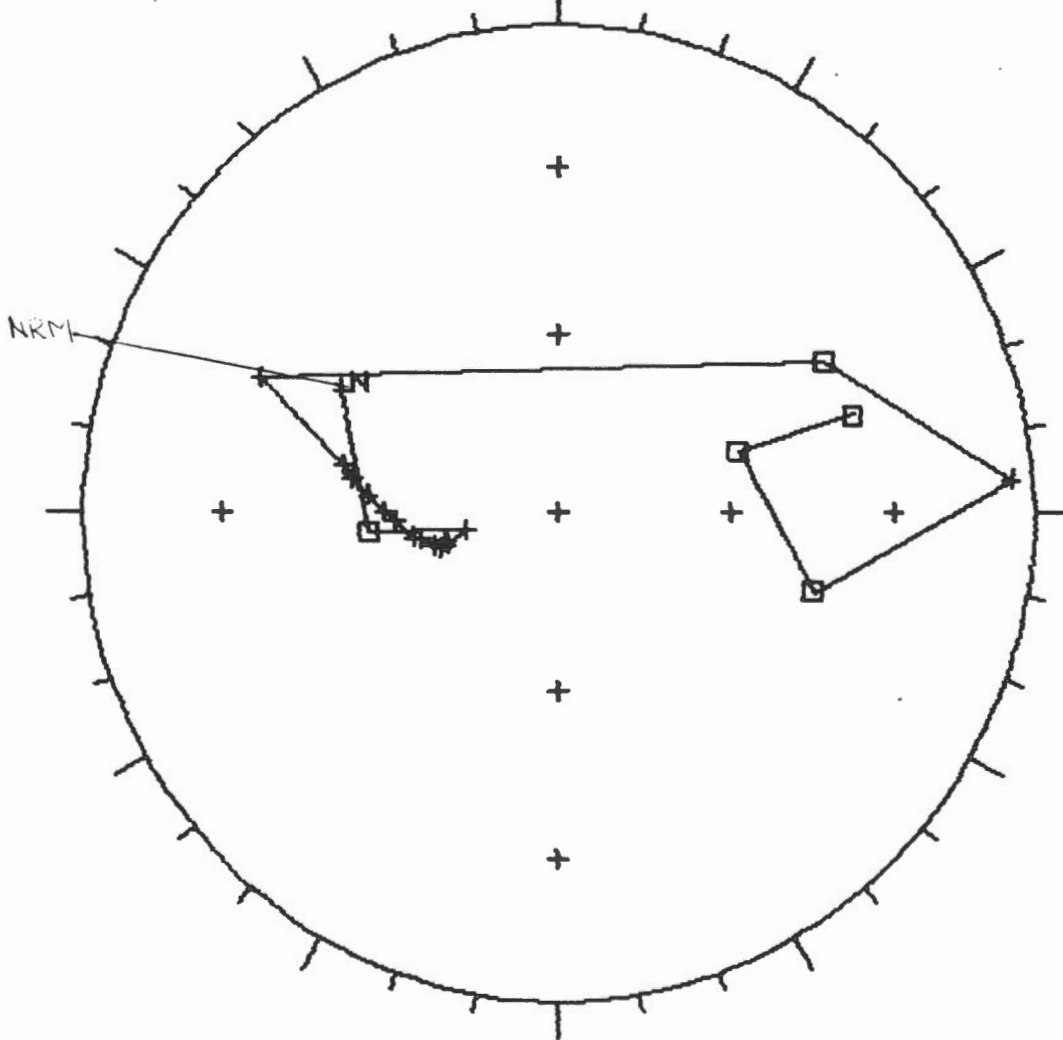
3.6 Plotting

Hardcopy of Specimen Stereonet.

Plot Option: ST

Collection: JNW

Specimen: 245B

This plot is for a range of treatments, labels are included and the data is with respect to the horizontal.

SPECIMEN JNW 245B   TREATMENTS 0640C TO 0700C H
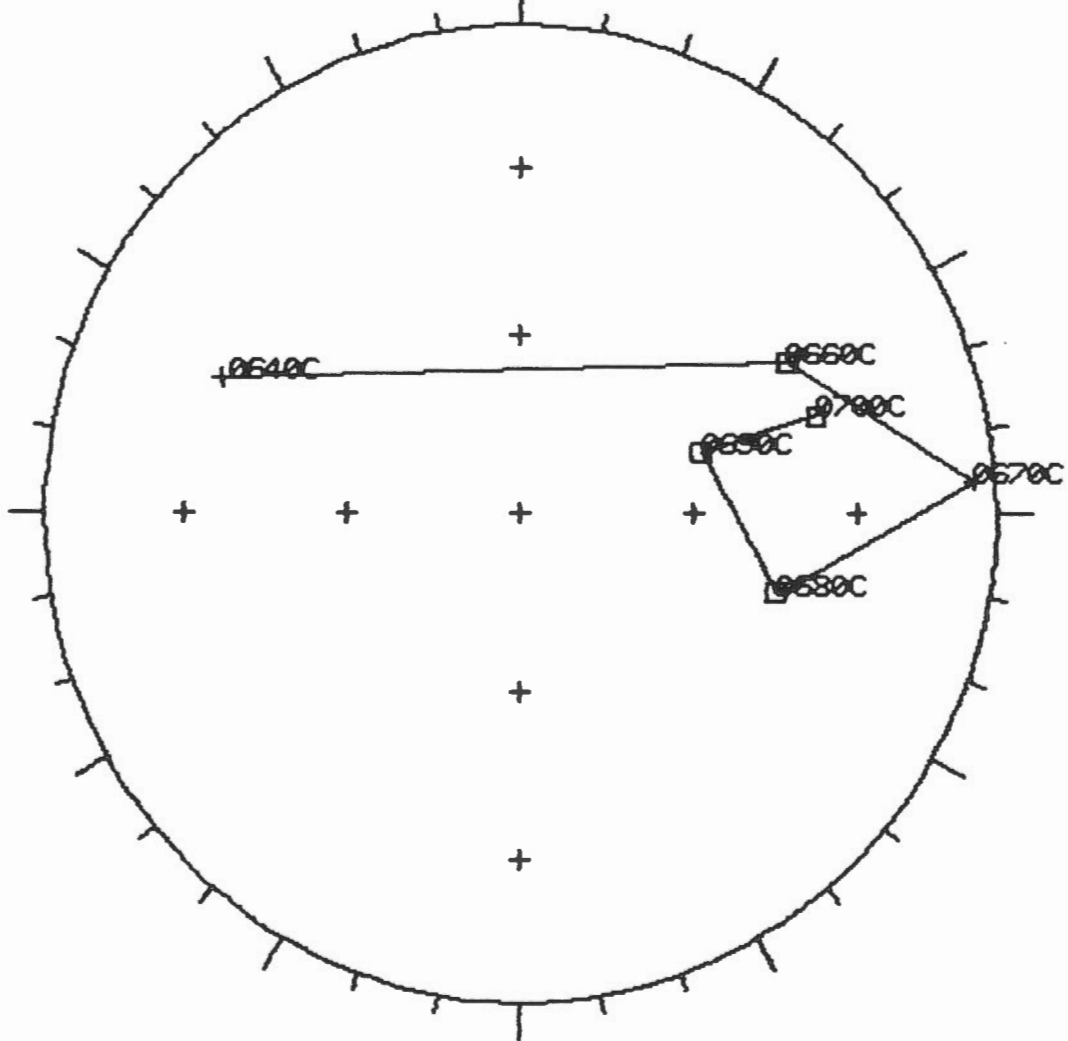
3.6 Plotting

Hardcopy of Intensity
Decay Curve, all treatments
plotted.

Plot option: MT

Collection: NW

Specimen: 245B

Value of maximum labelled tic
mark on vertical axis: 30

SPECIMEN NW   245B TREATMENTS 00000 TO 99999
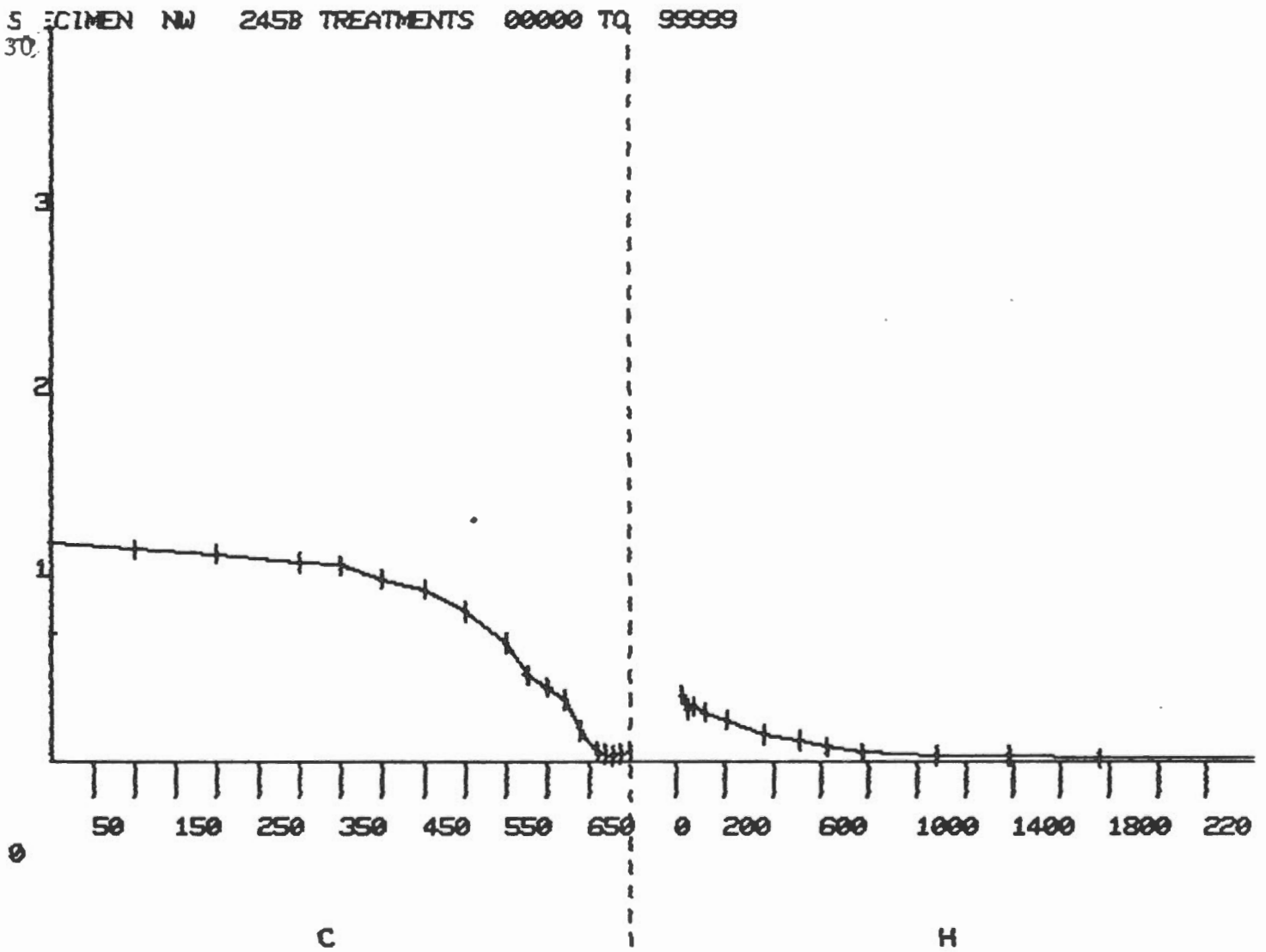
Hardcopy of Intensity Decay
Curve

Plot Option: MT

Collection: JNW

Specimen: 245B

Lower treatment: the lowest
temperature value

Upper treatment: 0700C

Value of maximum labelled
tic mark on vertical axis: 3∅

SPECIMEN JNW 245B TREATMENTS 0000C TO 0700C
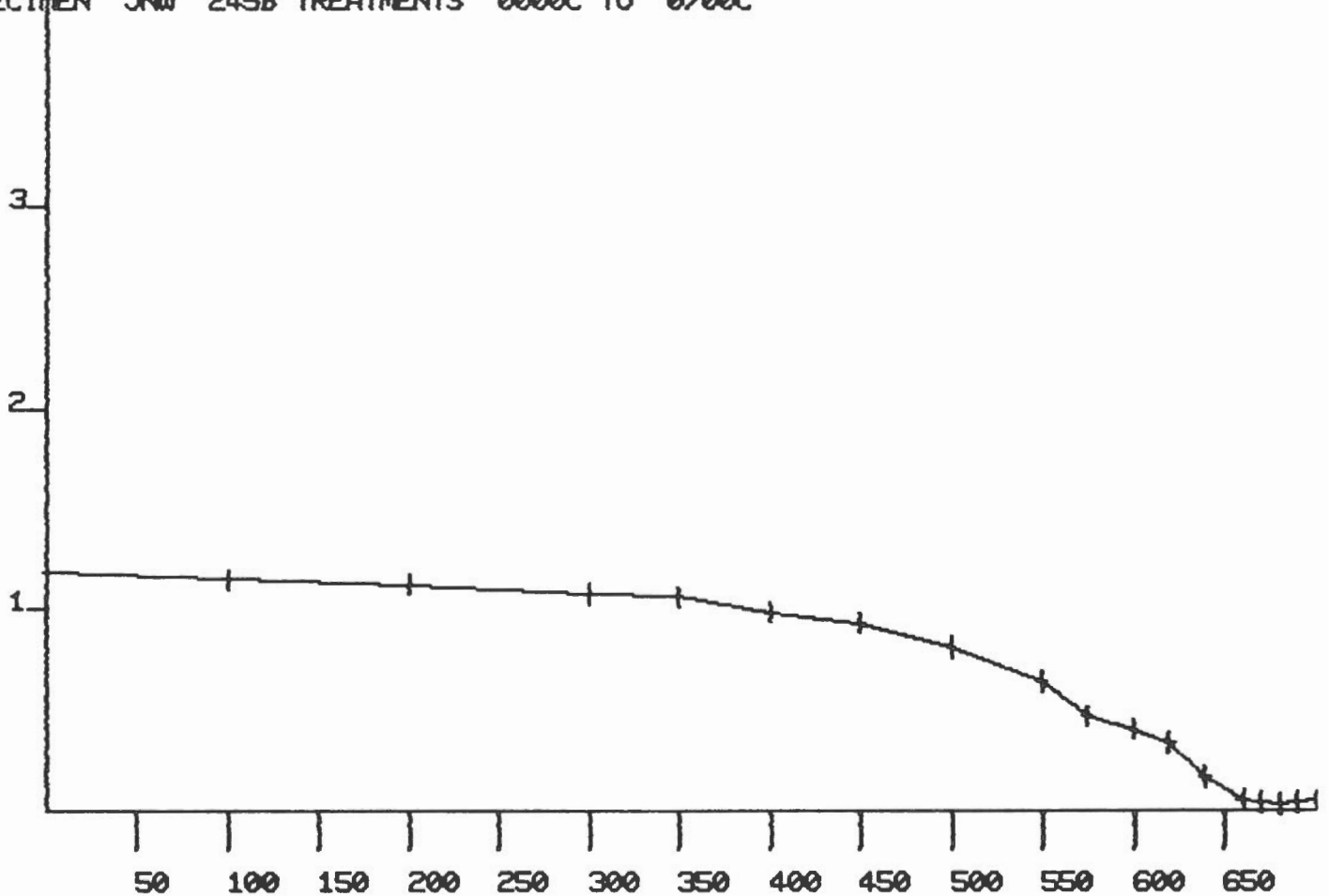
C

3.6 Plotting

Hardcopy of Vector graph
in xy plane with quadrant C
enlarged.

Quadrant: C

Collection: JNW

Specimen: 245B

Value of maximum labelled tic

mark: 1∅   NRM: No

XY – C   SPECIMEN JNW 245B H
1∅

–Y
10   8   6   4   2

SE

2 —

4 —

6 —

8 —

1∅—X
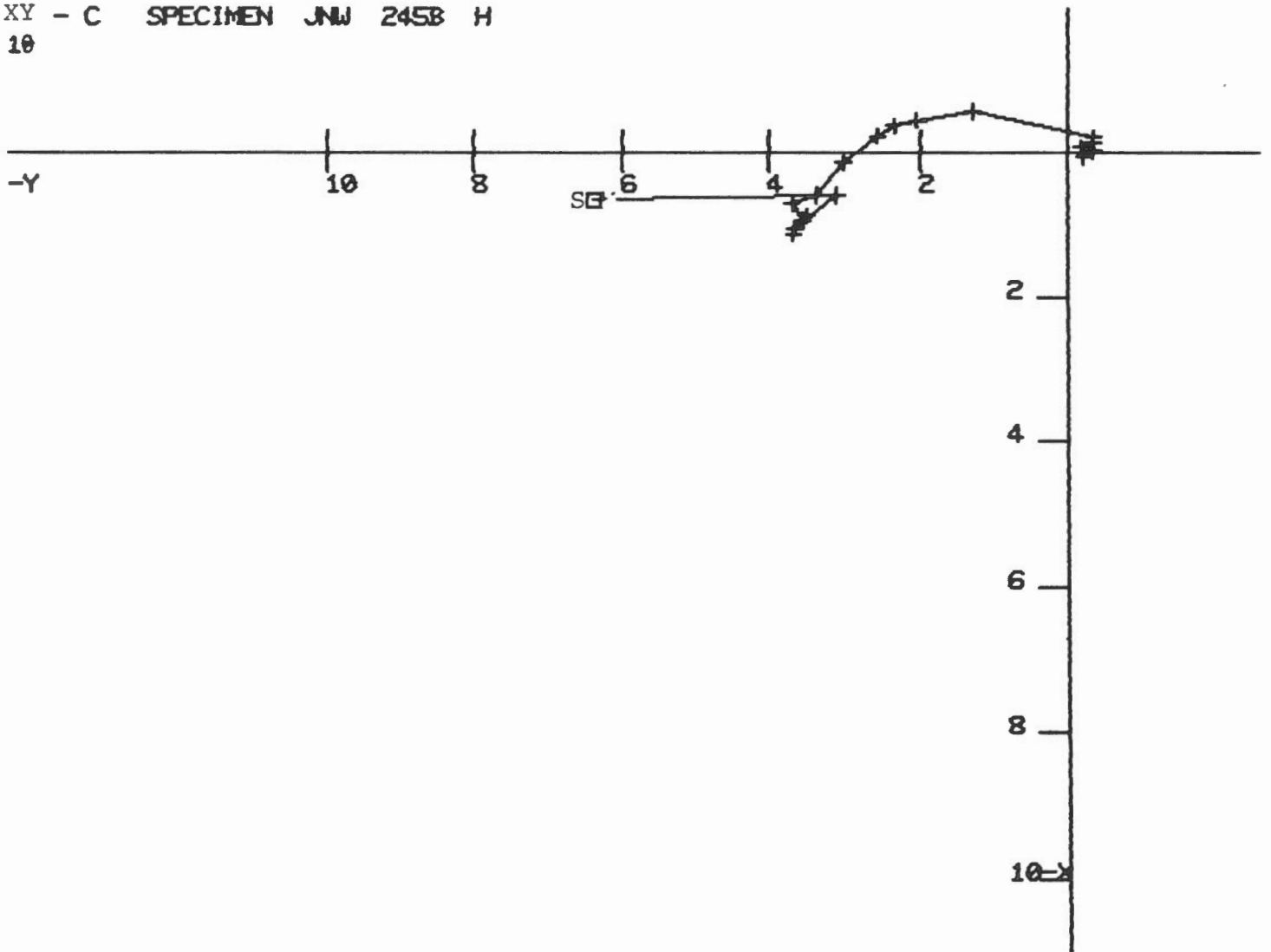
3.6 Plotting

Hardcopy of Vector graph
in XY plane.

Plot option: XY

Collection: JNW

Specimen: 245B

Value of maximum labelled
tic mark:10

Correction: Horizontal

NRM: Yes

XY
10   SPECIMEN JNW 245B H
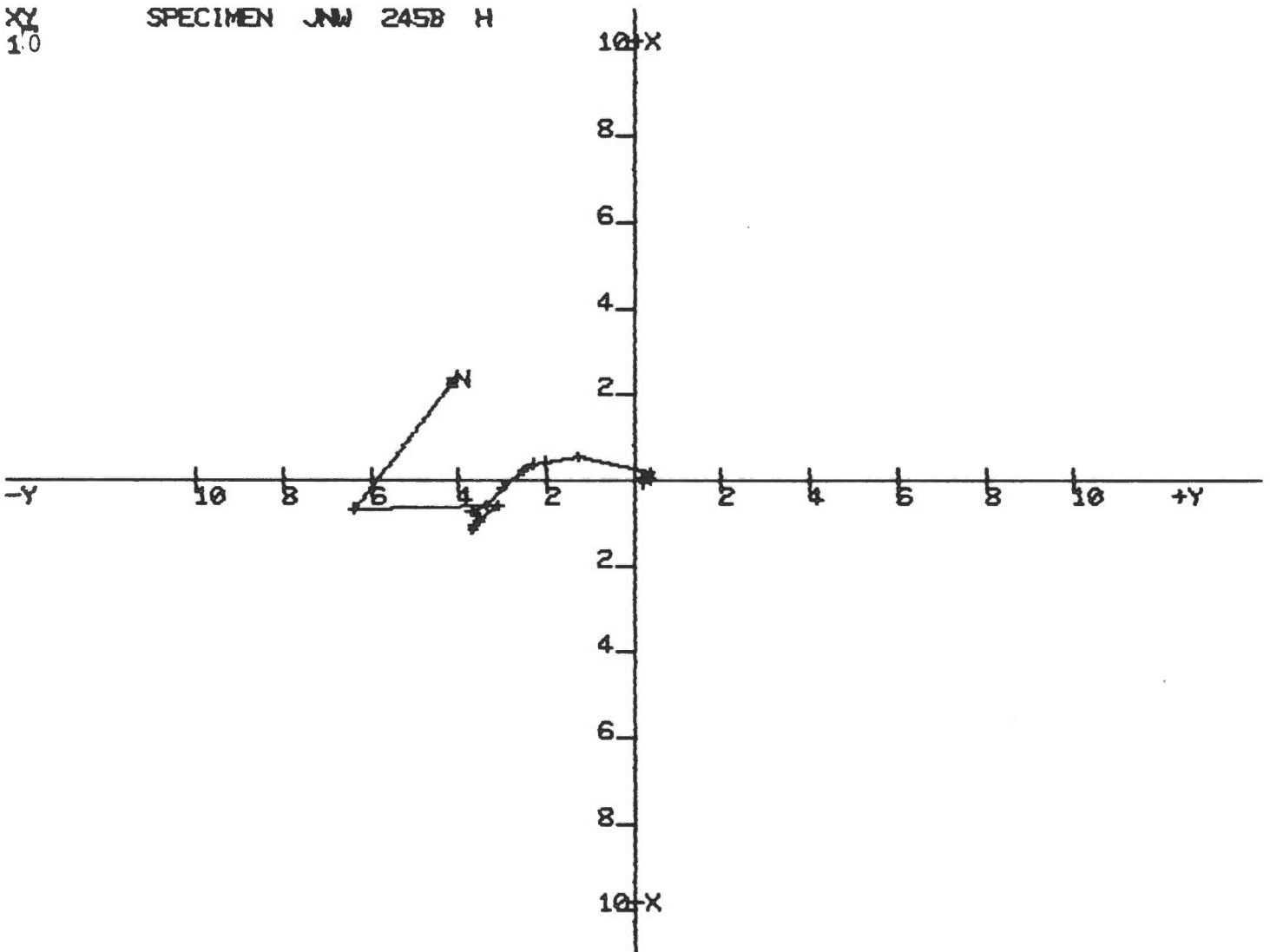
3.6 Plotting

Hardcopy of vector graph
inZY plane.

Plot option: ZY

Collection: JNW

Specimen: 245B

Value of Maximum labelled
tic mark: 30
Correction: Horizontal
NRM: No

ZY
30   SPECIMEN JNW 245B H
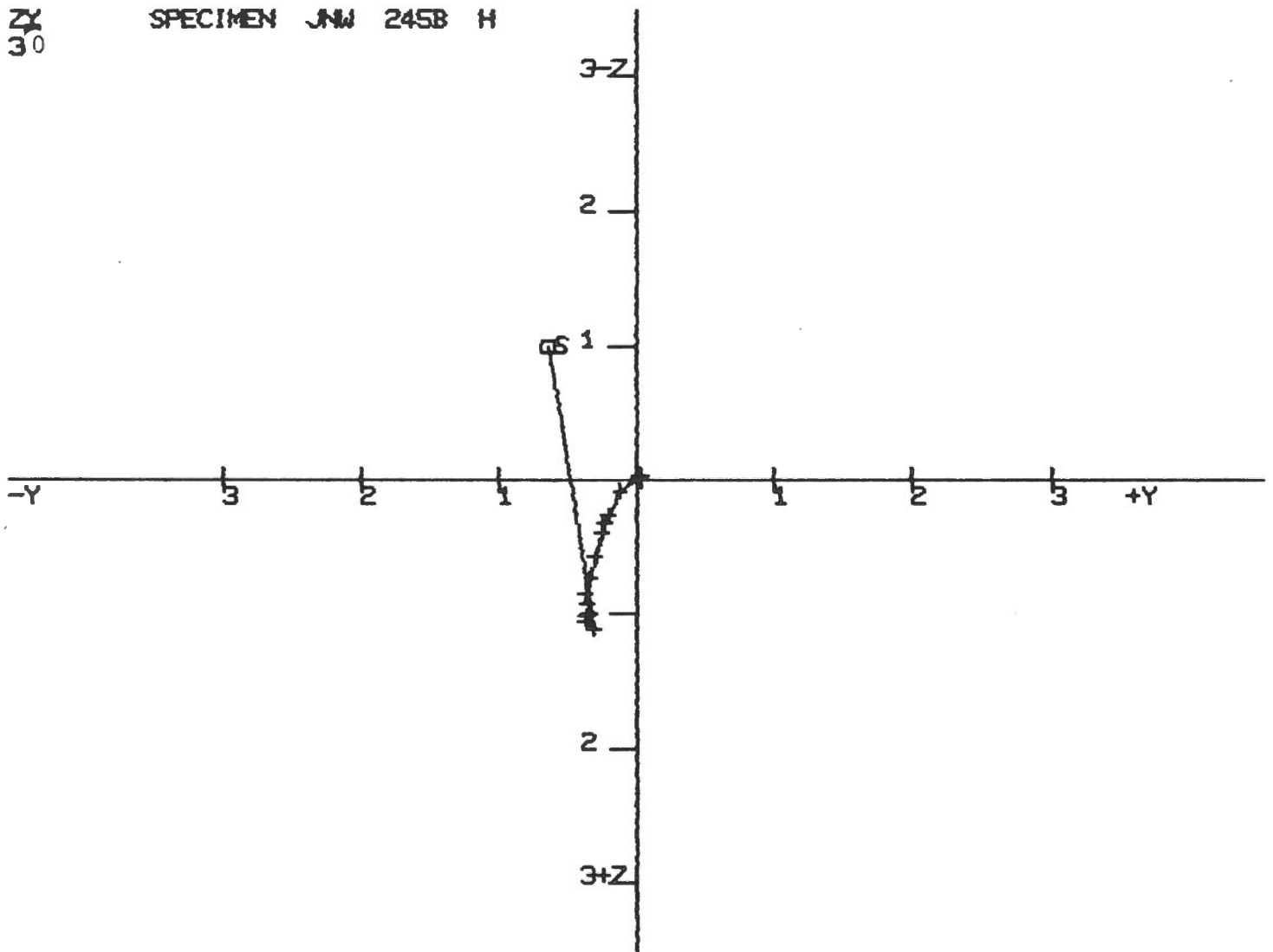
3.6 Plotting

Hardcopy of vector graph in the ZX plane.

Plot option: ZX

Collection: JNW

Specimen: 245B

Value of Maximum Labelled Tic mark: 30

Correction: Horizontal

NRM: Yes
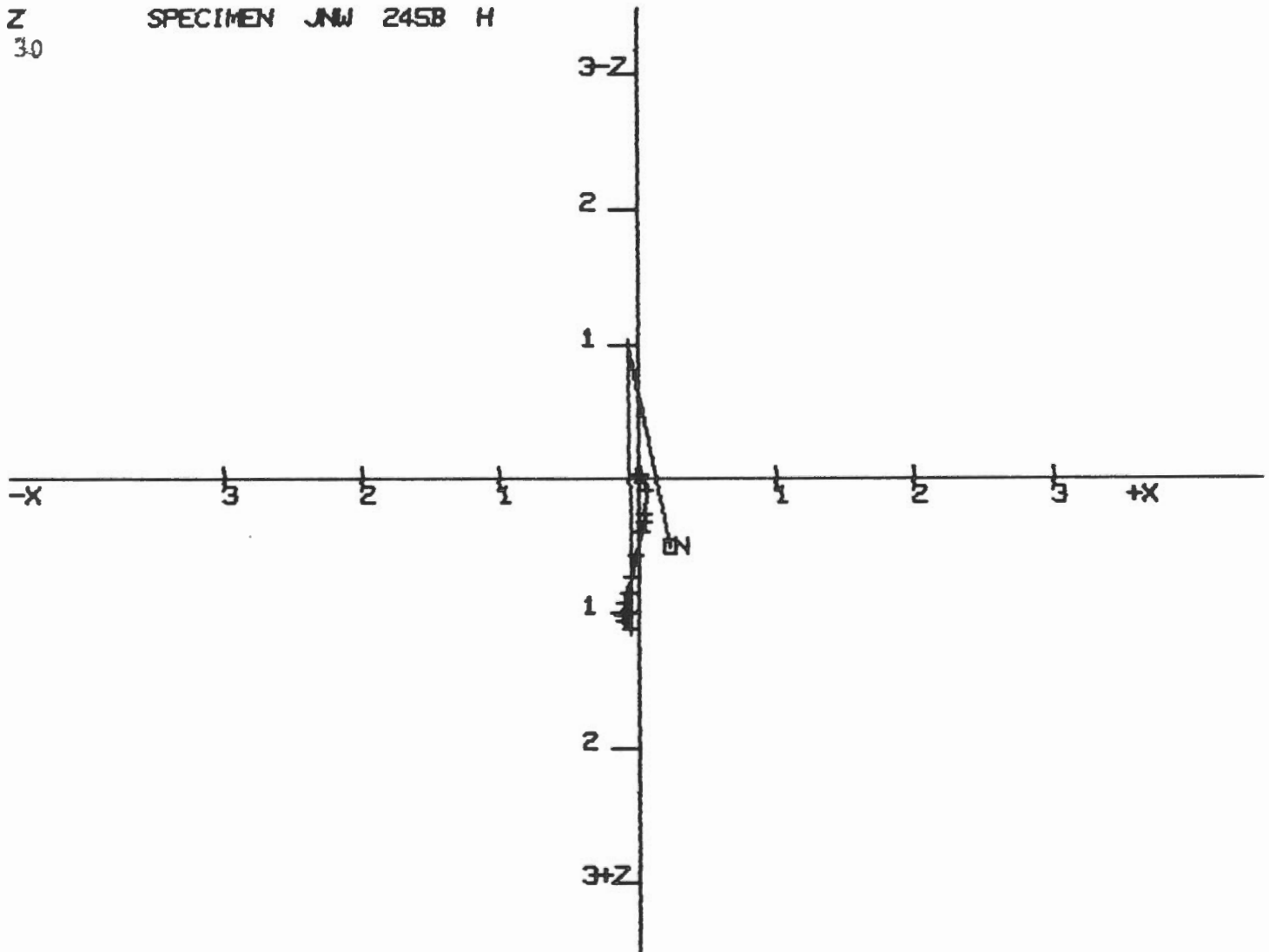
SPECIMEN JNW 245B H

3.6 Plotting

Hardcopy of vector graph in ZH plane.

Plot option: ZH

Collection: JNW

Specimen: 245B

Value of Maximum Labelled Tic Mark: 30

Correction: Horizontal

NRM: No

ZH
30

SPECIMEN JNW 245B H
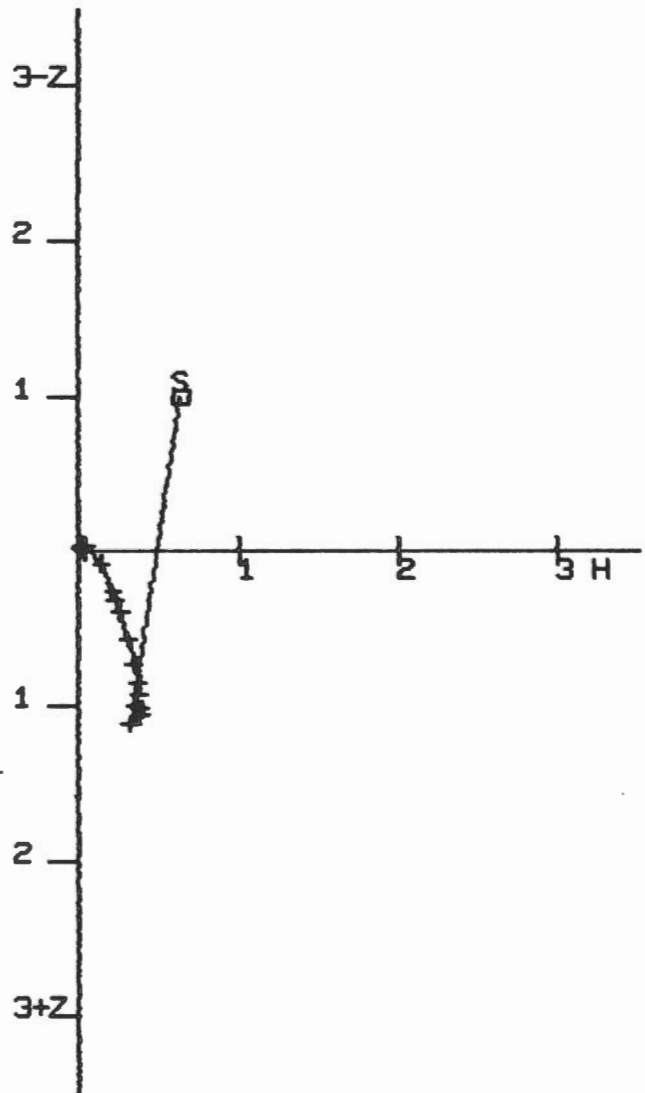
3.6 Plotting

Hardcopy of vector graph in ZH plane.

With lower half enlarged.

Section: L

Collection: JNW

Specimen: 245B

Value of Maximum Labelled Tic Mark: 30

Correction: Horizontal

NRM: No

ZH - L   SPECIMEN   JNW 245B   H
30
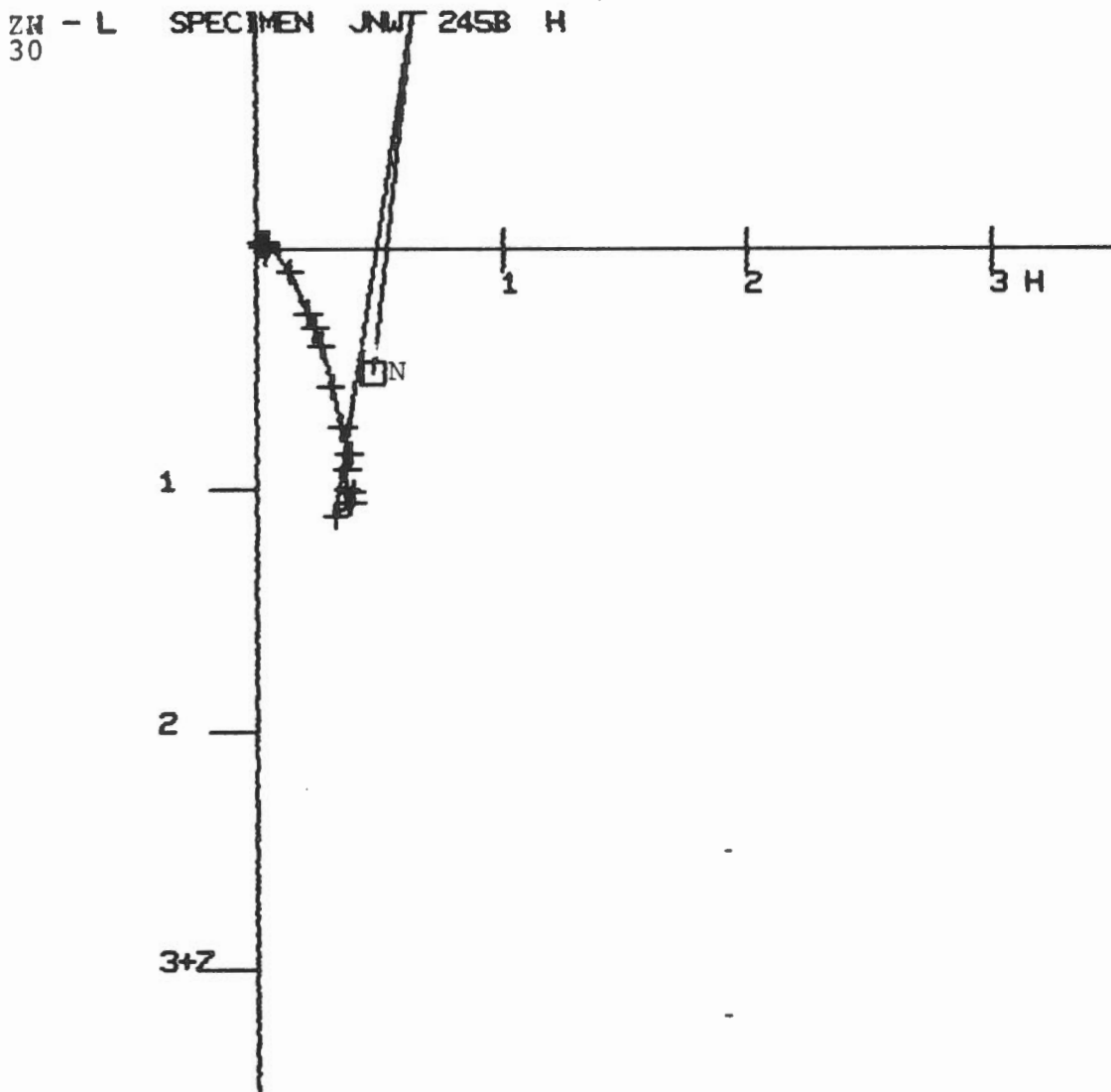
3.6 PLOTTING

Errors Messages:

ERROR opening intertask file   Source: SPPLOT.TSK(get.ftn)
                                                Expl: An attempt to open
                                                         the file INFO.DAT
                                                         failed
                                                Action: Exit SPIN
                                                         Call programmer

ERROR opening rock unit file   Source: SPPLOT.TSK
                                                         (oprock.ftn)
                                                Expl: An attempt to open
                                                         rock unit data file
                                                         failed
                                                Action: Exit Spin
                                                         Call programmer

Invalid site/specimen format   Source: SPPLOT.TSK
                                                         (verid.ftn)
                                                Expl: The format of the
                                                         specimen id
                                                         entered is not
                                                         correct. It
                                                         must be 3 numbers
                                                         and 1 character.
                                                Action: Reprompt user

Invalid Plot option   Source: SPPLOT.TSK
                                                         (plopt.ftn)
                                                Expl: An invalid plot
                                                         option was entered
                                                Action: Reprompt user

Specimen not on database   Source: SPPLOT.TSK
                                                         (stnrm,siplot,sirnge,
                                                          stplot,strnge.ftn)
                                                Expl: No data found to plot
                                                         Nothing plotted
                                                         except in case
                                                         when an NRM has
                                                         been found
                                                Action: Try another specimen

3.6 PLOTTING

Error messages (contd):

Invalid range of treatments	Source: SPPLOT.TSK
(mtrnge.ftn,strnge.ftn)	
	Expl: An invalid treatment type was entered or **the** treatment types entered in range are in the wrong order
	Action: Try another range
ERROR - treatment contains non-digit in positions 1-4	Source: SPPLOT.TSK (strnge.ftn)
	Expl: One of the treatment values entered is in the wrong format.
	It must have 4 numbers and one character (O,C,T,N)
	Action: Reprompt user for range of treatments

3.7 STATISTICAL ANALYSIS

Summary:

Fisher statistics can be calculated using data selected by any of the following methods:

a) average of a range of treatment results for a specimen

b) average of results for a range of specimens at a specified treatment step

c) average of results for selected specimens at specified treatment steps

d) average of results for selected specimens within a site (all data for a specimen is averaged, up to 50 specimens can be included)

e) average of all NRM measurements for a site or range of sites

Horizontal or bedding data must be chosen.
Total or Partial Fisher statistics can be calculated. Partial statistics can be saved and used to calculate Total Fisher statsitics. A maximum of 20 sets of Partial statistics can be saved. When Total statistics are selected the user must enter the latitude and longitude of the site. All output is displayed on the screen and listed on the lineprinter. See Appendix F for a summary of calculations used.

3.7 Statistical Analysis

FISHER STATISTICS

Enter type of correction (H,B, or X to exit) > H

Data selection option (A-E,(H)elp,e(X)it) > H

Option Selection questions in Fisher Statistical Analysis.
User responses are underlined.

Screen 1/9

FISHER STATISTICS OPTIONS

A) Average of range of treatment results for a specimen

B) Average of results for a range of specimens at a specified treatment step

C) Average of results for selected specimens at specified treatment steps

D) Average of results for selected specimens within a site

E) Average of all NRM measurements for a site or range of sites

Data selection option (A-E,(H)elp,e(X)it) > A

Help displayed for statistical analysis.
User responses are underlined.

Screen 2/9

3.7 Statistical Analysis

```
Enter specimen id (999X or X to exit) > 173B
Enter range of treatments

Lower treatment position and treatment (99999X) > 10300H
Upper treatment position and treatment (99999X) > 30300C


Specimen: 173B  Treatment 1-0300H to treatment 3-0300C        H

1-0300H      D =   170      I =   -52
1-0301H      D =   188      I =   -69
1-0350H      D =   156      I =   -56
1-0500H      D =   156      I =   -59
1-0550H      D =   142      I =   -63
2-01000      D =   176      I =   -49
2-03000      D =   160      I =   -53
2-04000      D =   156      I =   -55
2-07000      D =   152      I =   -55
2-10000      D =   153      I =   -61
3-0100C      D =   189      I =   -54

Partial or Total Statistics (P,T,X to exit) > P
```

Screen display of data selected for analysis option A.
User responses are underlined.

Screen 3/9

3.7 Statistical Analysis

PARTIAL STATISTICS

```
********************************************************************

        DECLINATION OF THE MEAN DIRECTION :   163.43
        INCLINATION OF THE MEAN DIRECTION :   -57.68
        N :   11



*********************** STATISTICAL ANALYSIS **********************
*                                                                *
*                                                                *
*          RESULTANT OF THE DIRECTION COSINES : R = 10.856103    *
*                                                                *
*                          ESTIMATE OF THE PRECISION : K =  69.49 *
*                                                                *
*  RADIUS OF THE CIRCLE OF CONFIDENCE (95%) : ALPHA 95 =   5.52  *
*                                                                *
*                                                                *
*****************************************************************

SAVE? Y/N  Y
```

Screen display of partial statistics produced from data displayed in previous
screen. These statistics can be saved for further calculation of total
statistics.
User responses are underlined.

Screen 4/9

FISHER STATISTICS OPTION A

Specimen: 173B

Treatment 1-0300H to treatment 3-0300C   H

1-0300H	D =	170	I =	-52
1-0301H	D =	188	I =	-69
1-0350H	D =	156	I =	-56
1-0500H	D =	156	I =	-59
1-0550H	D =	142	I =	-63
2-01000	D =	176	I =	-49
2-03000	D =	160	I =	-53
2-04000	D =	156	I =	-55
2-07000	D =	152	I =	-55
2-10000	D =	153	I =	-61
3-0100C	D =	189	I =	-54

PARTIAL STATISTICS

****

    DECLINATION OF THE MEAN DIRECTION : 163.43
    INCLINATION OF THE MEAN DIRECTION : -57.68
    N : 11

********************* STATISTICAL ANALYSIS **********************
*   *
*   *
*   RESULTANT OF THE DIRECTION COSINES : R = 10.856103   *
*   *
*   ESTIMATE OF THE PRECISION : K = 69.49   *
*   *
* RADIUS OF THE CIRCLE OF CONFIDENCE (95%) : ALPHA 95 = 5.52 *
*   *
*   *
****

3.7 Statistical Analysis

Lineprinter listing of input data and resultant partial statistics for
Fisher Statistics Option A.

3.7 Statistical Analysis

Enter low specimen id (999X or X to exit) > 010A

Enter high specimen id (999X or X to exit) > 173B
Enter treatment (9999X) > 0000N

```
Specimen 010A to specimen 173B       TREATMENT 0000N          H
010A   0-0000N       D =      0       I =       0

 055A   0-0000N        D =      0       I =       0
055B   0-0000N       D =      0       I =       0
055C   0-0000N       D =      0       I =       0
055D   0-0000N       D =      0       I =       0
055E   0-0000N       D =      0       I =       0
057A   0-0000N       D =      0       I =       0
057B   0-0000N       D =     45       I =       0
057C   0-0000N       D =      0       I =       0
057D   0-0000N       D =      0       I =       0
057E   0-0000N       D =      0       I =       0
058A   0-0000N       D =      0       I =       0
058B   0-0000N       D =      0       I =       0
058C   0-0000N       D =      0       I =       0
059A   0-0000N       D =     21       I =       0
059B   0-0000N       D =      0       I =       0
059C   0-0000N       D =      0       I =       0
059D   0-0000N       D =      0       I =       0
060A   0-0000N       D =      0       I =       0
060B   0-0000N       D =      0       I =       0

 171B   0-0000N        D =    170        I =    -52
173A   0-0000N       D =    156       I =    -56
173B   0-0000N       D =    218       I =    -27
```

Partial or Total Statistics (P,T,X to exit) > P

Screen display of data selected for analysis option B.
User responses are underlined.

Screen 5/9

FISHER STATISTICS OPTION B

Specimen 010A to Specimen 173B   Treatment 0000N   H

```
010A  0-0000N    D =     0    I =     0
055A  0-0000N    D =     0    I =     0
055B  0-0000N    D =     0    I =     0
055C  0-0000N    D =     0    I =     0
055D  0-0000N    D =     0    I =     0
055E  0-0000N    D =     0    I =     0
057A  0-0000N    D =     0    I =     0
057B  0-0000N    D =    45    I =     0
057C  0-0000N    D =     0    I =     0
057D  0-0000N    D =     0    I =     0
057E  0-0000N    D =     0    I =     0
058A  0-0000N    D =     0    I =     0
058B  0-0000N    D =     0    I =     0
058C  0-0000N    D =     0    I =     0
059A  0-0000N    D =    21    I =     0
059B  0-0000N    D =     0    I =     0
059C  0-0000N    D =     0    I =     0
059D  0-0000N    D =     0    I =     0
060A  0-0000N    D =     0    I =     0
060B  0-0000N    D =     0    I =     0

171B  0-0000N    D =   170    I =   -52
173A  0-0000N    D =   156    I =   -56
173B  0-0000N    D =   218    I =   -27
```

PARTIAL STATISTICS

****

```
    DECLINATION OF THE MEAN DIRECTION :    2.73
    INCLINATION OF THE MEAN DIRECTION :   -6.62
    N :  23
```


********************* STATISTICAL ANALYSIS *********************
*   *
*   *
*   RESULTANT OF THE DIRECTION COSINES : R = 17.961527   *
*   *
*   ESTIMATE OF THE PRECISION : K =   4.37   *
*   *
* RADIUS OF THE CIRCLE OF CONFIDENCE (95%) : ALPHA 95 = 16.45 *
*   *
*   *
****

3.7 Statistical Analysis

Lineprinter listing of input data and resultant partial statistics for
Fisher Statistics Option B.

3.7 Statistical Analysis

```
        Data selection option (A-E,(H)elp,e(X)it) > C


        Enter specimen id (999X or X to exit) > 173B
        Enter treatment position number (1-3) > 1
        Enter treatment (9999X) > 0163H

        Specimen: 173B 1-0163H    (H)        D =   152 I =   -23


        Enter specimen id (999X or X to exit) > 173B
        Enter treatment position number (1-3) > 1
        Enter treatment (9999X) > 0350H

        Specimen: 173B 1-0350H    (H)        D =   156 I =   -56


        Enter specimen id (999X or X to exit) > 173B
        Enter treatment position number (1-3) > 4
        Enter treatment (9999X) >

        Specimen 173B 4-      not on database



        Enter specimen id (999X or X to exit) > 177


        Enter specimen id (999X or X to exit) > 173B
        Enter treatment position number (1-3) > 2
        Enter treatment (9999X) > 01000

        Specimen: 173B 2-01000    (H)        D =   176 I =   -49


        Enter specimen id (999X or X to exit) > X

        Partial or Total Statistics (P,T,X to exit) > P
```

Screen display of data selected for analysis option C.
User responses are underlined.

Screen 6/9

```
FISHER STATISTICS OPTION C          Correction: H

Specimen: 173B 1-0163H        D =  152 I =  -23
Specimen: 173B 1-0350H        D =  156 I =  -56
Specimen: 173B 2-01000        D =  176 I =  -49


PARTIAL STATISTICS


********************************************************************

    DECLINATION OF THE MEAN DIRECTION :  160.37
    INCLINATION OF THE MEAN DIRECTION :  -43.23
    N :  3


********************* STATISTICAL ANALYSIS **********************
*                                                                *
*                                                                *
*        RESULTANT OF THE DIRECTION COSINES : R =  2.882507      *
*                                                                *
*                ESTIMATE OF THE PRECISION : K =   17.02         *
*                                                                *
*  RADIUS OF THE CIRCLE OF CONFIDENCE (95%) : ALPHA 95 =  30.85  *
*                                                                *
*                                                                *
********************************************************************
```

3.7 Statistical Analysis

Lineprinter listing of input data and resultant partial statistics
for Fisher Statistics Option C.

3.7 Statistical Analysis

```
Data selection option (A-E,(H)elp,e(X)it) > D


Enter site (99 or X to exit) > 17

Enter core & sample (9X or X to exit) > 3B

Specimen: 173B  (H)         Treatment

                    0-0000N   D=  218   I = -27
                    1-0024H   D=  124   I = -50
                    1-0048H   D=  137   I = -60
                    1-0096H   D=  186   I = -59
                    1-0163H   D=  152   I = -23
                    1-0300H   D=  170   I = -52
                    1-0301H   D=  188   I = -69
                    1-0350H   D=  156   I = -56
                    1-0500H   D=  156   I = -59
                    1-0550H   D=  142   I = -63
                    2-01000   D=  176   I = -49
                    2-03000   D=  160   I = -53
                    2-04000   D=  156   I = -55
                    2-07000   D=  152   I = -55
                    2-10000   D=  153   I = -61
                    3-0100C   D=  189   I = -54
                    3-0318C   D=  148   I = -23
                    3-0325C   D=  146   I =   0
                    3-0425C   D=  143   I =  -3
                    3-0540C   D=  138   I =  20

Enter core & sample (9X or X to exit) > X

Partial or Total Statistics (P,T,X to exit) > P
```

Screen display of data selected for analysis option D.
User responses are underlined.

Screen 7/9

3-65

Fisher Statistics Option D

SITE: 17

Specimen: 173B (H)　　　Treatment

```
                    0-0000N   D=  218   I = -27
                    1-0024H   D=  124   I = -50
                    1-0048H   D=  137   I = -60
                    1-0096H   D=  186   I = -59
                    1-0163H   D=  152   I = -23
                    1-0300H   D=  170   I = -52
                    1-0301H   D=  188   I = -69
                    1-0350H   D=  156   I = -56
                    1-0500H   D=  156   I = -59
                    1-0550H   D=  142   I = -63
                    2-01000   D=  176   I = -49
                    2-03000   D=  160   I = -53
                    2-04000   D=  156   I = -55
                    2-07000   D=  152   I = -55
                    2-10000   D=  153   I = -61
                    3-0100C   D=  189   I = -54
                    3-0318C   D=  148   I = -23
                    3-0325C   D=  146   I =   0
                    3-0425C   D=  143   I =  -3
                    3-0540C   D=  138   I =  20
```

PARTIAL STATISTICS

****

    DECLINATION OF THE MEAN DIRECTION : 157.91
    INCLINATION OF THE MEAN DIRECTION : -45.65
    N : 20

********************** STATISTICAL ANALYSIS **********************
*   *
*   *
*   RESULTANT OF THE DIRECTION COSINES : R = 17.632986 *
*   *
*   ESTIMATE OF THE PRECISION : K =   8.03   *
*   *
* RADIUS OF THE CIRCLE OF CONFIDENCE (95%) : ALPHA 95 = 12.29 *
*   *
*   *
****

3.7 Statistical Analysis

Lineprinter listing of input data and resultant partial statistics
for Fisher Statistics option D.

3.7 Statistical Analysis

```
Data selection option (A-E,(H)elp,e(X)it) > E
Enter low site value (99 or X to exit) > 17
Enter high site value (99 or X to exit) > 17


Site 17 to Site 17     H

  Specimen

171B 0-0000N        D =  170      I =  -52
173A 0-0000N        D =  156      I =  -56
173B 0-0000N        D =  218      I =  -27
174B 0-0000N        D =  124      I =  -50
175D 0-0000N        D =  186      I =  -59
175E 0-0000N        D =  152      I =  -23
179C 0-0000N        D =  137      I =  -60

Partial or Total Statistics (P,T,X to exit) > P
```

Screen display of data selected for analysis option E.
User responses are underlined.

Screen 8/9

FISHER STATISTICS OPTION E

Site 17 to Site 17   H

 Specimen

171B 0-0000N   D = 170   I = -52
173A 0-0000N   D = 156   I = -56
173B 0-0000N   D = 218   I = -27
174B 0-0000N   D = 124   I = -50
175D 0-0000N   D = 186   I = -59
175E 0-0000N   D = 152   I = -23
179C 0-0000N   D = 137   I = -60

PARTIAL STATISTICS

****

    DECLINATION OF THE MEAN DIRECTION : 164.98
    INCLINATION OF THE MEAN DIRECTION : -51.02
  . N :   7

*********************** STATISTICAL ANALYSIS ***********************
 *   *
 *   *
 *   RESULTANT OF THE DIRECTION COSINES : R =   6.368828   *
 *   *
 *   ESTIMATE OF THE PRECISION : K =   9.51   *
 *   *
 * RADIUS OF THE CIRCLE OF CONFIDENCE (95%) : ALPHA 95 = 20.64   *
 *   *
 *   *
****

    3.7 Statistical Analysis

    Lineprinter listing of input data and resultant partial statistics
    for Fisher Statistics Option E.

3.7 Statistical Analysis

Data selection option (A-E,(H)elp,e(X)it) > X

*****************TOTAL FISHER STATISTICS*******************

  SITE COORDINATES ? [(+:E/-:W)LONG,(+:N/-:S)LAT] * +30,-60

****

      DECLINATION OF THE MEAN DIRECTION : 160.30
      INCLINATION OF THE MEAN DIRECTION : -48.05
      N: 2

  COORDINATES OF THE PALEOMAGNETIC POLE : (LATITUDE)   0.55 S

                                        : (LONGITUDE)   12.86 E

*********************** STATISTICAL ANALYSIS ***********************
*   *
*   *
*   RESULTANT OF THE DIRECTION COSINES : R = 1.995598   *
*   *
*   ESTIMATE OF THE PRECISION : K = 227.16   *
*   *
* RADIUS OF THE CIRCLE OF CONFIDENCE (95%) : ALPHA 95 =   16.65 *
*   *
*   CIRCULAR STANDARD DEVIATION (63%) : THETA 63 =   5.37   *
*   *
*   ANGULAR STANDARD DEVIATION : DELTA =   3.80   *
*   *
*   POLAR ERROR ON THE DISTANCE : DELTA P = 14.23   *
*   *
*   POLAR ERROR IN THE DECLINATION : DELTA M = 21.76   *
*   *
*   *
****

Screen display of total Fisher statistics produced from saved partial
statistics.

Screen 9/9

```
******************TOTAL FISHER STATISTICS****************

SITE COORDINATES (+E/-W)LONG,(+N/-S)LAT   30.00    -60.00

*********************************************************************

     DECLINATION OF THE MEAN DIRECTION :  160.30
     INCLINATION OF THE MEAN DIRECTION :  -48.05
     N:   2


COORDINATES OF THE PALEOMAGNETIC POLE : (LATITUDE)     0.55 S

                                       : (LONGITUDE)   12.86 E
```

```
***************** STATISTICAL ANALYSIS *********************
*                                                          *
*                                                          *
*        RESULTANT OF THE DIRECTION COSINES : R =  1.995598 *
*                                                          *
*                ESTIMATE OF THE PRECISION : K = 227.16    *
*                                                          *
* RADIUS OF THE CIRCLE OF CONFIDENCE (95%) : ALPHA 95 =  16.65 *
*                                                          *
*     CIRCULAR STANDARD DEVIATION (63%) : THETA 63 =   5.37 *
*                                                          *
*           ANGULAR STANDARD DEVIATION : DELTA =    3.80   *
*                                                          *
*        POLAR ERROR ON THE DISTANCE : DELTA P =   14.23   *
*                                                          *
*     POLAR ERROR IN THE DECLINATION : DELTA M =   21.76   *
*                                                          *
*                                                          *
***********************************************************
```

3.7 Statistical Analysis

Lineprinter listing of Total Fisher Statistics

3.7 STATISTICAL ANALYSIS

Error Messages:

ERROR opening intertask file

Source: STATS.TSK(get.ftn)
Expl: An attempt to open the file INFO.DAT failed
Action: Exit SPIN
Call programmer

ERROR opening rock unit file

Source: STATS.TSK (oprock.ftn)
Expl: An attempt to open the rock unit data file failed.
Action: Exit SPIN
Call programmer

Invalid Option

Source: STATS.TSK
Expl: An invalid response was entered to prompt for type of data to use (horiz. or bedding)
Action: Reprompt user

Invalid Statistics Option

Source: STATS.TSK
Expl: Invalid Fisher Statistics option entered Response must be A,B,C,D,E,X,or H.
Action: Reprompt user

Invalid option (must be P or T)

Source: STATS.TSK
Expl: Response must be P or T to this prompt
Action: Reprompt user

Invalid site/specimen format

Source: STATS.TSK (verid.ftn)
Expl: The format of the specimen id entered is not correct. It must be 3 numbers and 1 character.
Action: Reprompt user

3.7 STATISTICAL ANALYSIS

Error Messages:

Treatment contains non-digit in
positions 2-5

Source: STATS.TSK
(stata.ftn,statb.ftn,
statc.ftn)
Expl: Format of treament
position and
value entered is
incorrect. It must
be: treat. pos #
(1-3) & treat.
value (4 numbers)
& treat. type
(H,C,O,N)
Action: reprompt user

No records within range specified

Source: STATS.TSK
(stata.ftn,
statb.ftn,
state.ftn)
Expl: There was no data
within the range
specified by user
Action: Try another range

Maximum data found

Source: STATS.TSK
(stata.ftn
statb,statc,statd,
state.ftn)
Expl: A maximum of 200
sets of data
can be used in
calculating the
Fisher Statistics.
Action: If there is any
more data in
the range specified
it is not included
in the calculations.

Specimen 999X 9-9999X not on database

Source: STATS.TSK
(statc.ftn)
Expl: These are no data
for the specimen
with the treatment
value specified.
Action: Try another
specimen or
treatment

3.7   STATISTICAL ANALYSIS

Error Messages (contd):

Specimen 999X not on database

Source: STATS.TSK
          (statd.ftn)
Expl: The specimen
          entered is not
          no database
Action: Try another
          specimen

Error Messages (contd):

3.8 VECTOR ANALYSIS

Summary:

The vector anlaysis option allows the user to add or subtract selected data. Initially the type of operation (addition or subtraction) is chosen. Next the specimen and type of correction (horizontal or bedding) is chosen. The user selects 2 vectors (specified by treatment value and type) at a time for addition or subtraction. The input and resultant vectors are displayed on the terminal screen. Up to 50 resultant vectors can be calculated and saved for one specimen. When the calculations are complete a list of all resultants for that specimen are printed on the lineprinter and on the screen. These resultants can be plotted on a stereonet,intensity decay curve or vector graphs.

A hardcopy of the graph on the graphics screen can be obtained by pushing the copy button on the copier unit.

3.8 Vector Analysis

```
Enter option:
(A)ddition,(S)ubtraction,e(X)it > A
Enter Specimen ID > 173B
(B)edding,(H)orizontal,e(X)it > B


Enter input vectors treatment values and type (9999X,  X to exit))
Vector 1 > 0024H
Vector 2 > 0048H



0024H    0.835E-06      67        -55
0048H    0.738E-06      49        -64
  +      0.156E-05      59.76     -59.52


Enter input vectors treatment values and type (9999X,  X to exit))
Vector 1 > 0096H
Vector 2 > 0165H


Specimen and treatment not on database - try again
Vector 1 > 0096H
Vector 2 > 0136H


Specimen and treatment not on database - try again
Vector 1 > 0096H
Vector 2 > 0163H



0096H    0.389E-06     344        -79
0163H    0.359E-06     130        -55
  +      0.692E-06     113.96     -77.47


Enter input vectors treatment values and type (9999X,  X to exit))
Vector 1 > 0300H
Vector 2 > 0350H



0300H    0.611E-06       0          0
0350H    0.540E-06      54        -74
  +      0.879E-06       9.78     -36.22


Enter input vectors treatment values and type (9999X,  X to exit))
Vector 1 > 03000
Vector 2 > 04000



03000    0.978E-06     141        -63
04000    0.890E-06     136        -64
  +      0.187E-05     138.66     -63.50


Enter input vectors treatment values and type (9999X,  X to exit))
Vector 1 > X
```

3.75

3.8 Vector Analysis


```
SPECIMEN:   173B   B


0024H + 0048H    0.156E-05      59.8     -59.5
0096H + 0163H    0.692E-06     114.0     -77.5
0300H + 0350H    0.879E-06       9.8     -36.2
0300O + 04000    0.187E-05     138.7     -63.5


Enter plot option
(ST,MT,XY,ZH,ZX,ZY AP(all plots),XX(exit)) >ST


Enter plot option
(ST,MT,XY,ZH,ZX,ZY AP(all plots),XX(exit)) >MT


Enter plot option
(ST,MT,XY,ZH,ZX,ZY AP(all plots),XX(exit)) >XY
Enter quadrant to enlarge (A,B,C,D,X) > X


Enter plot option
(ST,MT,XY,ZH,ZX,ZY AP(all plots),XX(exit)) >XX
Enter option:
(A)ddition,(S)ubtraction,e(X)it > X
>:
```

Screen Display of table of resultant vectors after addition complete,
plus a series of prompts and responses for plotting the resultant vectors.

Screen 2/2

VECTOR ANALYSIS - RESULTANT TABLE

SPECIMEN: 173B   B

0024H + 0048H	0.156E-05	59.8	-59.5
0096H + 0163H	0.692E-06	114.0	-77.5
0300H + 0350H	0.879E-06	9.8	-36.2
03000 + 04000	0.187E-05	138.7	-63.5

3.8 Vector Analysis

Lineprinter listing of table of resultant vectors
after vector addition complete. There can be
up to 50 vectors in the table.

Hardcopy of stereonet
produced after
vector addition
complete.

Plot option: ST

Note: produced
on old hardcopy
device.
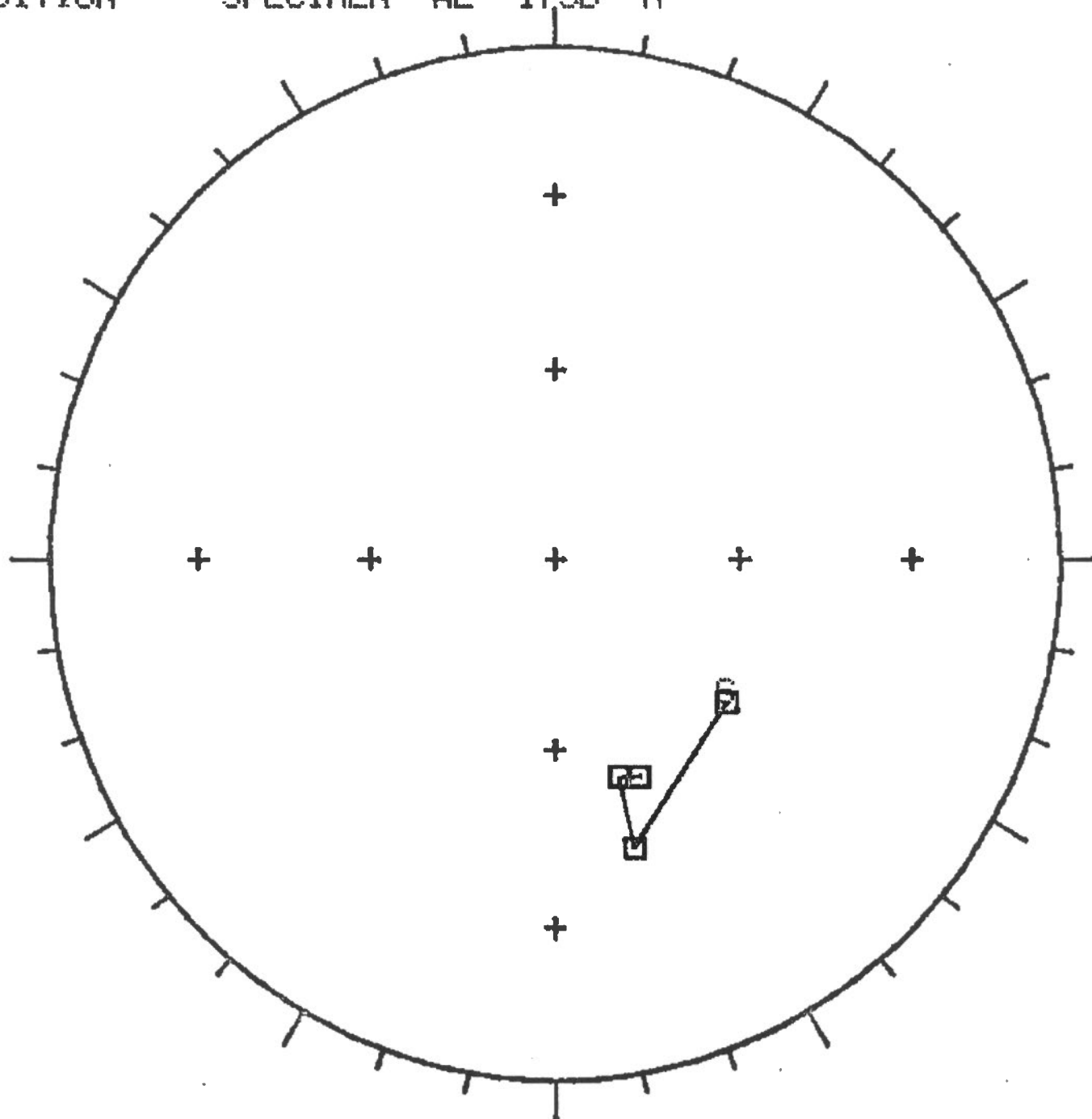
3.8 VECTOR ANALYSIS

Error Messages:

ERROR opening intertask file

Source: VECTOR.TSK(get.ftn)
Expl: An attempt to open the file INFO.DAT failed
Action: Exit SPIN
         Call programmer

ERROR opening rock unit file

Source: VECTOR.TSK (oprock.ftn)
Expl: An attempt to open the rock unit data file failed.
Action: Exit SPIN
         Call programmer

Invalid vector option

Source: VECTOR.TSK
Expl: The characters A,S or X are the only valid responses to this prompt
Action: Reprompt user

Invalid option

Source: VECTOR.TSK
Expl: The characters B,H, or X are the only valid responses to this prompt.
Action: Reprompt user

Specimen and treatment not on database

Source: VECTOR.TSK (vinpt.ftn)
Expl: There are no data for specimen with treatment specified
Action: Try another treatment

Invalid plot option

Source: VECTOR.TSK (plopt.ftn)
Expl: An invalid plot option was entered
Action: Reprompt user

3.8 VECTOR ANALYSIS

Error Messages:

Invalid site/specimen format

Source: VECTOR.TSK
(verid.ftn)
Expl: The format of the
specimen id
entered is not
correct. It
must be 3 numbers
and 1 character.
Action: Reprompt user

3.9 DATA VERIFICATION

Summary:

This option is provided to allow the user to verify that the data stored in the database for declination and inclination are the correct values. That is, it calculates DS and IS which are the declination and inclination with respect to the sample for each treatment step for a specimen.

3.9 DATA VERIFICATION

Summary:

3.9 Data Verification

```
Enter the specimen-id: 010A
Enter G and H values

     G = 125
     H = -25
```

Screen displayed when Data Verification option selected.
User responses are underlined.

Screen]/2

3.9 Data Verification

```
                           DATA VERIFICATION
                           ----  ------------

COLLECTION: AL
SPECIMEN:   010A                                  G:   125    H:   -25

TREAT   TRPOS    DH    IH      DB    IB        M          DS      IS
-----   -----    --    --      --    --        -          --      --

 NRM      0       0     0       1     0     0.300E-06      0       0
00500     1      255    0      266    67    0.677E-06      0       0
0680C     2      23     0       0     13    0.000E+00      0       0
0700C     2      1      2       3     4     0.500E-06      0       0
0021H     3      3      4       5     6     0.889E-04      0       0
0041H     3      56     32      5     9     0.230E-08      0       0
```

Last record read for the specimen : 010A

More verification ? [Y/N] Y

Screen display of verified data.

screen 2/2

3.9 Data Verification

DATA VERIFICATION

COLLECTION: AL
SPECIMEN: 010A   G: 125   H: -25

TREAT	TRPOS	DH	IH	DB	IB	M	DS	IS
NRM	0	0	0	1	0	0.300E-06	0	0
00500	1	255	0	266	07	..77E-06	0	0
0680C	2	23	0	0	13	0.000E+00	0	0
0700C	2	1	2	3	4	0.500E-06	0	0
0021H	3	3	4	5	6	0.889E-04	0	0
0041H	3	56	32	5	9	0.230E-08	0	0

Lineprinter Listing of verified data

3.9 DATA VERIFICATION

Error Messages:

ERROR opening intertask file

Source: VERIFY.TSK(get.ftn)
Expl: An attempt to open
         the file INFO.DAT
         failed
Action: Exit SPIN
         Call programmer

ERROR opening rock unit file

Source: VERIFY.TSK
         (oprock.ftn)
Expl: An attempt to open
         the rock unit file
         failed
Action: Exit spin
         Call programmer

Specimen 999X not on database

Source: VERIFY.TSK
Expl: The specimen entered
         by user is not on
         the database
Action: Reprompt user

3.10 ARCHIVE DATA

Summary:

When the archive or backup option is chosen the collection currently
being studied is copied from disk onto magnetic tape. The archive
process tells the user the label of the tape to mount. When the
collection has been successfully backed up it is deleted from the
disk.

3.10 Archive Data

```
);
)* Enter option (X for EXIT) ) [S]: A
Label and mount a new tape
The label for this new tape is :  AL832
)*          Enter "new" or "old" [S]: NEW
)* Enter the label of the NEW tape [S]: AL833
);
);
)* Do you need help to mount tape? [Y/N]: Y
);
```

Series of prompts are responses for archiving a rock collection.
User responses are underlined.

Screen 1/4

```
);
);
); To mount tape,proceed as follows:
); -- ----- ---- ------- -- -------
);
);      A. Apply power to unit and verify that unload indicator is
);         illuminated. (allow for normal delay of 2 sec.)
);
);      B. Insure that tape is wound completely  onto reel.
);
);      C. Open tape access door by pressing gently down on top
);         center of door.
);
);      D. Insert tape into front of unit with file-protect ring
);         side down and close door.
);
);      E. Actuate load switch. Access doors are now locked.
);
);      F. When load sequence is complete,load indicator will
);         remain illuminated.
);
);      G. Actuate on-line switch (tape is ready now).
);
);
);
); DON'T FORGET - Put write ring on your tape
);
)* Hit C when tape loaded [S]: C
\.
```

Help for mounting a tape.

Screen 2/4

3.10   Archive Data

```
( )
);
Label and mount a new tape
The label for this new tape is :  AL832
)*          Enter "new" or "old" [S]: NEW
)* Enter the label of the NEW tape [S]: AL832
);
);
)* Do you need help to mount tape? [Y/N]: N
);
);
);
);
); DON'T FORGET - Put write ring on your tape
);
)* Hit C when tape loaded [S]: C
);
);
);
);          Backup in progress
);
);
);
);
);          Backup completed
);
);
);
);
)* Do you need help to unload tape? [Y/N]: Y
);
);
( )
```

Series of prompts and responses for archiving a rock collection
on tape. No help requested.

Screen 3/4

3.10 Archive Data

```
>;
>;
>; To unload tape,proceed as follows:
>; -- ------ ---- ------- -- -------
>;
>;
>;    A. Actuate on-line switch.
>;
>;
>;    B. Actuate unload switch.
>;
>;
>;    C. During the unload sequence, the unload indicator will
>;       pulse and access doors will remain locked.
>;
>;
>;    D. When the unload sequence is complete,the unload indic-
>;       cator will remain illuminated and access doors will unlock.
>;
>;
>;    E. Open tape access door and carefully remove tape reel.
>;
>;
>;
>;
>*  Hit C when tape is unloaded [S]: C
>;
>;
DMO -- TT0:   dismounted from MT0:   *** Final dismount initiated ***
MTAACP --  MT0: ** DISMOUNT COMPLETE **
>;
>;
>; DON'T FORGET - Remove write ring from tape
>;
>;
>/
>@ <EOF>
>
```

Help to Unload Tape

Screen 4/4

3.10 ARCHIVE DATA

Error Messages:

ERROR opening intertask file	Source:	BACKUP.TSK or UPDATE2.TSK(get.ftn)
	Expl:	An attempt to open the file INFO.DAT failed
	Action:	Exit SPIN
		Call programmer
ERROR reading intertask file	Source:	BACKUP.TSK or UPDATE2.TSK
	Expl:	An attempt to read the collection name from the file INFO.DAT failed
	Action:	Exit SPIN
		Call programmer
ERROR opening directory file	Source:	BACKUP.TSK or UPDATE2.TSK
	Expl:	An attempt to open the file ROCDIR.DAT failed
	Action:	Exit SPIN
		Call programmer
ERROR reading directory file	Source:	BACKUP.TSK or UPDATE2.TSK
	Expl:	An attempt to read the file ROCDIR.DAT failed
	Action:	Exit SPIN
		Call programmer
ERROR rewriting directory file	Source:	UPDATE2.TSK
	Expl:	An attempt to update an existing record on the file ROCDIR.DAT failed
	Action:	Exit SPIN
		Call programmer
ERROR during processing Exit Status = (BACKUP.TSK)	Source:	ARCHIVE.CMD
	Expl:	An error occurred in the BACKUP task
	Action:	Exit SPIN
		Call programmer

3.10 ARCHIVE DATA

Error Messages:

WRONG tape mounted - check the label of the tape Unload the tape and try again with another	Source: Expl: Action:	ARCHIVE.CMD The tape put on the tape drive does not have the same label that was just previously displayed on the screen by SPIN If it is the wrong tape put the correct tape on the tape drive. If it is the correct tape but you entered the wrong label try reloading the tape and reentering the correct tape label.
ERROR updating directory file after restore. Status = (UPDATE2.TSK)	Source: Expl: Action:	ARCHIVE.CMD An attempt to write to directory file failed Exit spin Call programmer

3.11 HELP

Summary:

The help option provides some online detailed explanations of how
to use the SPIN system. The help option is invoked by entering
H or HELP when the MAIN MENU is displayed.
The information available through help is shown on the following
screens.

3.11 Help - Options

```
>;                              Help Option
>;                              ==== ======
>;
>;          Help is available for the following topics:
>;
>;          Topics                      Description
>;
>;          E      (or enter)           Enter data
>;
>;          EDI    (or edit)            Edit data
>;
>;          P      (or plot)            Plot data
>;
>;          V      (or vector)          Vector analysis
>;
>;          F      (or fisher)          Fisher statistics
>;
>;          VE     (or verify)          Verify data
>;
>;          A      (or archive)         Archive data
>;
>;    Enter the topic you would like help with or 'X' for the Main Menu
>*   [S]: A
```

Screen display of options available within HELP.

3.11 Help - Enter

```
>;
>;
>;
>;
>;
>;
>;
>;
>;
>;              This module allows data entry to the SPIN database
>;         in 2 ways:
>;
>;
>;         1) by cassette
>;         2) by hand
>;
>;
>;
>;
>;
>;
>;
>;
>* Hit C to continue [S]: C
>:
```

Screen display of help for data entry (option E).

Screen 1/4

3.11 Help - Enter

```
{   >;           CASSETTE:
    >;
    >;       The cassette reader must be setup at follows:
    >;
    >;           1)   Place your cassette in CASSETTE 1 drive.
    >;
    >;           2)   Press cassette REWIND switch
    >;
    >;           3)   Press cassette LOAD switch (READY light should illuminate)
    >;
    >;           4)   Ensure the cassette is in PLAYBACK mode for CASSETTE 1.
    >;
    >;           5)   Ensure the cassette reader is on-line (i.e.  the bottom
    >;                4 switches on the control panel must all be selected to
    >;                LINE and the switch to the right of the power switch
    >;                must be in the "on-line" position.)
    >;
    >;
    >;       The data is read into a working file from the cassette
    >;        and then printed on the line-printer.
    >;       This working file can be edited before the data is written
    >;       to the rock unit data file.
    >;
    >* Hit C to continue [S]: C
    \.
```

Screen display of help for data entry (option E) by cassette.

Screen 2/4

3.11 Help - Enter

```
/;
>;
>;                              Edit help
>;                              ---- ----
>;
>;            To enter or modify data on the current work file
>;        we use DATATRIEVE.
>;
>;        These options available in the FDIT mode are:
>;
>;                      IW     :    Insert a result
>;                      MW     :    Modify data
>;                      DW     :    Delete a result
>;                      LW     :    List working file on screen
>;                      PW     :    Print working file on lineprinter
>;                      KW     :    Delete a range of results
>;                      HW     :    Help menu display
>;                      EXIT   :    Exit - Database will be updated with
>;                                  data in working file
>;
>;
>;              Enter ":" + mnemonic to invoke option (except EXIT)
>;                      (e.g. :IW - invokes INSERT option)
>;
>;
>* Hit C to continue [S]: C
>;
```

Screen display of help for the work file editor when data enterred
by cassette.

Screen 3/4

3.11 Help - Enter

```
>;
>;
>;
>;
>;
>;
>;          BY HAND
>;
>;          If data is enterred by hand you will be prompted to
>;          enter each field of data. Each entry for a specimen will
>;          be written to the rock unit data file as it is enterred
>;          on the keyboard.
>;
>;
>;
>;
>;
>;
>;
>;
>;
>* Hit C to continue [S]: C
>:
```

Screen display of help for data entry by hand.

Screen 4/4

3.11 Help - Edit

```
>;
>;                              Edit help
>;                              ---- ----
>;
>;          To enter or modify data on the current Rockunit collection,
>;       we use DATATRIEVE.
>;
>;      The options available are:
>;
>;                      I    :    Insert a result
>;                      M    :    Modify data
>;                      D    :    Delete a result
>;                      LN   :    List site NRM's on terminal
>;                      LS   :    List specimen results on terminal
>;                      PN   :    Print site NRM's on lineprinter
>;                      PS   :    Print specimen results on lineprinter
>;                      K    :    Delete a range of results
>;                      H    :    Help menu display
>;                      EXIT :    Exit to main SPIN menu
>;
>;
>;              Enter ":" + mnemonic to invoke option (except EXIT)
>;                      (e.g. :I - invokes INSERT option)
>;
>* Hit C to continue [S]: C
>;
```

Screen Display of Help for Editor (option EDI)

Screen 1/1

3.11 Help - Plot

```
);                              Plot Options
);
);         Plot type        Help Mnemonic        Description
);         ---------        -------------        -----------
);
);         Site             SI                   stereonet using NRM measurement
);                                               for a range of specimens
);
);         Specimen         ST                   stereonet using data for a
);                                               range of treatments for a specimen
);
);         Specimen         MT                   intensity decay curve for a
);                                               range of treatments
);
);         Specimen         XY                   Zijderveld plot in the XY plane
);
);         Specimen         ZX                   Zijderveld plot in the ZX plane
);
);         Specimen         ZY                   Zijderveld plot in the ZY plane
);
);         Specimen         ZH                   Zijderveld plot in the ZH plane
);
);
)* Enter help mnemonic for information on a specified plot (X to exit)) [S]:
);
```

Screen display of menu of plot options in help (option P)

Screen 1/6

3.11 Help - Plot

```
· /
>;
>;                              SITE STEREONET
>;                              ---------------
>;
>;          When a site number is enterred in the plot option
>;          a stereonet of the NRM results for a range of
>;          specimens in the site is plotted.  To plot all
>;          specimens within a site hit the space bar when
>;          prompted for the low specimen number.
>;
>;          The stereonet can be plotted with or without the
>;          specimen # labelled.  Horizontal or bedding
>;          correction can be selected.
>;
>;          Each plotted point is indicated either by a cross
>;          or a square.  If the inclination is positive a cross
>;          is plotted, if the inclination is negative a square
>;          is plotted.
>;
>;
>;
>;
>* Hit C to continue [S]: C
\.
```

Help on Site Stereonet.

Screen 2/6

3.11 Help - Plot

```
>;
>;
>;                      SPECIMEN STEREONET
>;                      ------------------
>;
>;       A stereonet can be plotted for a range of
>;       treatments for a given specimen.  To plot all
>;       treatments hit the space bar when prompted
>;       for the low treatment value.
>;
>;       The stereonet can be plotted with or without the
>;       treatment value label.  Horizontal or bedding
>;       correction can be selected.
>;
>;       If the first point plotted on the stereonet is an
>;       NRM result the point is labelled with an 'N', otherwise
>;       the first point is labelled with an 'S'.
>;
>;       Each plotted point is indicated either by a cross
>;       or a square.  If the inclination is positive a cross
>;       is plotted, if the inclination is negative a square
>;       is plotted.
>;
>* Hit C to continue [S]: C
```

Help for Specimen stereonet.

Screen 3/6

3.11 Help - Plot

```
>;
>;
>;                      INTENSITY DECAY CURVE
>;                      ----------------------
>;
>;       The intensity decay curve is a graph of intensity vs
>;       treatment value.  The intensity value plotted on the
>;       vertical axis is the actual moment x 10**6.  The number
>;       at the top left of the plot is the maximum intensity
>;       value labelled on the vertical axis.
>;
>;       A range of treatment values can be selected.  The first
>;       treatment value for each treatment type in the range is
>;       zero unless the lower treatment value of the range is
>;       specified as greater than zero.
>;
>;       If more than one treatmet type is displayed a dashed line
>;       indicates the change of scale.
>;
>;
>;
>;
>;
>* Hit C to continue [S]: C
>;
```

Help for intensity decay curve.

Screen 4/6

3.11 Help - Plot

```
>;
>;
>;                          ZIJDERVELD GRAPHS
>;                          ----------------
>;
>;      Zijderveld graphs can be plotted to show data in the
>;      XY,ZX,ZY or ZH planes.  The graphs can be plotted:
>;
>;      1) with/without NRM
>;      2) with horizontal or bedding correction
>;      3) for selected quadrants only
>;          i.e. A,B,C or D for the XY,ZX,ZY plots
>;               or HIGH or LOW for the ZH plot.
>;
>;
>;
>;
>;
>;
>;
>;
>;
>;
>* Hit C to continue [S]: C
>;
```

Help for zijderveld graphs

Screen 5/6

3.11 Help - Plot

```
);
); The plot for the XY,ZX,ZY planes          The plot for ZH  is displayed
); are displayed as follows:                 follows:
);
);                      +x(-z)C                               -z
);                         !                                   !
);                         !                                   !   HIGH
);               A     !   B                                   !
);      (-x)-y --------!-------- +y(+x)                        !------- h
);               C     !   D                                   !   LOW
);                         !                                   !
);                         !                                   !
);                      -x(+z)                                +z
);
);
);        The first point is always plotted using a
);        square, the remainder are plotted using
);        a cross.  If the first point is an NRM value
);        an N is placed beside the square, if it not
);        on NRM an S is placed beside the square.
);
);
)* Hit C to continue [S]: C
\.
```

Help for zijderveld graphs.

Screen 6/6

3.11 Help - Vector

```
);                                   VECTOR ANALYSIS
);                                   ---------------
);
);
);      The options available are:
);                                      vector addition
);                                      vector subtraction.
);
);      The specimen and type of correction (horizontal or bedding)
);      to be used in the calculations are selected.
);      The input vectors are specified by treatment value and type.
);      The resultant vector is calculated and displayed on the terminal.
);
);      A maximum of 50 resultant vectors can be calculated in one run.
);      All input vectors must be for the same specimen.
);      At the end of the run a table of the resultant vectors is printed
);      on the screen and hardcopy printer.  A plotting option can be invoked
);      which plots the resultant vectors on a stereonet,intensity decay curve
);      or zijderveld graphs.
);
);
);
);
)* Hit C to continue [S]: C
```

Help for Vector analysis (help option V)

Screen 1/1

3.11 Help - Stats

```
>;
>;
>;
>;                             FISHER STATISTICS
>;
>;   Fisher Statistics can be calculated          using data selected
>;   by any of the following 5 methods:
>;
>;   a)  average of a range of treatment results for a specimen
>;
>;   b)  average of results for a range of specimens at a
>;       specified treatment step.
>;
>;   c)  average of results for selected specimens
>;       at specified treatment steps.
>;
>;   d)  average of results for selected specimens within a site (all data
>;       for a specimen is averaged, up to 50 specimens can be included)
>;
>;   e)  average of all NRM measurements for a site or range of sites.
>;
>;       Total or partial Fisher Statistics can be produced.
>;       Partial Statistics can be saved and used to calculate total Fisher
>;       Statistics.  A maximum of 20 sets of partial statistics can be saved
>;       All output if displayed on the screen.  A hardcopy is produced.
>;
>* Hit C to continue [S]: C
>:
```

 Help for Fisher Statistics (help option F)

 Screen 1/1

3.11 Help - Archive

```
);
);          The archive option copies the current collection onto
);      magtape,sets the archive flag in the directory file and
);      deletes the current collection from disk.
);
);          Each collection will be stored on its own tape identified
);      by the collection id (3 chars),the year the collection was first
);      studied,plus a sequence number between 1 and 3. This sequence
);      number is used for the rotation of tapes.  There will be
);      3 copies of each collection (for security) : the scientist
);      must mount one tape before processing and the next one after
);      processing (eg.: tape 1 is mounted before and tape 2 after).
);
);
);
);
);
);
);
);
);
);
);
>* Hit C to return to Main Menu [S]: C
);
```

Help for Archive Data   (help option A)

Screen 1/1

For each measurement taken of a rock specimen the following
data will be entered and stored on the spin database:

DATA ELEMENT	DESCRIPTION	VALUES
ROCK UNIT	COLLECTION IDENTIFIER	3 CHARACTERS XXX
SITE	SITE NUMBER WITHIN A ROCK UNIT	01-99)
		)
		) = SPECIMEN
		) ID
CORE	CORE NUMBER WITHIN A SITE	0-9)
		)
SAMPLE	IDENTIFIES SPECIMEN WITHIN CORE	A-E)
		)
TREATMENT TYPE	TYPE OF TREATMENT SPECIMEN EXPOSED TO	N = NRM C= ALTERNATING FIELDS H = CHEMICAL
TREATMENT VALUE	TREATMENT SPECIMEN EXPOSED TO	0-9999 (SET = 0 IF TREATMENT TYPE = N)
# POSITION IN TREATMENT SEQUENCE	INDICATES WHEN SPECIMEN EXPOSED TO A TREATMENT IN TREATMENT SEQUENCE	1 - 3 0 = NRM
SUSCEPTIBILITY	SUSCEPTIBILITY (optional - hand enterred)	99999 E-6
N	INTENSITY OF MAGNETIZATION	0.999E-99
DH	DECLINATION TO HORIZONTAL	0 - 360
IH	INCLINATION TO HORIZONTAL	-90 - +90

DATA ELEMENT	DESCRIPTION	VALUES
DB	DECLINATION IN BEDDED ROCK (optional)	0 - 360
IB	INCLINATION IN BEDDED ROCK (optional)	-90 - +90
K	ERROR STATISTIC (enterred by hand)	0 - 9999
RUN	RUN NUMBER	0 - 999

* A rock specimen may be treated using more than one type of treatment. In this case it is important to know in which order the specimen was treated with the different treatment types. This data element will indicate that order.

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For each collection data file that exists a record will be
stored on the directory file.

DATA ELEMENT	DESCRIPTION	VALUES
ROCK UNIT	COLLECTION IDENTIFIER	3 CHARACTERS XXX
DESCRIPTION	DESCRIPTION OF THE ROCK UNIT	15 CHARACTERS
LABEL OF TAPE LAST USED	LABEL OF THE TAPE THAT WAS LAST USED TO BACKUP THE COLLECTION	6 CHARACTERS
TAPE TYPE	TYPE OF TAPE THAT WAS LAST USED (OLD OR NEW)	1 CHARACTER
LOCATION OF COLLECTION	LOCATION OF MOST RECENT VERSION OF COLLECTION ON TAPE, OR ON DISK	1 CHARACTER
DATE LAST USED	DATE THE COLLECTION WAS LAST ACCESSED BY SPIN	9 CHARACTERS

TI Cassette Format

The cassette format is as follows:

```
─────────────────────

    Session Leader

─────────────────────

    Sample Entry

─────────────────────

    more entries

─────────────────────

    Session Trailer

─────────────────────

    Session Leader

─────────────────────

    Sample Entry

─────────────────────

         :
         :

─────────────────────

    Session Trailer

─────────────────────

         :
         :

─────────────────────

    Tape Trailer

─────────────────────
```

Appendix C

TI Cassette Format

The TI cassette reader reads and writes ascii characters

Each session header is as follows:

34 nulls	(leader)
1 octal	(start of header)
72 characters	(header)
DEL	(octal 177 or 377 - delimiter)

Each session trailer is as follows:

2 nulls	
3 octal	(end of session character)
nulls	

Each tape trailer is as follows:

nulls	
23 octal	(end of tape character (cntrl s))
nulls	
DEL	(octal 177 or 377 - delimiter)

TI Cassette Format

Each sample entry is as follows:

```
nulls
 4 octal              (start of sample marker)
12 characters         (sample number SN
                       - rock unit id (up to 3 chars)
                       - site (2 characters)
                       - core (1 character)
                       - sample ( 1 character)
                       - blank)

DEL                   (delimiter)
6 characters          (demagnetization number DN(treatment value))
DEL
9 characters          (intensity of magnetization M
                       - first character must be blank or 0
                       - second character must be a decimal point (.)
                       - 3 digits
                       - E
                       - blank or minus sign
                       - minus sign or number (exponent)
                       - number (exponent)

                         eg.   .123E -3
                             0.123E-03)

DEL                   (delimiter)
up to 3 characters    (declination DH (0-360))
DEL                   (delimiter)
up to 3 characters    (inclination IH (-90-+90))
DEL                   (delimiter)
up to 3 characters *  (declination DB (0-360))
DEL                   (delimiter)
up to 3 characters *  (inclination IB (-90 - +90))
DEL                   (delimiter)
```

| ** up to 4 characters (error statistic K (0-9999))   not implemented yet|
| DEL |

```
15 octal )
12 octal )
  or     )            (end of sample marker)
215 octal)
nulls
```

* DB and IB are optional and are not output unless the
  operator selects them.

** An additional field of data will be added to the TI cassette. It
   will be the Error statistic (K)

APPENDIX D

Calculations Used in Vector Analysis

For the vector analysis, these mathematical expressions are used:

$X = M*COS (D)*COS (I)$

$Y = M*SIN (D)*COS (I)$

$Z = M*SIN (I)$

> where M is the moment
>
> > D is either DH or DB
> >
> > I is either IH or IB

For the addition of vectors we will know $M_1 D_1 I_1$ and $M_2 D_2 I_2$

to give $M_3 D_3 I_3$

$$M_1 D_1 I_1 + M_2 D_2 I_2 = M_3 D_3 I_3$$

$$M_3 = \sqrt{(X1 + X2)^2 + (Y_1 + Y_2)^2 + (Z_1 + Z_2)^2}$$

$$D_3 = \arctan\left(\frac{Y_1 + Y_2}{X_1 + X_2}\right)$$

$$I_3 = \arctan\left[\frac{Z_1 + Z_2}{\sqrt{(X_1 + X_2)^2 + (Y_1 + Y_2)^2}}\right]$$

For the subtraction of vectors we will know $M_1 D_1 I_1$, $M_x D_x I_x$, $M_y D_y I_y$ to get $M_3 D_3 I_3$

$$M_x D_x I_x - M_1 D_1 I_1 = M_3 D_3 I_3$$

$$M_y D_y I_y - M_1 D_1 I_1 = M_3 D_3 I_3$$

The subtraction of vectors is subtracting one vector from a range of vectors.

$$M_3 = \sqrt{(x_x - x_1)^2 + (y_x - y_1)^2 + (z_x - z_1)^2}$$

$$D_3 = \arctan\left(\frac{Y_x - Y_1}{X_x - X_1}\right)$$

$$I_3 = \arctan\frac{Z_x - Z_1}{\sqrt{(X_x - X_1)^2 + (Y_x - Y_1)^2}}$$

etc. until all the subtractions are done.

Calculations Used in Statistical Analysis

The output of partial statistics is: D, I, N, R, K, A95

The output of total statistics is: D, I, N, R, K, A95, A63, PLAT, PLONG, SLAT, SLONG, DM95, DP95, DM63, DP63, TH63, and DELTA.

1) Means of all declinations

$$Dm = \arctan\left(\frac{\Sigma A}{\Sigma B}\right) \qquad \text{Where } A = COS(I)*SIN(D)$$
$$B = COS(I)*COS(D)$$

2) Means of all inclinations

$$Im = \arcsin\left(\frac{\Sigma C}{\sqrt{(\Sigma A)^2 + (\Sigma B)^2 + (\Sigma C)^2}}\right)$$

Where C = SIN(I)

3) N is the number of D and I selected

4) $$R = \sqrt{(\Sigma A)^2 + (\Sigma B)^2 + (\Sigma C)^2}$$

5) $$K = \frac{N}{N-R}$$

6) $$TH63 = \frac{81}{\sqrt{K}}$$

7) $$DELTA = \arccos\left(\frac{R}{N-1}\right)$$

8) $$A95 = \arccos\left(1 - \left(\left(\frac{N-R}{R}\right) * \left(20^{\frac{1}{N-1}} - 1\right)\right)\right)$$

9) $$A63 = \arccos\left(1 - \left(\left(\frac{N-R}{R}\right) * \left(2.7027^{\frac{1}{N-1}} - 1\right)\right)\right)$$

10) $$PLAT = \arcsin\ (SIN(SLAT)*COS(p) + (COS(SLAT)*SIN(p)COS(Dm))$$

where $p = \arctan\left(\dfrac{2}{\tan Im}\right)$

$0 \leq p \leq 180°$

11) $$PLONG = SLONG + B \quad \text{WHERE } B = \arcsin\left(\frac{\sin p*\sin Dm}{\cos (PLAT)}\right)$$

12) $DM95 = A95 * \left(\dfrac{\sin(p)}{\cos(Im)} \right)$

13) $DP95 = \dfrac{A95}{2} * (1 + 3 \cos^2(p))$

14) $DM63 = A63 * \left(\dfrac{\sin(p)}{\cos(Im)} \right)$

15) $DP63 = A63 * (1 + 3 \cos^2(p))$