UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

Geologic Application of the Interactive Surface Modeling Program (ISM)

by

Nancy K. Gardner and M. Devereux Carter

Open-File Report 86-87

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature.

USGS, Reston, Va.

ACKNOWLEDGMENTS

The authors of this report wish to acknowledge the valuable technical advise of Margaret F. Johnson, Branch of Applied Technology, Information Systems Division.

CONTENTS

ILLUSTRATIONS

In June 1985, the National Coal Resources Data System (NCRDS) of the Branch of Coal Resources of the U.S. Geological Survey purchased computer software titled, "Interactive Surface Modeling Program (ISM)." This program was designed by Dynamic Graphics, Inc. of Berkely, California and is currently being updated.

The purpose of this paper is to guide geologic users of NCRDS in the use of a valuable tool to create computer drawn 2 and 3 dimensional plots of stratigraphic data. Knowledge of geologic influencing factors, Primos operating commands and use of the Pacer data base storage and retrieval system for NCRDS are assumed. A short description is included which shows how to use Pacer data within ISM. The full capabilities of ISM are not demonstrated in this report. To purchase operations manuals, write to:

Dynamic Graphics, Inc.
2855 Telegraph Avenue
Berkely, California 94705
or call: (415) 845-8180.

The ISM Program is a user-friendly computer program that allows technical and non-technical personnel to create surface and subsurface maps and store them in a self-contained ISM directory. These maps are two- and three-dimensional, and volumes may be calculated from polygonal areas, defined by the user. Graphic editing and correction gridding are also options within ISM. Examples of ISM products are:

1) Base Maps
2) Contour and Isopach Maps
3) Cross Sections
4) Fence Diagrams
5) Mesh Perspectives
6) Contour Perspectives
7) Mesh and Contour Perspectives
8) Contour Keys (flat contours in perspective views)

Maps can show such features as normal faults, outcrop lines, polygonal areas, drill hole information, legends or explanations that are patterned and have text, township lines, county and state boundaries, location and names of cities, company names, dates, authorship and much more. Character size can be assigned as well as symbol type and pattern type . See appendix I for examples of character size, symbol types, and pattern types and sizes.

In order to gain access to ISM on the Branch of Coal Resources, National Coal Resources Data System (NCRDS) Prime computers, a potential user should call or write

U.S. Geological Survey
956 National Center
Reston, Va. 22092
Attn: Toni Medlin or Kathy Krohn

or

U.S. Geological Survey
Box 25046, MS 972
Denver Federal Center
Denver, Colorado 80225
Attn: Carol Molnia or Vicki Clark

A graphics terminal, with communications to NCRDS, and a hard copy unit are the only equipment required to utilize the ISM programs. After gaining access to NCRDS and logging onto the system, the NCRDS prompt, "OK", will appear on the screen. The user should type ISM and press carriage return. At this point the ISM program will be loaded into main memory. ISM will then prompt the user for his name and create a question and answer file for the name given in the user's main directory outside ISM. The file is called username.Rep, and it is overwritten each time the user gives ISM the same user name. To keep this file the user can change its name after exiting ISM.
Example: OK, CN Δusername.RepΔ newfilename (CR). (CR) is an abbreviation for the user and it means to press the carriage return. The triangle is also an abbreviation; it means for the user to press the space bar once.

The following is an example of the expanded (non-brief) mode of the ISM program up to the main menu. To answer a question in ISM that has a default answer in brackets, either press carriage return (CR) or the number of the question and then the (CR). Defaults are usually the most common answer. User responses are underlined (___) in this text for clarity, but should not be underlined in a real session of ISM.

Example of prompts up to the main menu

Type in user's name and password

```
**********************************************************************************
*                                                                                *
*              WELCOME TO THE NATIONAL COAL RESOURCES DATA SYSTEM                 *
*                           NATIONAL NODE (GVARSA)                               *
*                     (703) 860-7734 OR FTS: 928-7734                            *
*                                                                                *
**********************************************************************************
OK, ISM
     ==========================================================
                    DYNAMIC GRAPHICS, INC. PRESENTS

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

          I N T E R A C T I V E   S U R F A C E   M O D E L I N G
        ========== Version 6.91D ==========
          Special interactive dialogue responses:
          H      HELP    print tutorial for current question
          B      BACK UP one question in dialogue
          R      REVIEW  last answer given to current question
          F      Use previous answer & go FORWARD to next question
          L      LIST    pertinent files from ISM directory
          *      Brings up dialogue mode changing menu
          :      AUTOMATIC ANSWER results if answer is preceded by :
        ==========

Loading program....
```

Prompts up to the main menu (Continued)

```
INTERACTIVE SURFACE MODELING 6.91D

DYNAMIC GRAPHICS, INC.
2855 TELEGRAPH AVENUE, SUITE 405
BERKELEY, CA 94705
DATE: 07/08/85

PLEASE ENTER YOUR NAME: NANCY

 DO YOU WANT BRIEF MODE [DEFAULT: YES]? N
 1) TEXT-ONLY TERMINAL
    ISM MUST BE INFORMED WHETHER THE USER'S TERMINAL IS OF THE TEXT-ONLY
    OR GRAPHICS TYPE.  TEXT-ONLY TERMINALS CAN PERFORM THE MAJORITY OF
    ISM OPERATIONS TO INCLUDE:
      FILE OPERATIONS    -FILE CREATION, TEXT EDIT, DIRECTORY OPERATIONS,
                          FIELD OPERATIONS
      GRID CALCULATIONS  -STANDARD, TREND, AND ISOPACH GRIDDING
      GRID OPERATIONS    -GRID-TO-GRID, GRID-CONSTANT, ZONE BLANKING
      PLOTTING           -TO A DISK FILE (ALL VIEWS)
      VOLUMETRICS        -CALCULATIONS AND REPORTS
 2) GRAPHIC TERMINAL
    IN ADDITION TO THE PRIVILEGES ENJOYED BY TEXT-ONLY TERMINALS,
    GRAPHIC TERMINALS MAY ALSO PERFORM:
      PLOTTING           -INTERACTIVE DISPLAY OF PLOTS ON SCREEN
      GRAPHIC EDIT       -USING CRT DISPLAY AND CURSOR FOR COORDINATE INPUT
      GRAPHIC EDIT       -USING DIGITIZER TABLE FOR COORDINATE INPUT AND
                          CRT FOR MENU DISPLAY AND DIALOGUE.  THIS MODE
                          REQUIRES THE ISM DIGITIZING OPTION.
 3) TEXT AND GRAPHIC TERMINALS
    THIS TWO-TERMINAL MODE OFFERS ALL THE PRIVILEGES AVAILABLE TO A
    GRAPHIC TERMINAL.  ISM WILL DISPLAY ALL DIALOGUE ON THE TEXT
    TERMINAL, AND PLOTS ON THE GRAPHIC TERMINAL.

    SELECT TERMINAL CONFIGURATION
 1) TEXT-ONLY TERMINAL
 2) GRAPHIC TERMINAL [DEFAULT]
 3) TEXT/GRAPHICS ON SEPARATE TERMINALS
    WHICH? 2
PLEASE SELECT THE TERMINAL TYPE WHICH MATCHES OR IS CLOSEST TO THE TYPE
YOU ARE USING.  BASED ON YOUR RESPONSE, ISM WILL ADAPT ITSELF TO YOUR
TERMINAL'S COMMUNICATION PROTOCOL AND CHARACTERISTICS.
```

```
    TEXT/GRAPHICS TERMINAL TYPE
 1) TEKTRONIX 40XX SERIES [DEFAULT]
 2) ENVISION 220/230
 3) PRIME PST-100
 4) DIGITAL VT-100 W/GRAPHICS
 5) LEAR SIEGLER ADM W/GRAPHICS
 6) TEKTRONIX 4105
 7) TEKTRONIX 4107
 8) TEKTRONIX 4109
 9) TEKTRONIX 4112
10) TEKTRONIX 4113
11) TEKTRONIX 4115
 0) OTHER
    WHICH? 1

PLEASE WAIT. SCANNING FILE DIRECTORY FOR EXPIRED FILES.
NO FILES HAVE EXPIRED.
------------------ MAIN MENU - CAPABILITY OVERVIEW -----------------
1) OPTION SETTING        - SET, LOAD, SAVE, OR RESET ISM OPTIONS
     CONTOURING OPTIONS  - INTERVALS, AXIS LABELS, SCALES, ETC.
     PERSPECTIVE VIEWS   - AXIS LABELING
     PEN OPTIONS         - LIGHT, BOLD, FAULT, MESH, TEXT PEN NUMBERS
     GENERAL OPTIONS     - EDIT HISTORY, LOG FILE OUTPUT
     MEASUREMENT UNITS   - INCHES, CENTIMETERS
2) FILE OPERATIONS
     LIST FILE DIRECTORY- OVERVIEW FILES IN ISM'S DIRECTORY
     DELETE FILE         - DELETE FILE FROM ISM'S AND USER'S DIRECTORY
     DEACTIVATE FILE     - DELETE FILE ENTRY FROM ISM'S DIRECTORY ONLY
     EDIT/CREATE A FILE  - TEXT, GRAPHIC, OR DIGITIZER MODES
     DISPLAY A FILE      - DATA OR PLOT FILES
     FIELD OPERATIONS    - ON SCATTERED DATA FILES
3) GRID CALCULATIONS
     CALCULATE STD, TREND, CORRECTION, OR ISOPACH GRID, FAULTS OPTIONAL
     GRID OPERATIONS     - GRID/GRID,GRID/CONSTANT, POLY FILL, SMOOTHING
4) PLOT MAP
     SET PLOTTING MODE   - CRT, PLOT FILE, OR BOTH
     BASEMAP             - PLAN VIEW OF DATA FILES
     CONTOUR MAP         - PLAN (2D) VIEW OF SURFACE CONTOURS
     PERSPECTIVE VIEWS   - MESH OR CONTOUR PERSPECTIVE AND BLOCK DIAGRAM
     CROSS SECTION OR FENCE DIAGRAM - SECTIONS THROUGH MULTIPLE LAYERS
     ZOOM/PAN MODE       - ZOOM/PAN ON LAST CRT PLOT DISPLAYED
5) VOLUMETRICS
     CALCULATE VOLUMES   - N POLYGONS CUTTING THROUGH UP TO TEN LAYERS
     VOLUMETRICS REPORT  - CUSTOM REPORT WRITER FOR CALCULATED VOLUMES

    MAIN MENU
 1) Option setting
 2) File operations
 3) Grid calculations
 4) Plot map
 5) Volumetrics
 6) Exit ISM
    Which? 6

EXIT INTERACTIVE SURFACE MODELING
```

ISM requires various types of files to be created before mapping can be started. The first file type that should be made is called a "scattered data set". For this, the user formats and then enters longitude (x), latitude (y), and surface/subsurface elevations (z's). Each data set can contain a maximum of 60,000 x-y coordinates with as many as 8 z values or surfaces each. There is no limit on the number of scattered data sets because each surface or z is treated separately as a gridded unit.

To format a scattered data set, the program asks for the number of fields in the scattered data set. The limit at this time is 3-10 fields. Dynamic Graphics is working on expanding the number of fields to 60 which will be added to the NCRDS ISM program as an update as soon as this feature is available. Examples are as follows:
x = field 1, y = field 2, z1 = field 3, z2 = field 4, z3 = field 5, z4 = field 6, z5 = field 7, z6 = field 8, z7 = field 9 and z8 = field 10. Fields can be numeric or alpha which allows for point identification. All fields must fall in 72-character-wide horizontal rows, with x, y, and z's assigned to particular columns within the rows.

The following example shows how to format a scattered data set from a file that was created in the user's main directory outside ISM. The x and y's are in plot page coordinates instead of latitudes and longitudes. A plot page is the length of the x and y axis in inches. For example: if specified map is 12" X 12", the x and y coordinates for the points on the map will fall within the range of 0 to 12 inches.

The example following that shows how to create a scattered data set within ISM. Note: the ISM program requires a scattered data set to be formatted using the following method. If longitudes and latitudes are used, x-y data should be formatted with a negative sign if the values are to display along the x-y axes anything other than low to high starting at the intersection of the two axes. For instance, longitudes in the United States have a negative sign but the latitudes do not.

A list of available editing commands are shown at the bottom of the second example.

Example of creating a scattered data set from existing data

```
   FILE OPERATIONS
1) LIST FILE DIRECTORY
2) DELETE FILE
3) EDIT/CREATE FILE
4) FIELD OPERATIONS
5) DEACTIVATE FILE
6) DISPLAY FILE
7) RETURN TO MAIN MENU [DEFAULT]
   WHICH? 3

EDIT/CREATE
NAME OF FILE TO BE EDITED OR CREATED (L, LIST FILES): FH
*** THE FILE EXISTS ON DISK, BUT NOT IN THE ISM DIRECTORY ***

   FILE TYPE (FOR EXISTING DISK FILE)
1) SCATTERED DATA
2) FAULT DATA
3) ANNOTATION DATA
4) POLYGON DATA
5) GRIDDED DATA (IN ISM FORM)
   WHICH? 1
ENTER FILE DESCRIPTION: PP676

   PROTECTION TYPE
1) NONE [DEFAULT]
2) NO DELETE
3) NO MODIFY/NO DELETE
   WHICH? 1
YOU MAY SPECIFY A NUMBER OF DAYS THIS FILE IS TO BE KEPT BOTH
IN THE DIRECTORY AND ON DISK. AFTER THIS NUMBER OF DAYS, YOU
WILL BE QUERIED REGARDING WHETHER OR NOT YOU WISH TO DELETE
THE FILE. IF NOT, YOU MAY EXTEND ITS LIFETIME.
IF YOU SIMPLY HIT RETURN, THE FILE WILL BE KEPT INDEFINITELY.
HOW MANY DAYS DO YOU WISH TO KEEP THIS FILE [DEFAULT: FOREVER]? (CR)
FIRST 6 LINES OF FILE...
         1         2         3         4         5         6         7
1234567890123456789012345678901234567890123456789012345678901234567890123456
   1.17462    5.6137         A1          810   560   250   100     0

   1.59333    6.3153         A2    1260  960   790   560   120     0

   2.10308    6.9615         A3    1730  1290  890   550   490     0

         1         2         3         4         5         6         7
1234567890123456789012345678901234567890123456789012345678901234567890123456
WOULD YOU LIKE TO SEE MORE [DEFAULT: NO]? Y
         1         2         3         4         5         6         7
1234567890123456789012345678901234567890123456789012345678901234567890123456
   2.68564   7.44155         A4    2080  1410  940   690   430     0

    3.2318    8.1616         A5    2390  1400  1120  750   550     0

   3.52308   8.64164         A6    2450  1450  1120  750   610     0

         1         2         3         4         5         6         7
1234567890123456789012345678901234567890123456789012345678901234567890123456
WOULD YOU LIKE TO SEE MORE [DEFAULT: NO]? N
```

```
(THERE ARE 154 LINES IN THE FILE)
ENTER NUMBER OF FIELDS IN FILE (3 TO 10) [DEFAULT: 3]: 9
NAME OF FIELD 1 [DEFAULT: X]: X
STARTING, ENDING COLUMN FOR FIELD 1 [DEFAULT: 1,10]: (CR)
NUMERIC FIELD [DEFAULT: YES]?(CR)
NAME OF FIELD 2 [DEFAULT: Y]: Y
STARTING, ENDING COLUMN FOR FIELD 2 [DEFAULT: 11,20]:(CR)
NUMERIC FIELD [DEFAULT: YES]?(CR)
NAME OF FIELD 3 [DEFAULT: Z]: PTID
STARTING, ENDING COLUMN FOR FIELD 3 [DEFAULT: 21,30]: 27,30
NUMERIC FIELD [DEFAULT: YES]? N
NAME OF FIELD 4: TUSH
STARTING, ENDING COLUMN FOR FIELD 4: 34,39
NUMERIC FIELD [DEFAULT: YES]? Y
NAME OF FIELD 5: TLSH3
STARTING, ENDING COLUMN FOR FIELD 5: 40,45
NUMERIC FIELD [DEFAULT: YES]?(CR)
NAME OF FIELD 6: TKF1
STARTING, ENDING COLUMN FOR FIELD 6: 46,50
NUMERIC FIELD [DEFAULT: YES]?(CR)
NAME OF FIELD 7: TKPC1
STARTING, ENDING COLUMN FOR FIELD 7: 52,56
NUMERIC FIELD [DEFAULT: YES]?(CR)
NAME OF FIELD 8: TKL1
STARTING, ENDING COLUMN FOR FIELD 8: 53,63
NUMERIC FIELD [DEFAULT: YES]?(CR)
NAME OF FIELD 9: HB1
STARTING, ENDING COLUMN FOR FIELD 9: 67,70
NUMERIC FIELD [DEFAULT: YES]?(CR)

PLEASE REVIEW THE FILE DEFINITION
FILE NAME:          FH
TYPE:               SCATTERED DATA
DESCRIPTION:        PP676
PROTECTION:         NONE
CREATED/ENTERED:    07/08/85
BY:                 NANCY
EXPIRATION DATE:    NONE
FIELD     STARTING ENDING NUMERIC
NAME      COLUMN   COLUMN FIELD
---------------------------------
X              1       10   YES
Y             11       20   YES
PTID          27       30   NO
TUSH          34       39   YES
TLSH3         40       45   YES
TKF1          46       50   YES
TKPC1         52       56   YES
TKL1          58       63   YES
HB1           67       70   YES
IS THE FILE DEFINITION OK [DEFAULT: YES]? Y
DO YOU WISH TO EDIT THE FILE [DEFAULT: NO]? N
```

Example of creating a scattered data set from new data

```
   MAIN MENU
1) Option setting
2) File operations
3) Grid calculations
4) Plot map
5) Volumetrics
6) Exit ISM
   Which? 2

   FILE OPERATIONS
1) List file directory
2) Delete file
3) Edit/create file
4) Field operations
5) Deactivate file
6) Display file
7) Return to MAIN MENU [default]
   Which? 3

EDIT/CREATE
Name of file to be edited or created (L, list files): EXAMPLE
Creating new file...
*** The file neither exists on disk nor in the ISM directory ***

   FILE TYPE (for new file)
1) Scattered data
2) Fault data
3) Annotation data
4) Polygon data
   Which? 1
Enter file description: FH,676

   PROTECTION TYPE
1) None [default]
2) No delete
3) No modify/no delete
   Which? 1
How many days do you wish to keep this file [default: forever]? (CR)
Enter number of fields in file (3 to 10) [default: 3]: 9
Name of field 1 [default: X]: (CR)
Starting, ending column for field 1 [default: 1,10]: (CR)
Numeric field [default: yes]? (CR)
Name of field 2 [default: Y]: (CR)
Starting, ending column for field 2 [default: 11,20]: (CR)
Numeric field [default: yes]? (CR)
Name of field 3 [default: Z]: PTID
Starting, ending column for field 3 [default: 21,30]: 27,30
Numeric field [default: yes]? NO
Name of field 4: IUSH
Starting, ending column for field 4: 34,39
Numeric field [default: yes]? Y
Name of field 5: TLSH3
Starting, ending column for field 5: 40,45
Numeric field [default: yes]? (CR)
Name of field 6: TKF1
Starting, ending column for field 6: 46,50
Numeric field [default: yes]? (CR)
Name of field 7: TKPC1
Starting, ending column for field 7: 52,56
Numeric field [default: yes]? (CR)
```

Example of creating a scattered data set from new data (Continued)

```
Name of field 8: TKL1
Starting, ending column for field 8: 58,63
Numeric field [default: yes]? (CR)
Name of field 9: HB1
Starting, ending column for field 9: 67,70
Numeric field [default: yes]? (CR)

PLEASE REVIEW THE FILE DEFINITION
File name:          EXAMPLE
Type:               scattered data
Description:        FH,676
Protection:         none
Created/Entered:    11/05/85
By:                 NANCY
Expiration date:    none
Field     Starting Ending Numeric
Name      Column   Column Field
---------------------------------
X              1      10   Yes
Y             11      20   Yes
PTID          27      30   No
TUSH          34      39   Yes
TLSH3         40      45   Yes
TKF1          46      50   Yes
TKPC1         52      56   Yes
TKL1          58      63   Yes
HB1           67      70   Yes
Is the file definition OK [default: yes]? Y
Do you wish graphic editing [default: no]? NO

Reading data file...
INSERT
  X: 1.17462
  Y: 5.6137
  PTID: A1
  TUSH: (CR)
  TLSH3: 810
  TKF1: 560
  TKPC1: 250
  TKL1: 100
  HB1: 0
More [default: yes]? (CR)
  X: 1.59333
  Y: 6.3153
  PTID: A2
  TUSH: 1260
  TLSH3: 960
  TKF1: 790
  TKPC1: 560
  TKL1: 120
  HB1: 0
```

```
More [default: yes]? (CR)
   X: 2.10308
   Y: 6.9615
   PTID: A3
   TUSH: 1750
   TLSH3: 1290
   TKF1: 890
   TKPC1: 550
   TKL1: 490
   HB1: 0
More [default: yes]? (CR)
   X: 2.68564
   Y: 7.44155
   PTID: A4
   TUSH: 2080
   TLSH3: 1410
   TKF1: 940
   TKPC1: 690
   TKL1: 430
   HB1: 0
More [default: yes]? NO
Edit command (P,PO,N,L,C,I,D,E): H

EDIT COMMANDS
   P -- PRINT  n lines from current line
  PO -- POSITION  to new line
   N -- NEXT    move n lines from current line
   L -- LOCATE  character string
   C -- CHANGE  character string in current line
   I -- INSERT  new lines after current line
   D -- DELETE  lines
   E -- EXIT    and optionally store file
Edit command (P,PO,N,L,C,I,D,E): E

    EXIT EDIT
1) File
2) Exit without filing
    Which? 1
Updating history file...

    FILE OPERATIONS
1) List file directory
2) Delete file
3) Edit/create file
4) Field operations
5) Deactivate file
6) Display file
7) Return to MAIN MENU [default]
    Which? 7
```

The second file type is called a "fault data" file . It is used to enter x and y coordinates of fault lines onto the map surface. If the scattered data file is set up to show displacement on the fault, the fault(s) will show up in cross sections, fence diagrams, and mesh and contour perspectives as well.

There are two choices for the layout of a fault file. The first is to have x and y coordinates with an assigned fault number; this is used when there are multiple changes in one or more faults across an area. The second is to have x and y coordinates without a fault number. The last choice is used when there are straight line faults. There is a limit of 2,500 combined fault segments. This can be represented by the following example. If a fault is plotted by 4 points (1, 2, 3, and 4), it is said to contain 3 segments, (1-2), (2-3), and (3-4). Note: CPU time generally doubles when faults are used, and illustration of faulting is optional.

Examples of creating two different sets of fault data from new information

```
   FILE OPERATIONS
1) List file directory
2) Delete file
3) Edit/create file
4) Field operations
5) Deactivate file
6) Display file
7) Return to MAIN MENU [default]
   Which? 3

EDIT/CREATE
Name of file to be edited or created (L, list files): EXAMPLE1
Creating new file...
*** The file neither exists on disk nor in the ISM directory ***

   FILE TYPE (for new file)
1) Scattered data
2) Fault data
3) Annotation data
4) Polygon data
   Which? 2
Enter file description: FLTNM

   PROTECTION TYPE
1) None [default]
2) No delete
3) No modify/no delete
   Which? 1
How many days do you wish to keep this file [default: forever]? (CR)

   FAULT FILE LAYOUT
1) X,Y,FLTNUM
2) X1,Y1,X2,Y2
   Which? 1
Starting, ending column for X [default: 1,10]: (CR)
Starting, ending column for Y [default: 11,20]: (CR)
Starting, ending column for FLTNUM [default: 21,30]: (CR)
```

Examples of creating two different sets of fault data from new information

```
PLEASE REVIEW THE FILE DEFINITION
File name:          EXAMPLE1
Type:               fault data
Description:        FLTNM
Protection:         none
Created/Entered:    11/06/85
By:                 NANCY
Expiration date:    none
Field     Starting  Ending  Numeric
Name      Column    Column  Field
---------------------------------
X              1       10   Yes
Y             11       20   Yes
FLTNUM        21       30   Yes
Is the file definition OK [default: yes]? (CR)
Do you wish graphic editing [default: no]? (CR)

Reading data file...
INSERT
  X: -106.7808
  Y: 36.375
  FLTNUM: 1
More [default: yes]? (CR)
  X: -106.8125
  Y: 36.25
  FLTNUM: 1
More [default: yes]? (CR)
  X: -106.9575
  Y: 36.1875
  FLTNUM: 1
More [default: yes]? (CR)
  X: -106.9575
  Y: 36.125
  FLTNUM: 1
More [default: yes]? (CR)
  X: -106.9475
  Y: 36
  FLTNUM: 1
More [default: yes]? (CR)
  X: -106.9068
  Y: 35.875
  FLTNUM: 1
More [default: yes]? (CR)
  X: -106.875
  Y: 35.3875
  FLTNUM: 2
More [default: yes]? (CR)
  X: -106.9125
  Y: 35.375
  FLTNUM: 2
More [default: yes]? (CR)
```

Examples of creating two different sets of fault data from new information (Continued)

```
   X: -106.9675
   Y: 35.3125
   FLTNUM: 2
More [default: yes]? (CR)
   X: -107.0375
   Y: 35.1125
   FLTNUM: 2
More [default: yes]? NO
Edit command (P,PO,N,L,C,I,D,E): P01
      1: -106.7808     36.375          1
Edit command (P,PO,N,L,C,I,D,E): P10
      1: -106.7808     36.375          1
      2: -106.8125      36.25          1
      3: -106.9575    36.1875          1
      4: -106.9575     36.125          1
      5: -106.9475         36          1
      6: -106.9068     35.875          1
      7:  -106.875    35.3875          2
      8: -106.9125     35.375          2
      9: -106.9675    35.3125          2
     10: -107.0375    35.1125          2
Edit command (P,PO,N,L,C,I,D,E): E

   EXIT EDIT
1) File
2) Exit without filing
   Which? 1
Updating history file...


   FILE OPERATIONS
1) List file directory
2) Delete file
3) Edit/create file
4) Field operations
5) Deactivate file
6) Display file
7) Return to MAIN MENU [default]
   Which? 3

EDIT/CREATE
Name of file to be edited or created (L, list files): EXAMPLE2
Creating new file...
*** The file neither exists on disk nor in the ISM directory ***
```

Examples of creating two different sets of fault data from new information

(Continued)

```
   FILE TYPE (for new file)
1) Scattered data
2) Fault data
3) Annotation data
4) Polygon data
   Which? 2
Enter file description: X1,Y1,X2,Y2

   PROTECTION TYPE
1) None [default]
2) No delete
3) No modify/no delete
   Which? (CR)
How many days do you wish to keep this file [default: forever]? (CR)

   FAULT FILE LAYOUT
1) X,Y,FLTNUM
2) X1,Y1,X2,Y2
   Which? 2
Starting, ending column for X1 [default: 1,10]: (CR)
Starting, ending column for Y1 [default: 11,20]: (CR)
Starting, ending column for X2 [default: 21,30]: (CR)
Starting, ending column for Y2 [default: 31,40]: 31,42

PLEASE REVIEW THE FILE DEFINITION
File name:          EXAMPLE2
Type:               fault data
Description:        X1,Y1,X2,Y2
Protection:         none
Created/Entered:    01/06/86
By:                 NANCY
Expiration date:    none
Field     Starting Ending Numeric
Name      Column   Column Field
--------------------------------
X1             1       10   Yes
Y1            11       20   Yes
X2            21       30   Yes
Y2            31       42   Yes
Is the file definition OK [default: yes]? (CR)
Do you wish graphic editing [default: no]? (CR)

Reading data file...
INSERT
  X1: -106.7808
  Y1: 36.375
  X2: -106.8125
  Y2: 36.25
More [default: yes]? (CR)
  X1: -106.9575
  Y1: 36.1875
  X2: -106.9575
  Y2: 36.125
More [default: yes]? (CR)
```

Examples of creating two different sets of fault data from new information (Continued)

```
   X1: -106.9475
   Y1: 36.0
   X2: -106.9068
   Y2: 35.875
 More [default: yes]? (CR)
   X1: -106.9675
   Y1: 35.3125
   X2: -107.0375
   Y2: 35.1125
 More [default: yes]? NO

Edit command (P,PO,N,L,C,I,D,E): P01
      1: -106.7808    36.375 -106.8125       36.25
Edit command (P,PO,N,L,C,I,D,E): P10
      1: -106.7808    36.375 -106.8125       36.25
      2: -106.9575   36.1875 -106.9575      36.125
      3: -106.9475      36.0 -106.9068      35.875
      4: -106.9675   35.3125 -107.0375     35.1125
.bottom.
Edit command (P,PO,N,L,C,I,D,E): E

   EXIT EDIT
1) File
2) Exit without filing
   Which? 1
Updating history file...

   FILE OPERATIONS
1) List file directory
2) Delete file
3) Edit/create file
4) Field operations
5) Deactivate file
6) Display file
7) Return to MAIN MENU [default]
   Which? 7

   MAIN MENU
1) Option setting
2) File operations
3) Grid calculations
4) Plot map
5) Volumetrics
6) Exit ISM
   Which? 6

EXIT INTERACTIVE SURFACE MODELING
```

The following example shows how to format a fault file that has been created outside ISM and resides in the user's main directory.

```
   MAIN MENU
1) Option setting
2) File operations
3) Grid calculations
4) Plot map
5) Volumetrics
6) Exit ISM
   Which? 2

   FILE OPERATIONS
1) List file directory
2) Delete file
3) Edit/create file
4) Field operations
5) Deactivate file
6) Display file
7) Return to MAIN MENU [default]
   Which? 3

EDIT/CREATE
Name of file to be edited or created (L, list files): SJFAULT1
*** The file exists on disk, but not in the ISM directory ***

   FILE TYPE (for existing disk file)
1) Scattered data
2) Fault data
3) Annotation data
4) Polygon data
5) Gridded data (in ISM form)
   Which? 2
Enter file description: ONEFAULT

   PROTECTION TYPE
1) None [default]
2) No delete
3) No modify/no delete
   Which? (CR)
How many days do you wish to keep this file [default: forever]? H
You may specify a number of days this file is to be kept both
in the directory and on disk. After this number of days, you
will be queried regarding whether or not you wish to delete
the file. If not, you may extend its lifetime.
If you simply hit RETURN, the file will be kept indefinitely.
How many days do you wish to keep this file [default: forever]? (CR)
```

The following example shows how to format a fault file that has been created outside ISM and resides in the user's main directory. (Continued)

```
First 6 lines of fault data file...
         1         2         3         4         5         6         7
1234567890123456789012345678901234567890123456789012345678901234567890123456
 -106.7808    36.375          1
 -106.8125     36.25          1
 -106.9575   36.1875          1
 -106.9575    36.125          1
 -106.9475       36.          1
 -106.9068    35.875          1
         1         2         3         4         5         6         7
1234567890123456789012345678901234567890123456789012345678901234567890123456
Would you like to see more [default: no]? Y
         1         2         3         4         5         6         7
1234567890123456789012345678901234567890123456789012345678901234567890123456
  -106.875     35.75          1
 -106.8155    35.625          1
 -106.8155      35.5          1
(There are 9 lines in the file)

   FAULT FILE LAYOUT
1) X,Y,FLTNUM
2) X1,Y1,X2,Y2
   Which? 1
Starting, ending column for X [default: 1,10]: (CR)
Starting, ending column for Y [default: 11,20]: (CR)
Starting, ending column for FLTNUM [default: 21,30]: (CR)

PLEASE REVIEW THE FILE DEFINITION
File name:          SJFAULT1
Type:               fault data
Description:        ONEFAULT
Protection:         none
Created/Entered:    01/06/86
By:                 NANCY
Expiration date:    none
Field     Starting Ending Numeric
Name      Column   Column Field
---------------------------------
X              1      10   Yes
Y             11      20   Yes
FLTNUM        21      30   Yes
Is the file definition OK [default: yes]? Y
Do you wish to edit the file [default: no]? N

   FILE OPERATIONS
1) List file directory
2) Delete file
3) Edit/create file
4) Field operations
5) Deactivate file
6) Display file
7) Return to MAIN MENU [default]
   Which? 7
```

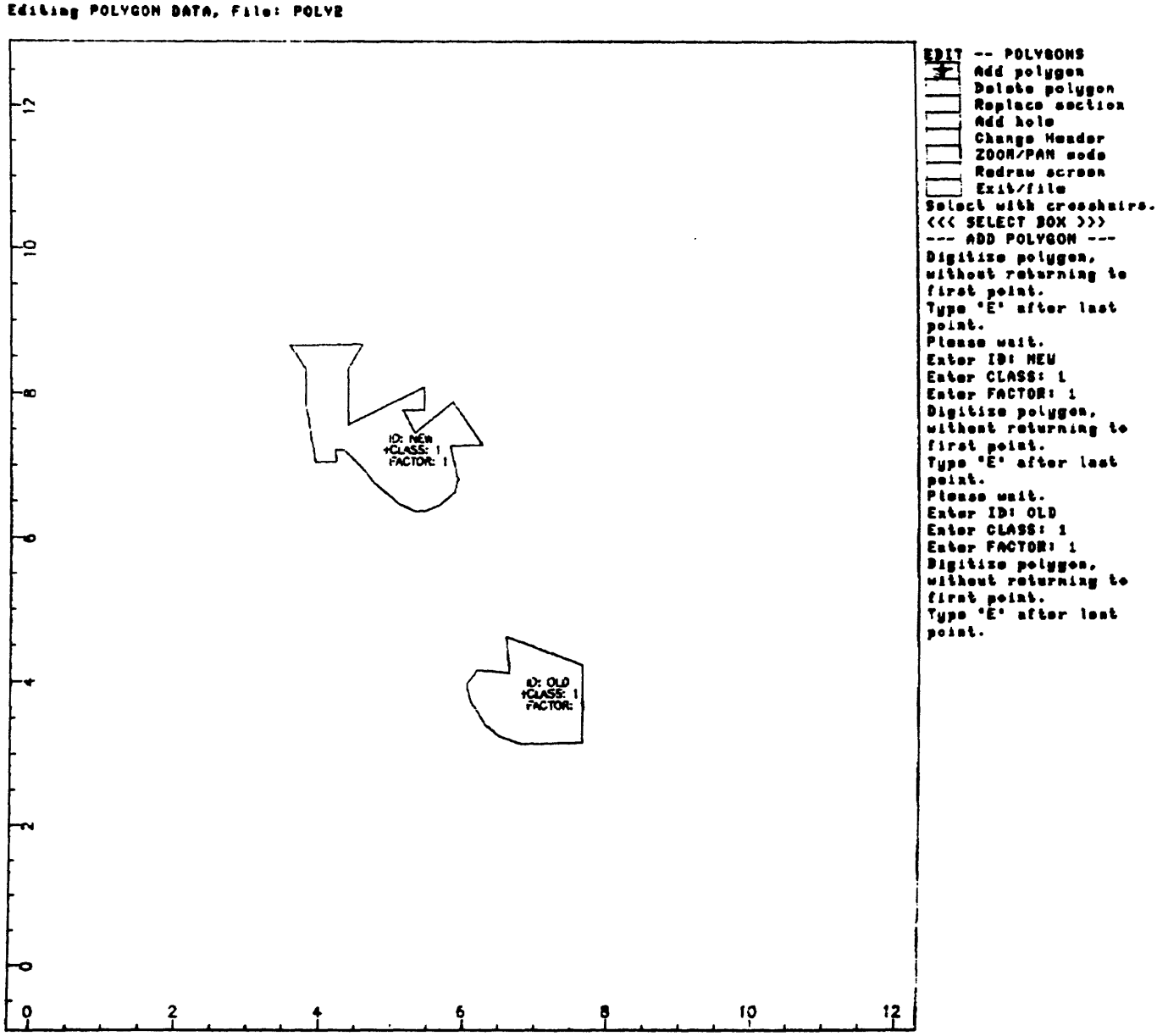
The third file type, which is optional, is called a "breakline polygon" file. Polygon files are also created by the user. They define areas in which volumes are to be calculated and/or areas which are displaced by non-vertical faults only. The limit of polygons per file is 1,000 or 20,000 x-y coordinates. Note: this example shows how to create a polygon file in the graphic editor. It can also be created by not choosing the graphic editor when the dialogue asks, and then inserting x-y values, class numbers, and factor numbers. See the ISM manual for a more detailed explanation of how to work with polygon files.
See below for an example of creating a polygon file.

Example of creating and displaying a polygon file using the Graphic Editor and File Operations

```
   MAIN MENU
1) Option setting
2) File operations
3) Grid calculations
4) Plot map
5) Volumetrics
6) Exit ISM
   Which? 2

   FILE OPERATIONS
1) List file directory
2) Delete file
3) Edit/create file
4) Field operations
5) Deactivate file
6) Display file
7) Return to MAIN MENU [default]
   Which? 3

EDIT/CREATE
Name of file to be edited or created (L, list files): POLY2
Creating new file...
*** The file neither exists on disk nor in the ISM directory ***

   FILE TYPE (for new file)
1) Scattered data
2) Fault data
3) Annotation data
4) Polygon data
   Which? 4
Enter file description: DEMO

   PROTECTION TYPE
1) None [default]
2) No delete
3) No modify/no delete
   Which?(CR)
How many days do you wish to keep this file [default: forever]? (CR)
Starting, ending column for X [default: 1,10]: (CR)
Starting, ending column for Y [default: 11,20]:(CR)
```

Example of creating and displaying a polygon file using the Graphic Editor and File Operations (Continued)

```
PLEASE REVIEW THE FILE DEFINITION
File name:            POLY2
Type:                 polygon data
Description:          DEMO
Protection:           none
Created/Entered:      11/06/85
By:                   NANCY
Expiration date:      none
Field     Starting Ending Numeric
Name      Column   Column Field
---------------------------------
X-              1      10   Yes
Y              11      20   Yes
Is the file definition OK [default: yes]? (CR)
Do you wish graphic editing [default: no]? YES
Reading data file...
Reference file #1 (L, list files) [default: no more files]: (CR)
Please enter window bounds (XMIN,XMAX,YMIN,YMAX): 0,12,0,12
Editing POLYGON DATA, File: POLY2
```



```
   EXIT EDIT
1) File
2) Exit without filing
   Which? 1
Writing data file...
Updating history file...

   FILE OPERATIONS
1) List file directory
2) Delete file
3) Edit/create file
4) Field operations
5) Deactivate file
6) Display file
7) Return to MAIN MENU [default]
   Which? 6

DISPLAY FILE
Enter filename to display (L, list files): POLY2
File name:          POLY2
Type:               polygon data
Description:        DEMO
Protection:         none
Created/Entered:    11/06/85
By:                 NANCY
Last modified:      11/06/85
By:                 NANCY
Expiration date:    none
Field     Starting Ending Numeric
Name      Column   Column Field
---------------------------------
X              1       10   Yes
Y             11       20   Yes
Enter starting column for list [default: 1]: (CR)
    1:POLYGON "NEW" "1" 1
    2:  3.559487    8.6601
    3:  3.777948  8.327766
    4:  3.777948  7.829265
    5:  3.905384  7.053817
    6:  4.196666  7.053817
    7:   4.17846  7.219986
    8:  4.305897  7.219986
    9:  4.615383  6.906114
   10:  4.706408  6.776873
   11:  5.052306  6.481464
   12:  5.288973  6.370686
   13:  5.434614  6.370686
   14:  5.616665  6.444538
   15:  5.835126  6.629168
   16:  5.889742  6.813799
   17:   5.78051  7.275374
   18:  6.235640  7.293838
   19:   5.81692  7.884654
   20:  5.288973  7.460005
   21:  5.125127  7.773877
   22:  5.434614  7.773877
Would you like to see more [default: yes]? (CR)
```

Example of creating and displaying a polygon file using the Graphic Editor and File Operations (Continued)

```
   23:   5.416409   8.087747
   24:   4.360512   7.570783
   25:   4.360512   8.346230
   26:   4.560768   8.678564
   27:   3.559487     8.6601
   28:POLYGON "OLD" "1" 1
   29:   6.563332   4.616697
   30:   7.619229   4.228973
   31:   7.619229   3.158118
   32:   6.781794   3.139655
   33:   6.472306   3.250433
   34:   6.272050     3.4166
   35:   6.071793   3.730473
   36:   6.017178   3.915103
   37:   6.017178   3.970492
   38:   6.162820   4.155122
   39:   6.617947   4.118196
   40:   6.563332   4.616697
Type "Q" to quit [default: continue]: (CR)
(There are 40 lines in the file)

    FILE OPERATIONS
1) List file directory
2) Delete file
3) Edit/create file
4) Field operations
5) Deactivate file
6) Display file
7) Return to MAIN MENU [default]
    Which? 7

    MAIN MENU

1) Option setting
2) File operations
3) Grid calculations
4) Plot map
5) Volumetrics
6) Exit ISM
    Which? 6

EXIT INTERACTIVE SURFACE MODELING
```

The fourth type of file is called a "grid file". Grid files are calculated by ISM using the z values from the created scattered data sets, fault files, and polygon files (the last two file types are optional). These grid files are then used to produce fence diagrams, cross sections, contour maps, and similar products. Each z value is gridded separately. The following example shows how to calculate a normal grid.
Grid types are as follows:

Normal or Standard Grid - closely honors the original scattered data points and is smooth between data points.
Trend Grid - models the gross features of the surface via an Nth-order polynomial equation where N is supplied by the user.
Correction Surface Grid - allows correction data to alter original grid.
Isopach Grid - allows one grid to be added or subtracted from another grid creating a grid that is used to make thickness maps.

Example of calculating a normal grid

```
   MAIN MENU
1) OPTION SETTING
2) FILE OPERATIONS
3) GRID CALCULATIONS
4) PLOT MAP
5) VOLUMETRICS
6) EXIT ISM
   WHICH? 3

   GRID CALCULATIONS
1) CALCULATE GRID
2) CALCULATE TREND GRID
3) GRID OPERATIONS
4) RETURN TO MAIN MENU [DEFAULT]
   WHICH? 1

   CALCULATE GRID
1) NORMAL MINIMUM TENSION SURFACE [DEFAULT]
2) ISOPACH DATA SURFACE (SPECIAL ZERO TREATMENT)
3) CORRECTION SURFACE
   WHICH? 1
NAME OF SCATTERED DATA FILE (L, LIST FILES): FH
CHOOSE Z FROM THE FOLLOWING ELIGIBLE FIELD NAMES -
TUSH     TLSH3     TKF1     TKPC1     TKL1     H81
   WHICH? TUSH
READING SCATTERED DATA...
              X              Y              Z
-----------------------------------------------
MIN         1.5933         1.1835       690.0000
MAX        11.0109        12.2364      2700.0000

   GRIDDING RANGE
1) 5% LARGER THAN X-Y RANGE OF CURRENT SCATTERED DATA [DEFAULT]
2) EXACT X-Y RANGES OF CURRENT SCATTERED DATA
3) USER CHOSEN XMIN,XMAX,YMIN,YMAX
   WHICH? 2

   GRID SIZE
1) SYSTEM CALCULATED (45 BY 53) [DEFAULT]
2) USER CHOSEN GRID SIZE
   WHICH? 1
```

```
   ELEVATION LIMITS
1) NO LIMITS APPLIED [DEFAULT]
2) EXACT ELEVATION RANGE IN CURRENT SCATTERED DATA
3) USER CHOSEN ELEVATION LIMITS
   WHICH? 2


FIRST SOME DEFINITIONS --
  DATA REGION -- IF ONE DREW A POLYGON AROUND THE OUTERMOST SET
    OF SCATTERED DATA POINTS, THE REGION INSIDE THIS POLYGON WOULD
    BE CALLED THE DATA REGION.  THIS POLYGON CAN HAVE SLIGHT
    INDENTATIONS (IT IS CALLED A CLOSELY FOLLOWING POLYGON).
  INTERPOLATION -- NATURALLY, IT IS MORE ACCURATE TO CALCULATE
    OR ESTIMATE SURFACE HEIGHTS WITHIN THE DATA REGION BECAUSE
    SCATTERED DATA POINTS SURROUND THE POINT TO BE CALCULATED.
  EXTRAPOLATION -- IT IS MUCH LESS ACCURATE TO CALCULATE SURFACE
    HEIGHTS OUTSIDE THE DATA REGION.  THIS TYPE OF CALCULATION IS
    CALLED EXTRAPOLATION.  IT IS COMMON TO REQUIRE THAT THE
    EXTRAPOLATED REGIONS OF A MAP BE BLANKED.

  SO, TO ANSWER THIS QUESTION...
NO -  CAUSES THE REGION OUTSIDE THE DATA REGION TO BE SET TO A
      NULL VALUE (1.0E20), CAUSING THAT PORTION TO APPEAR BLANK.
YES - CAUSES THE SURFACE TO EXTEND BEYOND THE DATA REGION TO
      THE OUTERMOST EDGES OF THE MAP.

EXTRAPOLATION WANTED [DEFAULT: YES]? N
ENTER THE NAME OF THE FAULT LINE DATA FILE. IF THIS IS NOT
TO BE A FAULTED GRID, SIMPLY HIT RETURN.
NAME OF FAULT DATA FILE (L, LIST FAULT FILES)
  [DEFAULT: NO FAULTING]: (CR)
ENTER NAME OF BREAKLINE POLYGON FILE (L, LIST POLYGON FILES)
    [DEFAULT: NO BREAKLINE POLYGONS]: (CR)
NAME OF NEW GRID FILE (L, LIST GRID FILES): TUSHGRID
ENTER FILE DESCRIPTION: FHDEMO

   PROTECTION TYPE
1) NONE [DEFAULT]
2) NO DELETE
3) NO MODIFY/NO DELETE
   WHICH? (CR)
YOU MAY SPECIFY A NUMBER OF DAYS THIS FILE IS TO BE KEPT BOTH
IN THE DIRECTORY AND ON DISK. AFTER THIS NUMBER OF DAYS, YOU
WILL BE QUERIED REGARDING WHETHER OR NOT YOU WISH TO DELETE
THE FILE. IF NOT, YOU MAY EXTEND ITS LIFETIME.
IF YOU SIMPLY HIT RETURN, THE FILE WILL BE KEPT INDEFINITELY.
HOW MANY DAYS DO YOU WISH TO KEEP THIS FILE [DEFAULT: FOREVER]? (CR)
SEND GRIDDING TO BATCH QUEUE [DEFAULT: NO]? (CR)
CALCULATING GRID...
WRITING GRID....
```

Example of calculating a normal grid (Continued)

```
   GRID CALCULATIONS
1) CALCULATE GRID
2) CALCULATE TREND GRID
3) GRID OPERATIONS
4) RETURN TO MAIN MENU (DEFAULT)
   WHICH? 4
---------- MAIN MENU - CAPABILITY OVERVIEW ----------
1) OPTION SETTING        - SET, LOAD, SAVE, OR RESET ISM OPTIONS
     CONTOURING OPTIONS  - INTERVALS, AXIS LABELS, SCALES, ETC.
     PERSPECTIVE VIEWS   - AXIS LABELING
     PEN OPTIONS         - LIGHT, BOLD, FAULT, MESH, TEXT PEN NUMBERS
     GENERAL OPTIONS     - EDIT HISTORY, LOG FILE OUTPUT
     MEASUREMENT UNITS   - INCHES, CENTIMETERS
2) FILE OPERATIONS
     LIST FILE DIRECTORY - OVERVIEW FILES IN ISM'S DIRECTORY
     DELETE FILE         - DELETE FILE FROM ISM'S AND USER'S DIRECTORY
     DEACTIVATE FILE     - DELETE FILE ENTRY FROM ISM'S DIRECTORY ONLY
     EDIT/CREATE A FILE  - TEXT, GRAPHIC, OR DIGITIZER MODES
     DISPLAY A FILE      - DATA OR PLOT FILES
     FIELD OPERATIONS    - ON SCATTERED DATA FILES
3) GRID CALCULATIONS
     CALCULATE STD, TREND, CORRECTION, OR ISOPACH GRID, FAULTS OPTIONAL
     GRID OPERATIONS     - GRID/GRID,GRID/CONSTANT, POLY FILL, SMOOTHING
4) PLOT MAP
     SET PLOTTING MODE   - CRT, PLOT FILE, OR BOTH
     BASEMAP             - PLAN VIEW OF DATA FILES
     CONTOUR MAP         - PLAN (2D) VIEW OF SURFACE CONTOURS
     PERSPECTIVE VIEWS   - MESH OR CONTOUR PERSPECTIVE AND BLOCK DIAGRAM
     CROSS SECTION OR FENCE DIAGRAM - SECTIONS THROUGH MULTIPLE LAYERS
     ZOOM/PAN MODE       - ZOOM/PAN ON LAST CRT PLOT DISPLAYED
5) VOLUMETRICS
     CALCULATE VOLUMES   - N POLYGONS CUTTING THROUGH UP TO TEN LAYERS
     VOLUMETRICS REPORT  - CUSTOM REPORT WRITER FOR CALCULATED VOLUMES

   MAIN MENU
1) OPTION SETTING
2) FILE OPERATIONS
3) GRID CALCULATIONS
4) PLOT MAP
5) VOLUMETRICS
6) EXIT ISM
   WHICH? 6

EXIT INTERACTIVE SURFACE MODELING
```

Note: Send gridding and any maps to be made to the batch queue. Prompts for the batch queue are found at the end of "grid calculations and plot map routines" of the main menu. A dialogue example is at the bottom of page 43. The batch queue allows the user to work on other data while the computer is calculating that information. Also, maps are not stored in the ISM file directory if they are not sent to the batch queue first.

Note: After a grid is calculated in batch mode the user directory outside ISM stores a file called JOB___.BLG . This file calculates statistics of your gridded information. See example below of a JOB___. BLG file.

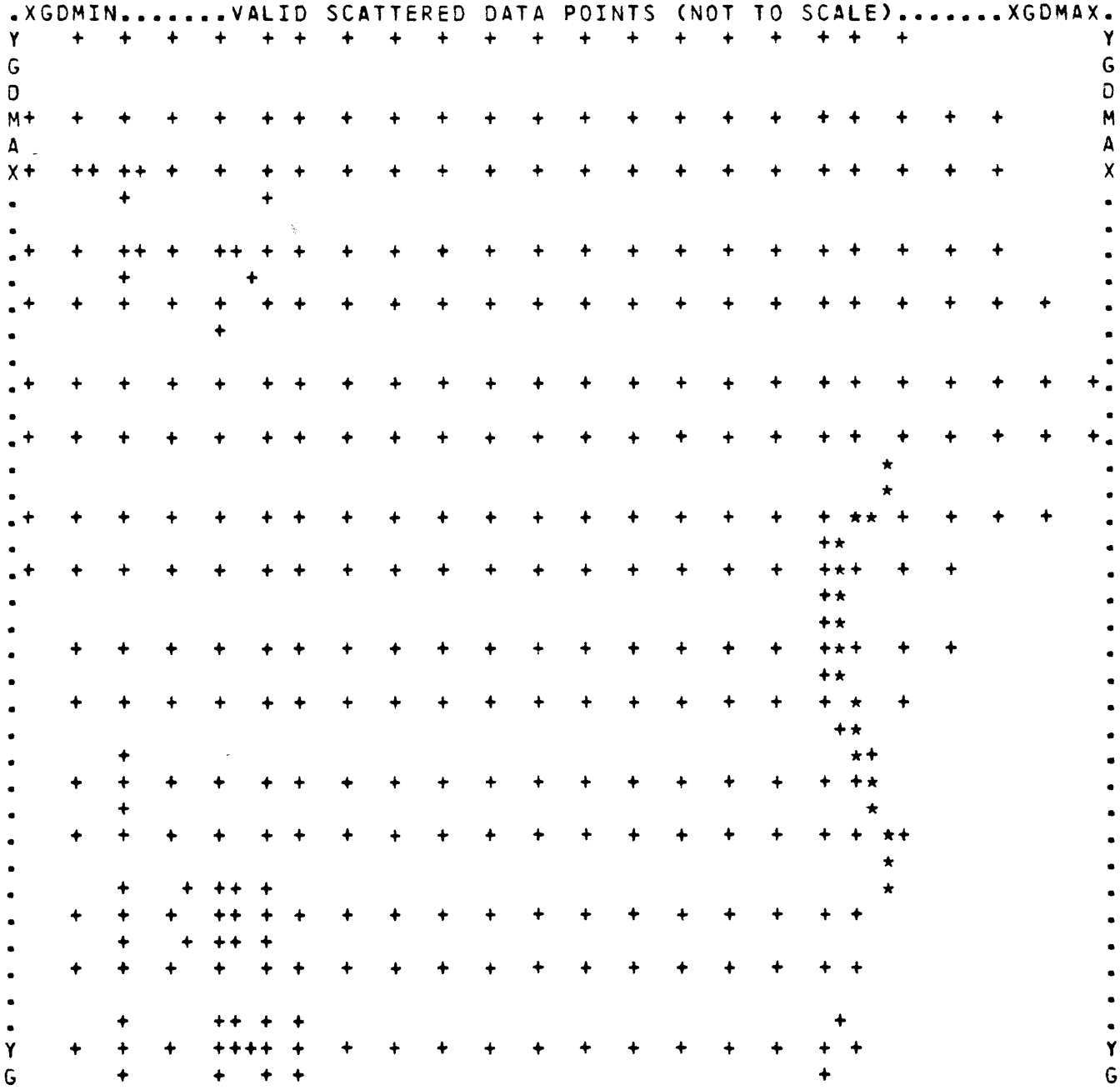
Example of a statistical file in ISM

```
1I            EXECUTION REPORT LOG



1I            EXECUTION REPORT LOG
 I            SURFACE GRIDDING LIBRARY (2.1G)
 I            DYNAMIC GRAPHICS, INC.
 I            DATE THURSDAY 18 JULY 1985
 I            TIME 9.55.00 A.M.
 I            .
 C    1 BGNGRD
 C    2 SETGLG IFLGLG=        3     IUNGLG=       40
 C    3 SETGRP IFLGRP=        4     IUNGRP=       40     IMXLNE=       25
 C    4 SETGRD INMXCL=       56     XGDMIN= 0.00000      XGDMAX=  2.8750
 +             INMYRW=       42     YGDMIN= 0.00000      YGDMAX=  2.1250
 C    5 DEFGFL NUMFLT=        1     XFLARR= *ARRAY*      YFLARR= *ARRAY*
 +             INMFPT=        2
 C    6 DEFGFL NUMFLT=        1     XFLARR= *ARRAY*      YFLARR= *ARRAY*
 +             INMFPT=        2
 C    7 DEFGFL NUMFLT=        1     XFLARR= *ARRAY*      YFLARR= *ARRAY*
 +             INMFPT=        2
 C    8 DEFGFL NUMFLT=        1     XFLARR= *ARRAY*      YFLARR= *ARRAY*
 +             INMFPT=        2
 C    9 DEFGFL NUMFLT=        1     XFLARR= *ARRAY*      YFLARR= *ARRAY*
 +             INMFPT=        2
 C   10 DEFGFL NUMFLT=        1     XFLARR= *ARRAY*      YFLARR= *ARRAY*
 +             INMFPT=        2
 C   11 DEFGFL NUMFLT=        1     XFLARR= *ARRAY*      YFLARR= *ARRAY*
 +             INMFPT=        2
 C   12 DEFGFL NUMFLT=        1     XFLARR= *ARRAY*      YFLARR= *ARRAY*
 +             INMFPT=        2
 C   13 SETGLM IFLGLM=        1     ZGDMIN= -1787.0      ZGDMAX=  13487.
 C   14 CLCFLT XPTARR= *ARRAY*      YPTARR= *ARRAY*      ZPTARR= *ARRAY*
 +             INMXYZ=      423     ELVARR=*RESULT*      IDMXCL=      512
 +             IDMYRW=      512     IWKARR= *ARRAY*      IDMWRK=   524288
 +             G22 (GRID NUMBER     1 IN THIS EXECUTION.)
1        GRIDDING REPORT FOR GRID NUMBER    1
         DYNAMIC GRAPHICS SURFACE GRIDDING LIBRARY (2.1G)
         EXECUTION OF 9.55.00 A.M.  THURSDAY 18 JULY 1985

   INPUT DATA AND GRIDDING PARAMETERS
   NUMBER OF INPUT SCATTERED DATA POINTS
        TOTAL NUMBER OF POINTS INPUT =   423
        NUMBER OF POINTS OUTSIDE GRID AREA =      0
        NUMBER OF POINTS OUTSIDE ELEVATION LIMITS =      0
        NUMBER OF POINTS MATCHING NULL ELEVATION DATUM =      0
        NUMBER OF VALID POINTS IGNORED BECAUSE OF FAULTS =      1
        NBR OF VALID POINTS IGNORED BECAUSE MXDPTS TOO LOW =     14
        REMAINING TOTAL SCATTERED POINTS USED IN GRIDDING =    408
```

Example of a statistical file in ISM (Continued)

```
   DATA RANGES OF SCATTERED POINTS USED IN GRIDDING
        XPTMIN= 0.000000      YPTMIN= 0.000000      ZPTMIN= -1787.00
        XPTMAX=  2.87500      YPTMAX=  2.12500      ZPTMAX=  13487.0
   GRIDDING PARAMETERS
        ELEVATION RANGE LIMITS  ZVLMIN= -1787.00       ZVLMAX=  13487.0
        NULL ELEVATION DATUM = (NONE)
   GRIDDING RESULT AND OUTPUT ANALYSIS
   GRID RESULT SIZE AND DATA RANGES
        INMXCL=       56      INMYRW=       42
        XGDMIN= 0.00000       YGDMIN= 0.00000       ZGDMIN= -1784.6
        XGDMAX=  2.8750       YGDMAX=  2.1250       ZGDMAX=  13447.
        X COLUMN GRID SPACING=  0.52273E-01
        Y ROW GRID SPACING=     0.51829E-01


1I            EXECUTION REPORT LOG


   GRIDDED SURFACE ACCURACY AT ALL VALID SCATTERED POINTS
        AVERAGE ABSOLUTE DEVIATION OF ELEV=  172.42
        STD DEV OF ABSOLUTE DEVIATION OF ELEV=  469.29
        AVERAGE PERCENT DEVIATION OF ELEV = 1.13 OF ELEV RANGE
        MAXIMUM DEVIATION OF ELEV AT ANY POINT= -3750.5
        MAXIMUM PERCENT DEVIATION OF ELEV=24.62 OF ELEV RANGE
        MAXIMUM AT INPUT SCATTERED POINT NUMBER   364 LOCATED
        XPTVAL= 0.53110       YPTVAL= 0.37500       ZPTVAL=  11025.
   GRIDDED SURFACE ACCURACY AT SCATTERED POINTS USED IN GRIDDING
        AVERAGE ABSOLUTE DEVIATION OF ELEV=  110.97
        STD DEV OF ABSOLUTE DEVIATION OF ELEV=  281.85
        AVERAGE PERCENT DEVIATION OF ELEV = 0.73 OF ELEV RANGE
        MAXIMUM DEVIATION OF ELEV AT ANY POINT= -2908.7
        MAXIMUM PERCENT DEVIATION OF ELEV=19.10 OF ELEV RANGE
        MAXIMUM AT INPUT SCATTERED POINT NUMBER   402 LOCATED
        XPTVAL=  2.2190       YPTVAL=  1.2194       ZPTVAL=  6561.7
1
```

Example of a statistical file in ISM (Continued)



```
1I            EXECUTION REPORT LOG


 D   +  +  +  +  +  +  +  +  +  +  +  +  +  +  +  +  +  +                  D
 M                                                                        M
 I                                                                        I
 N   +  +  +  +  +  +  +  +  +  +  +  +  +  +  +  +  +                   N
 .XGDMIN.....................................................XGDMAX.
1
 .XGDMIN.........RESULT GRID CONTOUR MAP (NOT TO SCALE).........XGDMAX.
 Y   G       F            EEDB  A           A BDEFFFF G GFFF GHIJKL MNOY
 G   G       F        FF EDC B A             ABCDEEEEF G GGGGH IJKL MN G
 D   G      F           EDCBBAA              AABBCDD EFG   HH IJ KL MN D
 MH  G      F         EEDCB  A                 A BC DEFG HH  I JK L M NM
 A H G     F        EEDDCB  A                   A BCDEFGH  II J K L M NA
 XI H G   FF       E DCBB   A                    A BDEFGH I   J K L  M X
 .JIH G    FFFF EEDDC B    AAAA                   ABCDFGHI    J KK L  M.
 .JI H G       FEDCC B          AAAA              ABCDEGHI     JJ K L  .
 . JIH G      F EC BB               AA            A BCEFHI       J K L .
 .J IH G     F EDC B                  AA          ABCDFGHI   III J K L.
 .J IH G   FF EDC   BB                   AAAAA      A BDEGH I I   I JK  .
 . JIH G   F EEDC     BBB                    A      ABCEGH I I    IJ K .
 .KJI H GG F EDC          BBB                 AAAA  ABCEFH I I   I  JK .
 .KJ IH  G FED C             BBB                A  A CDFHI   III  J K .
 .K JI H G FED C                BBBB             A A BDFHIJ      J K L.
 . K JIH GF ED C                    BBBB         A A BCFHJ JJ   J  K L.
 .  K JIG FE D  CCCCCCCCCCCCC           BBBB      A  BDF*    JJJ   K  .
 . LLKJIGFE D                  CCC          BB     BDEG*KK         K  .
 . L LJIGFED                      CCC         BB   BBCE**L  K        K .
 . LLKJHFE D                      CCCC        BBB CE* MMLL KK       K .
 .LLLKIGF D         DDDDDDDDD          CCCC      CDE*   M L  KKK   K .
 .M LKIGE DDDDDDDDD          DDDDDD         CC     CC*M   M L    KKKKK.
 .NMLKIGE                          DDDD      CCCCC CC*     M LL      K.
 .ONMKIGE    EEEE EEEEEE               DD         C E*M     M  L     K.
 .ONMKIGFE  E    E       EEEEEEE    /    DDDDD   D  DG* M    M  L     K.
 .ONLJIGF EE                     EEEEEEE      DDD DD FI*M    M   L    K.
 .NMKJHGF       F   FFFF                EEE        EEFH* M   M  L    K .
 .MLKJHGF     FF FFF     FFFFFFF   FF      EEE    EE FGH*  MMM  L    K  .
 .LKJIHGF    F       GGG         FFF  FF       EEEE  FFGHJ*   LLL   KK   .
 .KJI HG F F  GGGGG   GGGGGGG         FFFF       FF G IJ*LLL   KKK     .
 .JI H G  FF GHHHHHHHHHH      GGGGG       FFFFFFF   GHIJK*KKKKK   JJJJJ.
 .I H  G    GHIIIIIIII  HHHHH     G               GGH IJ*JJJJJJJJ     .
 .  H   GGGGHIJJJJJJJ III    HHH   G       GGGGGGG   HII*IIIIIIIIIIII.
 .  HH       HJKKK  KKJJ  II     H  G      G            HHHHHHHHHHHHHHH.
 .I   HH     HJK KKK  KKJJ  IIII  H  G    G      H      GGGG           .
 . II   H     IKLLMLLLL K JJJ   II H G    G    HH H   GG    GGGGGGGGGG.
 .   II HH  GGHLM MMM LLKKK JJJ  I H G  G    H  HH   GFFFFFFFFFFFFFFF.
 .     II H G HLMM   M  LL KK  J I H  GG     HHH    G F  EEEEE       .
 Y       IIH GHIKLMMMMMMMMLL K  JI H          HH    GGF EE     EEEEEEEEY
 GI       I HHH IJKLL M NNMML KJ I  HHHHH  HH  HH G F E  DDDDDDDDDDDDDG
 D II      I     IJKKLM NONML KJ I       HH      HGFEE DD           CCD
 M   I      I     I JKLMNOONMLKJI                HGFE D  CCCCCCCCCCC  M
 I    I     I      IJ KLMNN MMKJ I               HGFED CC   BBBBBBBBBBI
 N   I       I     I JJKLLMNNNMKI                H GFEDC  BBB          N
 .XGDMIN.....................................................XGDMAX.
```

Example of a statistical file in ISM (Continued)

```
                    . . . . . .

 A   -1000.      F    4000.      K    9000.
 B   0.0000      G    5000.      L    10000.000
 C    1000.      H    6000.      M   0.1100E 05
 D    2000.      I    7000.      N   0.1200E 05
 E    3000.      J    8000.      O   0.1300E 05


1I              EXECUTION REPORT LOG


1LISTING OF INPUT SCATTERED DATA POINTS

   KEY TO CASES --
        1. AREA      INVALID POINT    NOT USED  OUT OF MAP AREA
        2. NULL      INVALID POINT    NOT USED  NULL Z VALUE
        3. ELEV      INVALID POINT    NOT USED  Z OUT OF RANGE
        4. FIXED       VALID POINT    NOT USED  FIXED GRID POINT
        5. FAULTS      VALID POINT    NOT USED  GRD PTS ACROSS FLT
        6. MXDPTS      VALID POINT    NOT USED  MXDPTS TOO LOW
        7. ALONE       VALID POINT    USED ALONE AT ITS GRID POINT
        8. SHARED      VALID POINT    USED WITH OTHER DATA POINTS
                                      AT THE SAME GRID POINT
 POINT   X-COORDINATE  Y-COORDINATE  Z-COORDINATE  Z-RESIDUAL    CASE
 -----   ------------  ------------  ------------  ----------    ----
     1   0.125000       2.12500       5036.00      -12.6729      ALONE
     2   0.250000       2.12500       4740.00       1.22754      ALONE
     3   0.375000       2.12500       4612.00      -10.9229      ALONE
     4   0.500000       2.12500       3824.00       1.45068      ALONE
     5   0.625000       2.12500       3499.00      -2.83154      ALONE
     6   0.750000       2.12500       3615.00       38.3188      ALONE
     7   0.875000       2.12500       3615.00       88.4526      ALONE
     8    1.00000       2.12500       3545.00      -56.1631      ALONE
     9    1.12500       2.12500       199.000       4.63727      ALONE
    10    1.25000       2.12500      -1100.00       18.8638      ALONE
    11    1.37500       2.12500      -999.000      -18.4613      ALONE
    12    1.50000       2.12500      -1064.00      -16.0444      ALONE
    13    1.62500       2.12500      -1479.00      -14.6016      ALONE
    14    1.75000       2.12500      -1305.00       33.3381      ALONE
    15    1.87500       2.12500       1177.00       5.15845      ALONE
    16    2.00000       2.12500       4478.00      -107.084      ALONE
    17    2.12500       2.12500       4158.00       42.9150      ALONE
    18    2.25000       2.12500       5404.00      -59.1064      ALONE
    19    2.37500       2.12500       3404.00       138.415      ALONE
    20   0.125000       2.00000       4970.00       33.5889      ALONE
    21   0.250000       2.00000       4544.00       15.1768      ALONE
    22   0.375000       2.00000       4283.00      -26.7969      ALONE
    23   0.500000       2.00000       3726.00       20.7129      ALONE
    24   0.625000       2.00000       3171.00       97.5356      ALONE
    25   0.750000       2.00000       3451.00       55.0342      ALONE
  (LISTING TERMINATED AFTER FIRST   25 OF TOTAL  423 INPUT POINTS.)
1
```

Example of a statistical file in ISM (Continued)

```
+            G21 ELAPSED TIME IN ROUTINE=  191.45      SECONDS.
+            (RESOLUTION OF TIMER IS SECS/ 330.)
C  15 CLCBND XPTARR= *ARRAY*     YPTARR= *ARRAY*     ZPTARR= *ARRAY*
+            INMXYZ=     423     ITPBND=       2     IDMBND=    1000
+            XBDARR=*RESULT*     YBDARR=*RESULT*     INMBND=*RESULT*
+            G23 RESULT PARAMETER 9 =       61
C  16 CLCPLY XBDARR= *ARRAY*     YBDARR= *ARRAY*     INMXYP=      61
+            IFLINO=       1     VALSET= 0.10000E 21 ELVARR= *ARRAY*
+            IDMXCL=     512     IDMYRW=     512
C  17 ENDGRD
S            .
S           SUMMARY OF EXECUTION
S           SGL TOTAL CALLS=        17
S           CALLS WITH ERRORS=       0
S           GRIDS CALCULATED=        1
S           TOTAL TIME IN SGL CALLS=  192.96     SECONDS.
S           (RESOLUTION OF TIMER IS SECS/ 330.)



1I          EXECUTION REPORT LOG


 S          END OF SUMMARY
```

The fifth type of file is called an "Annotation" file. It is important in that it will allow the user to annotate the surface of the map or annotate outside map boundaries. Categories of annotations and annotation commands are:

I. Categories of annotation files are as follows:
   1.) Plot text, lines, patterns and symbols on the surface of the map. Examples: city names, state and county boundaries, lines of section etc.
   2.) Plot text, lines, patterns and symbols in plot page coordinates off the map surface. Examples: explanations or legends, titles, dates, authorship etc.

II. Annotation commands available as of July 1985:

	---- PARAMETER SETTING COMMANDS ----
SETANG	Set angle for annotation text.
SETPEN	Set pen numbers for drawing annotation text and lines.
SETZER	Redefine origin for legend annotation.
SETCHR	Redefines character height for sizes 1-6.
SETTXT	Set character font, height, and weight.
	---- PLOT PAGE COMMANDS (XY in inches) ----
PAGLNE	Draw line on plot using page coordinates.
PAGTXT	Draw text on plot using page coordinates.
LINKEY	Draw legend entry for line types used.
SYMKEY	Draw single-line legend entry for symbol used in posting.
PATKEY	Draw legend box corresponding to patterns used.
PSTKEY	Draw multi-line legend entry for symbol used in posting.
	---- LEGEND COMMANDS ----
LGDFRM	Defines legend frame (must be 1st in series of LGD commands)
LGDBOX	Defines legend box.
LGDTXT	Plots text in the legend box.
LGDPAT	Plots a pattern key in legend box.
LGDLNE	Plots a line key in the legend box.
LGDSYM	Plots a symbol key in the legend box.
LGDHDL	Sets a horizontal divider line in legend box.
LGDZFL	Inserts a previously created plot file into legend box.
	---- MAP SURFACE ANNOTATION COMMANDS (XY in data scale) ----
SRFTXT	Draw text on map surface.
SRFLNE	Draw line on map surface.
SRFPLY	Outline, shade, and label a polygon on map surface.
SRFSYM	Draw symbol and explanatory text on map surface.
MAPLNE	Draw line on map surface (over null areas).
XY	Permits entry of (X,Y) coordinate pairs.

The following is an example of an annotation file. It is displayed as the text on a fence diagram. The first two numbers in PAGTXT, PATKEY, and LINKEY are in plot page coordinates.

1.) SETPEN command was used to set the line weight and pen color;
2.) PAGTXT was used to plot the location for the word explanation;
3.) PATKEY was used to place a box with a pattern and text under the explanation;
4.) LINKEY was used to draw a line, at a certain length and line weight and to label it.

```
   FILE OPERATIONS
1) List file directory
2) Delete file
3) Edit/create file
4) Field operations
5) Deactivate file
6) Display file
7) Return to MAIN MENU [default]
   Which? 6

DISPLAY FILE
Enter filename to display (L/ list files): FA2
File name:          FA2
Type:               annotation data
Description:        FENCEANNO
Protection:         none
Created/Entered:    02/01/85
By:                 NANCY
Last modified:      03/18/85
By:                 NANCY
Expiration date:    none
Field     Starting Ending Numeric
Name      Column   Column Field
--------------------------------
X              1       10   Yes
Y             11       20   Yes
Enter starting column for list [default: 1]: (CR)
   1:SETPEN 1 1 1
   2:PAGTXT 15 11 5 "EXPLANATION"
   3:SETPEN 2 1 1
   4:PATKEY 13.5 9 .75 .75 4 1 1 "UPPER SHALE OF KIRTLAND FM"
   5:SETPEN 1 1 1
   6:PATKEY 13.5 8 .75 .75 0 1 1 "LOWER SHALE OF KIRTLAND FM"
   7:SETPEN 4 1 1
   8:PATKEY 13.5 7 .75 .75 7 .5 1 "FRUITLAND FORMATION"
   9:SETPEN 2 1 1
  10:PATKEY 13.5 6 .75 .75 8 1 1 "PICTURED CLIFFS SANDSTONE"
  11:SETPEN 3 1 1
  12:PATKEY 13.5 5 .75 .75 7 1.5 1 "LEWIS SHALE"
  13:SETPEN 1 2 1
  14:LINKEY 13.5 4 .75 2 1 "HUERFANITO BENTONITE BED - DATUM"
Type "Q" to quit [default: continue]: (CR)
(There are 14 lines in the file)
```

The last file type in ISM is called an "Option" file. Option files allow the user a greater flexibility in displaying maps.

Default pen colors are pen 1 = black, pen 2 = green, pen 3 = red, pen 4 = blue.

See below for an example of setting up an option file, storing it, and resetting ISM to default values.

```
   MAIN MENU
1) Option setting
2) File operations
3) Grid calculations
4) Plot map
5) Volumetrics
6) Exit ISM
   Which? 1

   OPTION SETTING
1) Review/edit options
2) Load options file
3) Reset to default values
4) Return to MAIN MENU [default]
   Which? 1

REVIEW/EDIT OPTIONS
Type L to relist option settings for current group.

    CONTOURING OPTIONS
 1) Contour interval     ----      System calc
 2) Bold line interval   ----               5
 3) Labeling interval    ----               5
 4) Text size (1 to 6)   ----               2
 5) Decimal places       ----      System calc
 6) Reference value      ----      0.00000E 00
 7) Contour file output  ----         Disabled
 8) Map Edge             ----          Enabled
 9) Scale Line/Labels    ----          Enabled
10) Scale Tick Interval  ----      System calc
11) Map Scale (1:x)      ----              Ask
12) Light line min sep   ----      0.60000E-01
13) Bold line min sep    ----      0.60000E-01
    Which (L, list settings) [default: next group]? 2

   BOLD LINE INTERVAL (every ITHBLD contour level is bold)
1) Have system ask
2) Have system calculate
3) Define value
   Which? 3
Enter value: 10
    Which (L, list settings) [default: next group]? 3
```

Example of setting up an option file, storing it, and resetting ISM to default values. (Continued)

```
   LABELING INTERVAL (every ITHLAB contour level is labeled)
1) Have system ask
2) Have system calculate
3) Define value
   Which? 3
Enter value: 2
    Which (L, list settings) [default: next group]? (CR)

    PERSPECTIVE VIEW OPTIONS
 1) Scale Line/Labels    ----          Enabled
 2) Scale Tick Interval  ----      System calc
 3) Z Axis Scale         ----          Enabled
 4) Z Axis Tick Interval ----      System calc
    Which (L, list settings) [default: next group]? (CR)

    PEN OPTIONS
 1) Light pen number     ----              1
 2) Bold pen number      ----              2
 3) Fault Line Pen       ----              4
 4) Background Mesh Pen  ----              3
 5) Text Pen             ----              1
 6) Scale Pen            ----              1
    Which (L, list settings) [default: next group]? 1

    LIGHT CONTOUR PEN
 1) Have system ask
 2) Define value
    Which? 2
 Enter value: 3
     Which (L, list settings) [default: next group]? (CR)

   GENERAL OPTIONS
 1) History files        ----          Enabled
 2) SDL log level        ----              2
 3) SGL execution log    ----              2
 4) SGL report log       ----              2
    Which (L, list settings) [default: next group]? (CR)

The current measurement unit is INCHES.

   MEASUREMENT UNITS
1) Inches
2) Centimeters
   Which [default: next group]? (CR)
```

Example of setting up an option file, storing it, and resetting ISM to default values. (Continued)

```
Do you wish to save the current options [default: no]? YES
Name of new options file (L, list options files): EXAMPLE5
Enter file description: (CR)

   PROTECTION TYPE
1) None [default]
2) No delete
3) No modify/no delete
   Which? (CR)
How many days do you wish to keep this file [default: forever]? (CR)

   OPTION SETTING
1) Review/edit options
2) Load options file
3) Reset to default values
4) Return to MAIN MENU [default]
   Which? 3

Options set to ISM default values.

   OPTION SETTING
1) Review/edit options
2) Load options file
3) Reset to default values
4) Return to MAIN MENU [default]
   Which? 4


   MAIN MENU
1) Option setting
2) File operations
3) Grid calculations
4) Plot map
5) Volumetrics
6) Exit ISM
   Which? 6

EXIT INTERACTIVE SURFACE MODELING
```

The procedure to create maps in ISM is as follows:

1.) Make a scattered data set in ISM using x, y, and z values.

2.) Make a fault file if there is faulting, in the area of interest.

3.) Make a polygon file if there is a need to calculate volumes or if there is non-vertical faulting. Non-vertical faults require both an outline of the area displaced as well as a fault file.

4.) Grid the z values in the scattered data set with fault files and polygon files .

Note: Maps can be plotted with or without annotation files and option files.

5.) Make annotation files. To check files quickly, enter ISM, go to Plot Map in the main menu and display the annotation files with the base map to your scattered data set.

6.) Make option files if there is a need to reset default option parameters.

7.) Use gridded files to make maps in ISM.

The following pages discuss how to plot a map.

PLOTTING MAPS

This section shows several of the prompts found in the plot map routine and provides an explanation to questions users might have concerning plot map questions.

```
PERSPECTIVE VIEWING POINT
Enter THDING, PHIDXY [default: 20,35]: H
THDING is the angle (in degrees) of inclination for the line of sight.
       20 generally provides a good view.  Permitted values: -90.0 to 90.0
PHIDXY is the angle (in degrees) of the line of sight as measured in the x-y
       plane.  It is measured in a counterclockwise direction, where zero
       degrees is looking from the bottom of the grid.
       Angles that vary 35 degrees from a principal axis (35,55,125,145,215,235,
       305, or 325) are recommended.  Permitted values: 0.0 to 360.0
Enter THDING, PHIDXY [default: 20,35]: (CR)
```

Figure 1 shows examples of varying the PHIDXY angle. The title to each map shows the THDING, PHIDXY angle that was assigned to each map. These maps were created as block diagrams in the mesh perspective category of plot map. Note the patterns assigned to each block diagram. Immediately following these examples are 3 examples of how to actually plot maps in ISM. Note that the fence diagram is missing one axis. This is because the THDING angle assigned to that diagram was too high to plot the axis and numbers on the illustration.

After making maps under the plot map menu, the user can go to his directory and list his files. Symbols beside file names indicate that the file is being worked on in the batch mode of ISM. An asterisk (*) means the batch is waiting to be done, an A means the batch is running, and no symbol means the batch is complete. The asterisk will also remain on a file if the file cannot be calculated by the computer (due to user error), or if the file was deleted in the user's main directory outside ISM.

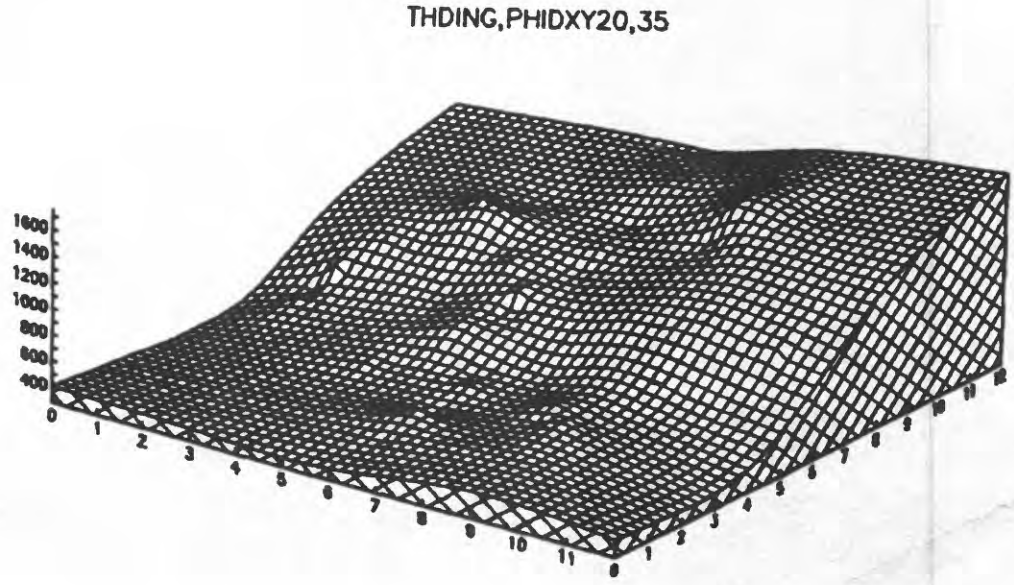
Once the batch is complete the user can go to the Main Directory within ISM, press 2 for File Operations, press 6 for display file, type in the user defined filename, and press carriage return after the question, "Enter number of desired plot frame". At this point the graphic terminal will plot the map on the terminal screen. Make a screen print, press carriage return until the File Operation menu appears. Note: maps may be displayed on graphic terminals or plotters only.

One way to plot maps in color without using the plotter is to display the plot files on a Tektronix 4115 or 4107 terminals. These terminals have a color printing unit which takes only 3 minutes to copy. Note: #1, (Select plotting mode), of Plot Map does not need to be used in order to make maps in ISM, this is due to overriding Primos commands.

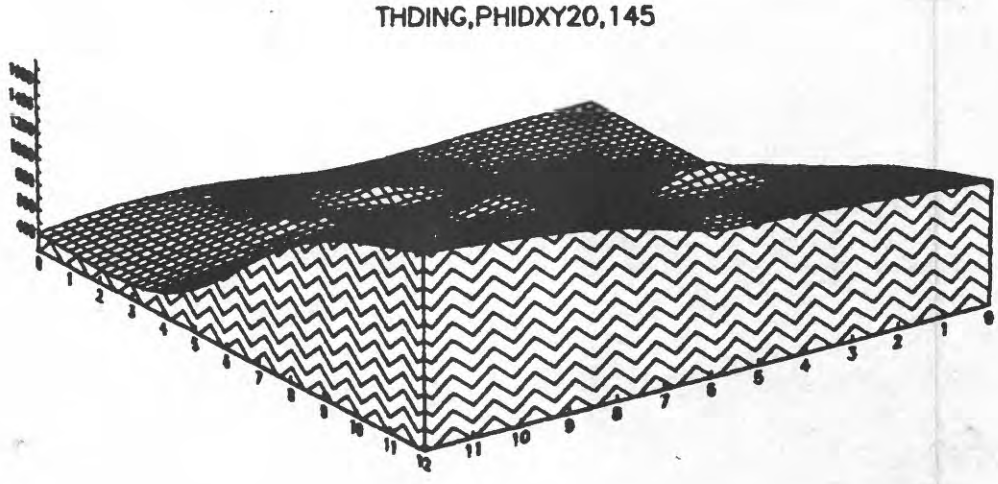
The user should also note that once a map or a grid file has been sent to the batch mode the user should not try to use those particular files again until the Job has finished running.

To plot a map on the Calcomp plotter contact Antoinette L. Medlin, Kathleen K. Krohn, or Vicki Clark at NCRDS (address and telephone numbers are on page 2).

GRAPHIC TERMINAL SCREEN PRINT



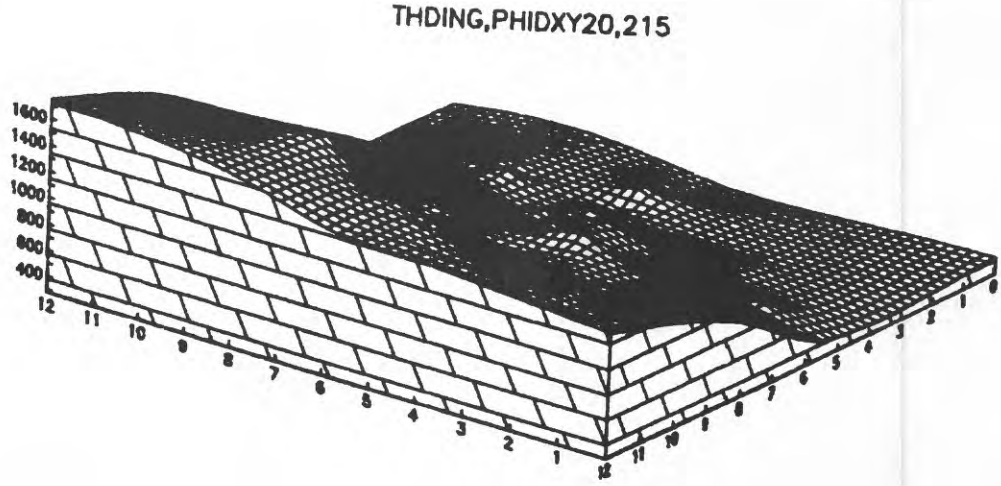
A. THDING, PHIDXY angle equals 20, 35. Pattern is right and left slanting lines (no.6).



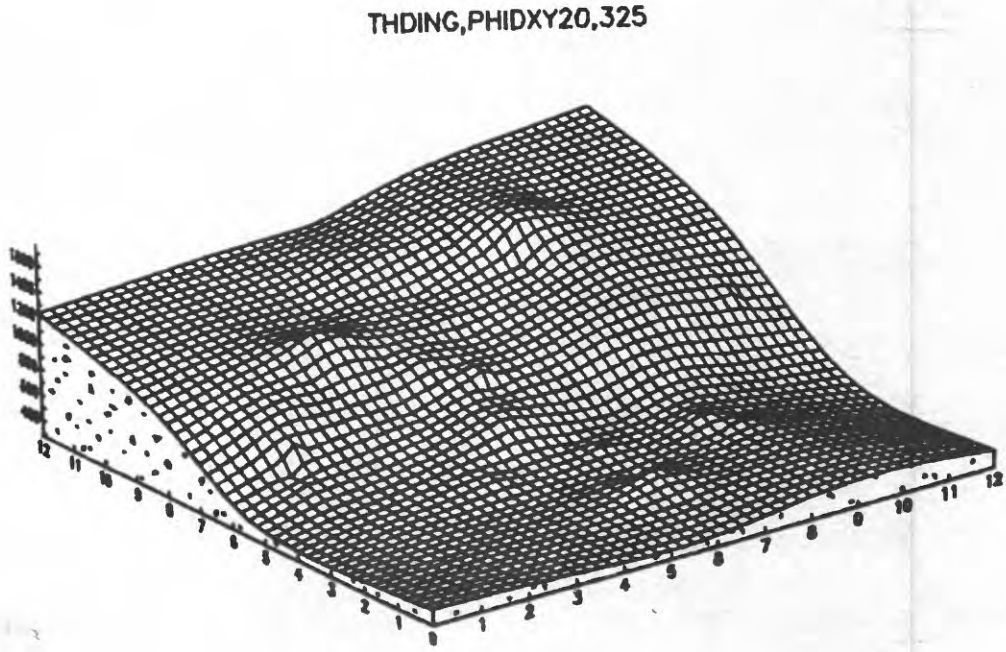
B. THDING, PHIDXY angle equals 20, 145. Pattern is sharp waves (no.11).

Figure 1. Examples of varying PHIDXY angles in a clockwise direction using the same grid.

GRAPHIC TERMINAL SCREEN PRINT



C. THDING, PHIDXY angle equals 20, 215. Pattern is slanting brick (no.10).



D. THDING, PHIDXY angle equals 20, 325. Pattern is rock (no.8).

Figure 1. Examples of varying PHIDXY angles in a clockwise direction using the same grid. (Continued)

The next thirteen pages show both the dialogue and the graphic terminal screen prints of sessions using the Plot Map routine of the Main Menu. Figure 2 is an example of a contour perspective and a contour map created on pages 41 through 45. Figure 3 is an example of a fence diagram created on pages 47 through 52.

A cross-section annotation file is the only annotation file that can be created outside the File operations menu. An example of this type of a file is found within the fence diagram routine on pages 47 through 52.

Example of creating a contour perspective

```
Please wait. Scanning file directory for expired files.
No files have expired.
------------------ MAIN MENU - CAPABILITY OVERVIEW -----------------
1) OPTION SETTING        - SET, LOAD, SAVE, or RESET ISM options
     CONTOURING OPTIONS  - intervals, axis labels, scales, etc.
     PERSPECTIVE VIEWS   - axis labeling
     PEN OPTIONS         - light, bold, fault, mesh, text pen numbers
     GENERAL OPTIONS     - edit history, log file output
     MEASUREMENT UNITS   - inches, centimeters
2) FILE OPERATIONS
     List file directory- overview files in ISM's directory
     Delete file         - delete file from ISM's and user's directory
     Deactivate file     - delete file entry from ISM's directory only
     Edit/create a file  - Text, graphic, or digitizer modes
     Display a file      - data or plot files
     Field operations    - on scattered data files
3) GRID CALCULATIONS
     Calculate std, trend, correction, or isopach grid, faults optional
     Grid operations     - grid/grid,grid/constant, poly fill, smoothing
4) PLOT MAP
     Set plotting mode   - CRT, plot file, or both
     Basemap             - plan view of data files
     Contour map         - plan (2D) view of surface contours
     Perspective views   - mesh or contour perspective and block diagram
     Cross section or fence diagram - sections through multiple layers
     Zoom/Pan mode       - zoom/pan on last crt plot displayed
5) VOLUMETRICS
     Calculate volumes   - n polygons cutting through up to ten layers
     Volumetrics report  - custom report writer for calculated volumes

   MAIN MENU
1) Option setting
2) File operations
3) Grid calculations
4) Plot map
5) Volumetrics
6) Exit ISM
   Which? 4

   PLOT MAP
The current plotting device is the graphic terminal.
1) Select plotting mode/new plot file
2) Base map
3) Contour map
4) Perspective view
5) Cross sections/fence diagram
6) Enter ZOOM/PAN processor
7) Return to MAIN MENU [default]
   Which? 4

   PERSPECTIVE VIEW
1) Mesh perspective
2) Contour perspective
3) Mesh and contour perspective
4) Contour key
   Which? 2
```

Example of creating a contour perspective (Continued)

```
Block diagram [default: no]? (CR)
The current grid file in memory is: DAKOTATOP
Name of grid file (L, list grid files) [default: current grid]: (CR)

ANNOTATION
Enter name of annotation file #1 (L, list files)
  [default: none]: ANNOH
Enter name of annotation file #2 (L, list files)
  [default: none]: SJSURFANNANCY
Enter name of annotation file #3 (L, list files)
  [default: none]: (CR)
Less than the full XY range of the grid may be displayed
View partial area [default: no]? (CR)
You must either enter a new contour interval or simply hit
RETURN to use the system calculated (default) contour
interval.  If you chose to enter a contour interval, the
number you enter must be greater than zero.
The Z-range is 15231.99. The system calculated contour interval is 1000.
Enter contour interval [default: 1000]: (CR)
The length of the map is defined by XWNLEN while the
height of the map is defined by YWNLEN.  Both of these
arguments are in inches.
Enter map size XWNLEN,YWNLEN (in inches): 12,12

Enter map caption: CONTOUR PERSPECTIVE OF DAKOTA SANDSTONE, SAN JUAN BASIN

Post data points [default: no]? (CR)

When reading contour maps, it is sometimes difficult to
distinguish between valleys and hills.  One solution is to
use "TICKED" contour lines.  Tickmarks are small segments
extending from contour polygons to indicate a depression or
downward slope.
Downhill tickmarks [default: no]? Y

   LOCAL HIGH/LOWS
Contour lines usually indicate elevations as the surface
rises or falls, but extreme values for tops of peaks or
the depths of valleys are not indicated.  One solution is to
place an "H" or an "L" (HIGH/LOW) on a peak or a valley.
1) None [default]
2) Local highs only
3) Local lows only
4) Both local high and lows
   Which? (CR)
```

```
PERSPECTIVE VIEWING POINT

THDINC is the angle (in degrees) of inclination for the line of sight.
       20 generally provides a good view.  Permitted values: -90.0 to 90.0
PHIDXY is the angle (in degrees) of the line of sight as measured in
       the x-y plane.  It is measured in a counterclockwise direction,
       where zero degrees is looking from the bottom of the grid.
       Angles 35 degrees from a principle axis (35,55,125,145,215,235,
       305 or 325) are recommended.  Permitted values: 0.0 to 360.0
Enter THDINC,PHIDXY [default: 20,35]: (CR)
An exaggeration factor of 1.0 defines the apparent Z range
to be 0.3 of the apparent X range.  This usually results
in a map that is properly scaled.
Enter exaggeration factor [default: 1]: .75
Send job to batch queue [default: no]? Y
Batch requires a seperate plot file for each job.
Name of plot file (L, list plot files): CONTOURPSPT
The file already exists, do you wish to overwrite it [default: no]? NO
Batch requires a seperate plot file for each job.
Name of plot file (L, list plot files): CONTOURPER
Enter file description: DEMO

   PROTECTION TYPE
1) None [default]
2) No delete
3) No modify/no delete
   Which? (CR)
You may specify a number of days this file is to be kept both
in the directory and on disk.  After this number of days, you
will be queried regarding whether or not you wish to delete
the file.  If not, you may extend its lifetime.
If you simply hit RETURN, the file will be kept indefinitely.
How many days do you wish to keep this file [default: forever]? 3
This file will expire on 11/09/85.

   BATCH QUEUES
1) DEFAULT ((UNLIMITED CPU TIME))
2) QUEUE1 ( (CPU TIME 60 SEC))
3) QUEUE4 ( (UNLIMITED CPU TIME))
   Which? 3

Job "JOB045.BAT" was submitted to queue "QUEUE4".
```

```
   PLOT MAP
The current plotting device is the graphic terminal.
1) Select plotting mode/new plot file
2) Base map
3) Contour map
4) Perspective view
5) Cross sections/fence diagram
6) Enter ZOOM/PAN processor
7) Return to MAIN MENU [default]
   Which? 3

CONTOUR MAP
The current grid file in memory is: DAKOTATOP
Name of grid file (L, list grid files) [default: current grid]: TKF1
Reading grid...

ANNOTATION

Enter name of annotation file #1 (L, list files)
  [default: none]: (CR)
Less than the full XY range of the grid may be displayed
View partial area [default: no]? (CR)
You must either enter a new contour interval or simply hit
RETURN to use the system calculated (default) contour
interval.  If you chose to enter a contour interval, the
number you enter must be greater than zero.
The Z-range is 1406.025. The system calculated contour interval is 100.
Enter contour interval [default: 100]: (CR)

   MAP SCALE
   The map X range is 12, the Y range is 12.
1) Enter scale as 1"=x units [default]
2) Enter scale as 1:x (representative fraction)
   Which? 1
Enter number of units per inch: 1
Map size will be 12 by 12 inches.
Is the above map size acceptable [default: yes]? (CR)

CONTOURING Z RANGE
The grid Z range is 347.64 to 1753.67.
You may select a Z range to be contoured.  Contours will not be
generated for Z values outside this range.  The default is to
generate contours for the full range of data.
Enter ZMIN,ZMAX for contour range [default: full range]: (CR)

Enter map caption: FRUITLAND FORMATION STRUCTURE CONTOUR

Post data points [default: no]? YES
File in use...
Eligible fields for scattered data posting -
PTID     TUSH     TLSH3    TKF1     TKPC1    TKL1     HB1
Enter the number of fields to post (up to five)
[default: none]: 1
Name of first field: PTID
```

```
When reading contour maps, it is sometimes difficult to
distinguish between valleys and hills.  One solution is to
use "TICKED" contour lines.  Tickmarks are small segments
extending from contour polygons to indicate a depression or
downward slope.
Downhill tickmarks [default: no]? (CR)

   LOCAL HIGH/LOWS
Contour lines usually indicate elevations as the surface
rises or falls, but extreme values for tops of peaks or
the depths of valleys are not indicated.  One solution is to
place an "H" or an "L" (HIGH/LOW) on a peak or a valley.
1) None [default]
2) Local highs only
3) Local lows only
4) Both local high and lows
   Which? 4
Send job to batch queue [default: no]? Y
Batch requires a seperate plot file for each job.
Name of plot file (L, list plot files): FRUITLANDCONT
Enter file description: DEMO

   PROTECTION TYPE
1) None [default]
2) No delete
3) No modify/no delete
   Which? (CR)
You may specify a number of days this file is to be kept both
in the directory and on disk.  After this number of days, you
will be queried regarding whether or not you wish to delete
the file.  If not, you may extend its lifetime.
If you simply hit RETURN, the file will be kept indefinitely.
How many days do you wish to keep this file [default: forever]? 10
This file will expire on 11/16/85.

   BATCH QUEUES
1) DEFAULT ((UNLIMITED CPU TIME))
2) QUEUE1 ( (CPU TIME 60 SEC))
3) QUEUE4 ( (UNLIMITED CPU TIME))
   Which? 3

Job "JOB046.BAT" was submitted to queue "QUEUE4".
```

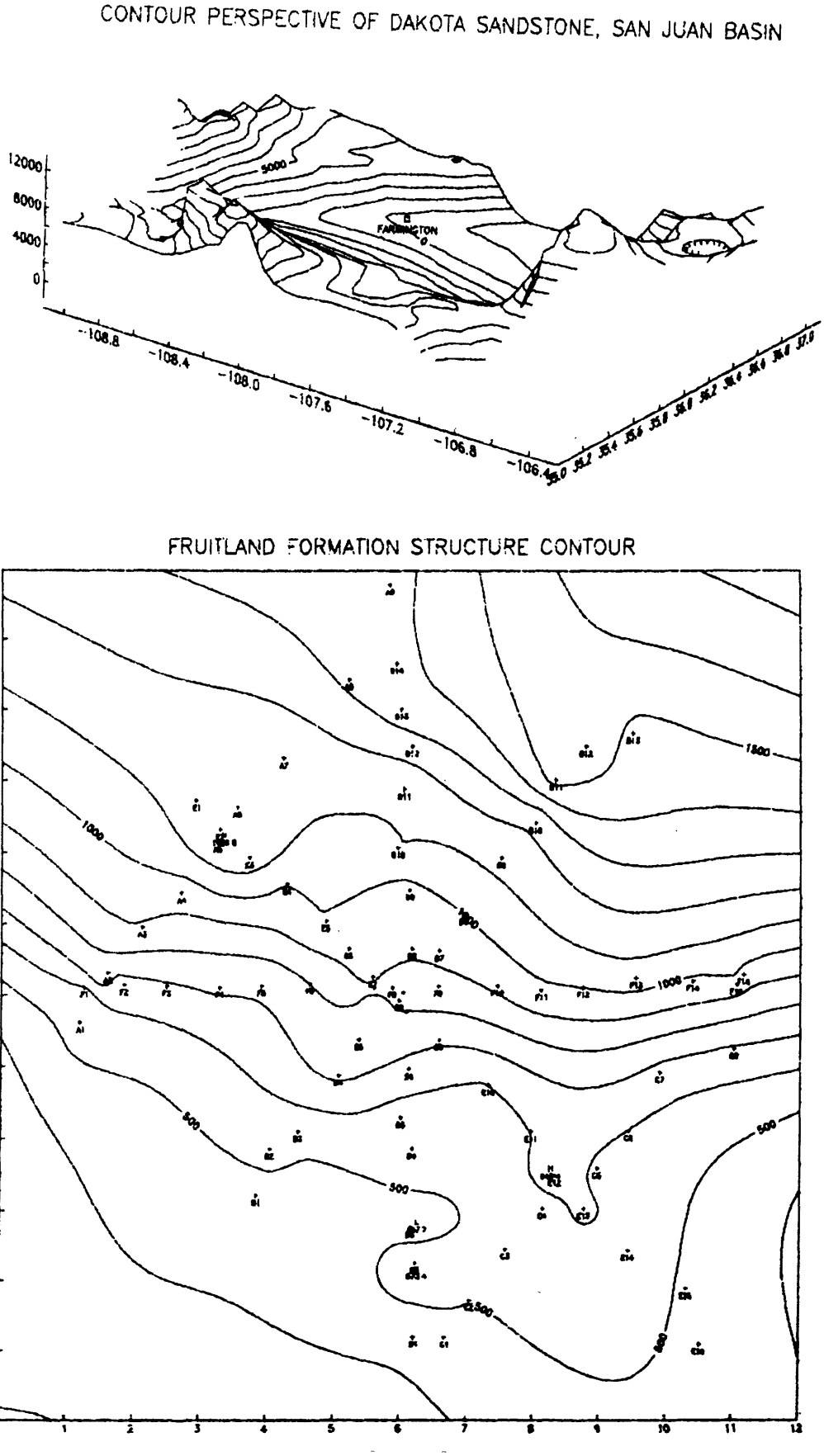


Figure 2. Graphic terminal screen print of a plotted contour perspective and a contour map. (Note: character size can be adjusted so that words numbers are more legible)

Example of creating a fence diagram using different patterns and colors.

```
Please wait. Scanning file directory for expired files.
No files have expired.
------------------ MAIN MENU - CAPABILITY OVERVIEW -----------------
1) OPTION SETTING          - SET, LOAD, SAVE, or RESET ISM options
     CONTOURING OPTIONS    - intervals, axis labels, scales, etc.
     PERSPECTIVE VIEWS     - axis labeling
     PEN OPTIONS           - light, bold, fault, mesh, text pen numbers
     GENERAL OPTIONS       - edit history, log file output
     MEASUREMENT UNITS     - inches, centimeters
2) FILE OPERATIONS
     List file directory   - overview files in ISM's directory
     Delete file           - delete file from ISM's and user's directory
     Deactivate file       - delete file entry from ISM's directory only
     Edit/create a file    - Text, graphic, or digitizer modes
     Display a file        - data or plot files
     Field operations      - on scattered data files
3) GRID CALCULATIONS
     Calculate std, trend, correction, or isopach grid, faults optional
     Grid operations       - grid/grid,grid/constant, poly fill, smoothing
4) PLOT MAP
     Set plotting mode     - CRT, plot file, or both
     Basemap               - plan view of data files
     Contour map           - plan (2D) view of surface contours
     Perspective views     - mesh or contour perspective and block diagram
     Cross section or fence diagram - sections through multiple layers
     Zoom/Pan mode         - zoom/pan on last crt plot displayed
5) VOLUMETRICS
     Calculate volumes     - n polygons cutting through up to ten layers
     Volumetrics report    - custom report writer for calculated volumes

   MAIN MENU
1) Option setting
2) File operations
3) Grid calculations
4) Plot map
5) Volumetrics
6) Exit ISM
   Which? 4

   PLOT MAP
The current plotting device is the graphic terminal.
1) Select plotting mode/new plot file
2) Base map
3) Contour map
4) Perspective view
5) Cross sections/fence diagram
6) Enter ZOOM/PAN processor
7) Return to MAIN MENU [default]
   Which? 5
```

Example of creating a fence diagram using different patterns and colors. (Continued)

```
   CROSS SECTIONS/FENCE DIAGRAM
1) Cross sections
2) Fence diagram
   Which? 2
Patterns to distinguish layers [default: no]? Y
Name of GRID1 file (L, list grids) [default: no more]: TUSH
Pattern types:
0 = Empty                          6 = Right and left slants
1 = Horizontal lines               7 = Broken horizontal lines
2 = Vertical lines                 8 = Rock pattern
3 = Left slanting lines            9 = Brick pattern
4 = Right slanting lines          10 = Slanting brick pattern
5 = Horz. and vert. lines         11 = Sharp waves
Pattern type below surface 1: 4
Pattern size factor [default: 1]: 1
Pen number (1 to 8) [default: 1]: 2
Name of GRID2 file (L, list grids) [default: no more]: TLSH3
Pattern types:
0 = Empty                          6 = Right and left slants
1 = Horizontal lines               7 = Broken horizontal lines
2 = Vertical lines                 8 = Rock pattern
3 = Left slanting lines            9 = Brick pattern
4 = Right slanting lines          10 = Slanting brick pattern
5 = Horz. and vert. lines         11 = Sharp waves
Pattern type below surface 2: 0
Pattern size factor [default: 1]: 1
Pen number (1 to 8) [default: 1]: 1
Name of GRID3 file (L, list grids) [default: no more]: TKF1
Pattern types:
0 = Empty                          6 = Right and left slants
1 = Horizontal lines               7 = Broken horizontal lines
2 = Vertical lines                 8 = Rock pattern
3 = Left slanting lines            9 = Brick pattern
4 = Right slanting lines          10 = Slanting brick pattern
5 = Horz. and vert. lines         11 = Sharp waves
Pattern type below surface 3: 7
Pattern size factor [default: 1]: .5
Pen number (1 to 8) [default: 1]: 4
Name of GRID4 file (L, list grids) [default: no more]: TKPC1
Pattern types:
0 = Empty                          6 = Right and left slants
1 = Horizontal lines               7 = Broken horizontal lines
2 = Vertical lines                 8 = Rock pattern
3 = Left slanting lines            9 = Brick pattern
4 = Right slanting lines          10 = Slanting brick pattern
5 = Horz. and vert. lines         11 = Sharp waves
Pattern type below surface 4: 8
Pattern size factor [default: 1]: 1
Pen number (1 to 8) [default: 1]: 2
```

Example of creating a fence diagram using different patterns and colors. (continued
(note: cross-section annotation file created also)

```
Name of GRID5 file (L, list grids) [default: no more]: TKL1
Pattern types:
0 = Empty                          6 = Right and left slants
1 = Horizontal lines               7 = Broken horizontal lines
2 = Vertical lines                 8 = Rock pattern
3 = Left slanting lines            9 = Brick pattern
4 = Right slanting lines          10 = Slanting brick pattern
5 = Horz. and vert. lines         11 = Sharp waves
Pattern type below surface 5: 7
Pattern size factor [default: 1]: 1.5
Pen number (1 to 8) [default: 1]: 3
Name of GRID6 file (L, list grids) [default: no more]: HB1
Pattern types:
0 = Empty                          6 = Right and left slants
1 = Horizontal lines               7 = Broken horizontal lines
2 = Vertical lines                 8 = Rock pattern
3 = Left slanting lines            9 = Brick pattern
4 = Right slanting lines          10 = Slanting brick pattern
5 = Horz. and vert. lines         11 = Sharp waves
Pattern type below surface 6: 0
Pattern size factor [default: 1]: 1
Pen number (1 to 8) [default: 1]: 2
Name of GRID7 file (L, list grids) [default: no more]: (CR)

NON-PIERCING SURFACE OPTION
Allow lower surfaces to pierce upper surfaces [default: no]? (CR)

ANNOTATION
Enter name of annotation file #1 (L, list files)
  [default: none]: FA2
Enter name of annotation file #2 (L, list files)
  [default: none]: (CR)
The cross section annotation file stores the location of the
traverse(s) for later plotting over another map.  This creates
a reference to where the surface was cut.
Name of cross section annotation file (L, list annotation files)
  [default: none]: CROSSANNO
Creating new file...
Enter file description: FENCE

   PROTECTION TYPE
1) None [default]
2) No delete
3) No modify/no delete
   Which? (CR)
You may specify a number of days this file is to be kept both
in the directory and on disk.  After this number of days, you
will be queried regarding whether or not you wish to delete
the file.  If not, you may extend its lifetime.
If you simply hit RETURN, the file will be kept indefinitely.
How many days do you wish to keep this file [default: forever]? (CR)
Starting, ending column for X [default: 1,10]: (CR)
Starting, ending column for Y [default: 11,20]: (CR)
```

Example of a cross-section annotation file (Continued)

```
PLEASE REVIEW THE FILE DEFINITION
File name:          CROSSANNO
Type:               annotation data
Description:        FENCE
Protection:         none
Created/Entered:    11/06/85
By:                 NANCY
Expiration date:    none
Field     Starting Ending Numeric
Name      Column   Column Field
---------------------------------
X              1      10   Yes
Y             11      20   Yes
Is the file definition OK [default: yes]? (CR)
Available line types are:
     1 = solid line          4 = medium dashes
     2 = bold line           5 = long dashes
     3 = short dashes
Line type for cross section annotation (1 to 5) [default: 5]: 1
Standard z-range (5% above highest and 5% below lowest point)
  [default: yes]? NO

Enter ZMIN,ZMAX (2 values): 0,2500
Reading grid...
              X               Y
--------------------------------
min         0.0000          0.0000
max        12.0000         12.0000
Number of traverses (1 to 10): 4
Number of coordinates in first traverse (2 to 10): 2
X1: 1.4
Y1: 5.6
X2: 5.9
Y2: 10.3
Number of coordinates in second traverse (2 to 10): 2
X1: 4.0
Y1: 3.5
X2: 8.0
Y2: 8.3
Number of coordinates in third traverse (2 to 10): 2
X1: 6.6
Y1: 1.3
X2: 10.3
Y2: 5.0
Number of coordinates in fourth traverse (2 to 10): 2
X1: 2.8
Y1: 8.8
X2: 10.3
Y2: 1.0
Enter fence diagram caption: FENCE DIAGRAM, SAN JUAN BASIN
Enter fence diagram size XWNLEN,YWNLEN (in inches): 12,12
```

Continued dialogue for creating a fence diagram and displaying an annotation file.

```
   PERSPECTIVE VIEWING POINT
THDINC is the angle (in degrees) of inclination for the line of sight.
       40 generally provides a good view.  Permitted values: -90.0 to 90.0
PHIDXY is the angle (in degrees) of the line of sight as measured in
       the x-y plane.  It is measured in a counterclockwise direction,
       where zero degrees is looking from the bottom of the grid.
       Angles 35 degrees from a principle axis (35,55,125,145,215,235,
       305 or 325) are recommended.  Permitted values: 0.0 to 360.0
Enter THDINC,PHIDXY [default: 40,35]: 60,0
An exaggeration factor of 1.0 defines the apparent Z range
to be 0.3 of the apparent X range.  This usaully results
in a map that is properly scaled.
Enter exaggeration factor [default: 1]: 4
Send job to batch queue [default: no]? Y
Batch requires a seperate plot file for each job.
Name of plot file (L, list plot files): FENCE
Enter file description: DEMO

   PROTECTION TYPE
1) None [default]
2) No delete
3) No modify/no delete
   Which? (CR)
You may specify a number of days this file is to be kept both
in the directory and on disk. After this number of days, you
will be queried regarding whether or not you wish to delete
the file. If not, you may extend its lifetime.
If you simply hit RETURN, the file will be kept indefinitely.
How many days do you wish to keep this file [default: forever]? (CR)


   BATCH QUEUES
1) DEFAULT ((UNLIMITED CPU TIME))
2) QUEUE1 ( (CPU TIME 60 SEC))
3) QUEUE4 ( (UNLIMITED CPU TIME))
   Which? 3

Job "JOB047.BAT" was submitted to queue "QUEUE4".


   MAIN MENU
1) Option setting
2) File operations
3) Grid calculations
4) Plot map
5) Volumetrics
6) Exit ISM
   Which? 2

   FILE OPERATIONS
1) List file directory
2) Delete file
3) Edit/create file
4) Field operations
5) Deactivate file
6) Display file
7) Return to MAIN MENU [default]
   Which? 6

DISPLAY FILE
Enter filename to display (L, list files): CROSSANNO
```

his is a display of the cross-section annotation file that was created in the fence diagram Figure 12.

```
File name:          CROSSANNO
Type:               annotation data
Description:        FENCE
Protection:         none
Created/Entered:    11/06/85
By:                 NANCY
Expiration date:    none
Field     Starting Ending Numeric
Name      Column   Column Field
---------------------------------
X              1      10   Yes
Y             11      20   Yes
Enter starting column for list [default: 1]: (CR)
   1:SRFLNE   1
   2:      1.40      5.60
   3:      5.90     10.30
   4:SRFLNE   1
   5:      4.00      3.50
   6:      8.00      8.30
   7:SRFLNE   1
   8:      6.60      1.30
   9:     10.30      5.00
  10:SRFLNE   1
  11:      2.80      8.80
  12:     10.30      1.00
Type "Q" to quit [default: continue]: (CR)
(There are 12 lines in the file)

   FILE OPERATIONS
1) List file directory
2) Delete file
3) Edit/create file
4) Field operations
5) Deactivate file
6) Display file
7) Return to MAIN MENU [default]
   Which? 7

   MAIN MENU
1) Option setting
2) File operations
3) Grid calculations
4) Plot map
5) Volumetrics
6) Exit ISM
   Which? 6

EXIT INTERACTIVE SURFACE MODELING
```

GRAPHIC TERMINAL SCREEN PRINT

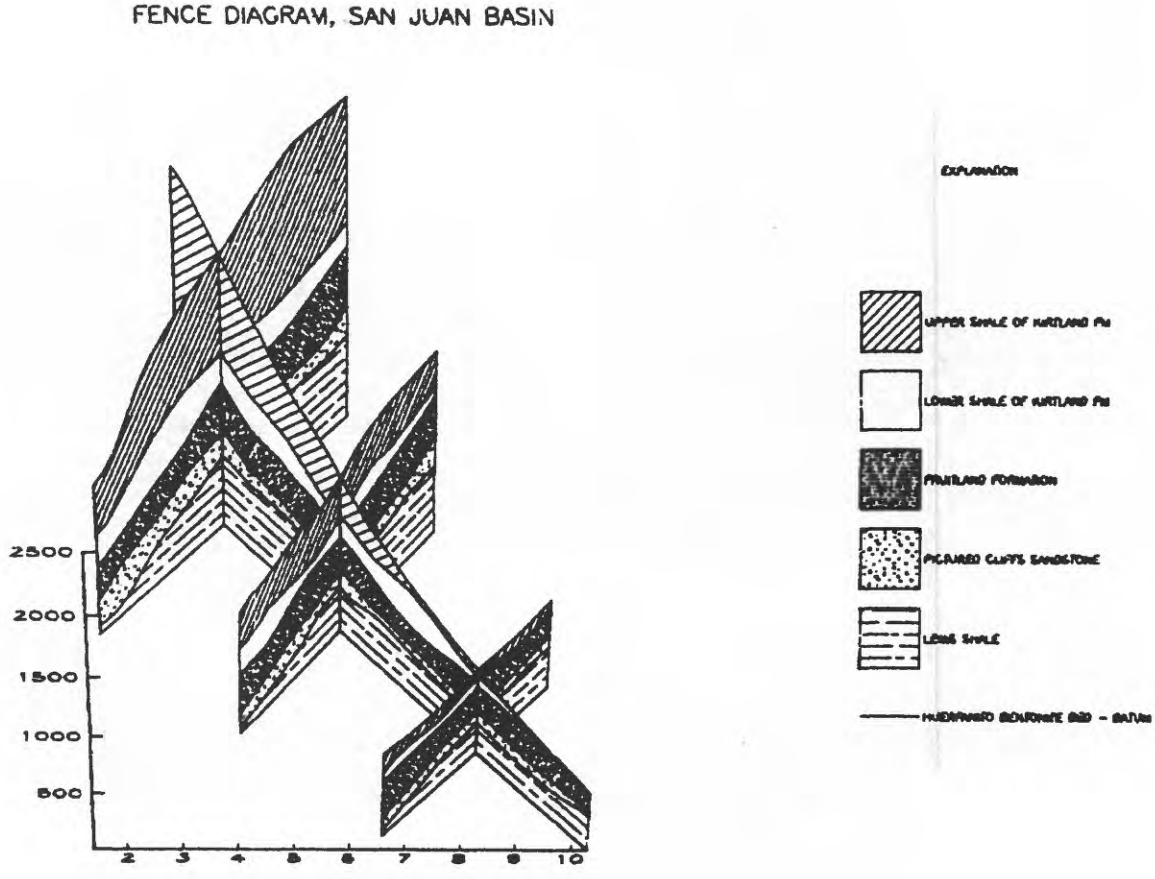


Figure 3. Graphic terminal screen print of a fence diagram

FILE OPERATIONS

In addition to the regular PRIMOS SYSTEM operator file ISM offers various file maintenance aids.

Expired Files

Files with assigned expiration dates will not be deleted by ISM automatically. Each time a user enters ISM the program will scan the file directory for expired files. It will then print the file name, type, descriptors, and other items, and then ask the user if the file should be deleted. The user then types "Y" or "N". If the answer is no the program will ask for a new expiration date and then proceed to the main menu; if the answer is yes the program will delete the history files and then will proceed to the main menu.

Delete / Deactivate Files

Users should clean up their file directory often. To delete a file go to File Operations, then press Delete file and give file name. ISM will display the file name, file type description, etc. and ask if the file should be deleted. If the file is a grid, ISM will also display grid size, grid range, and the scattered data set that the grid was calculated from.

If a user would like to store a file outside of ISM to be used at another date go to Deactivate File. If the user wants to recreate the same file later on go to Edit/Create and give the previous name of the file. At this point ISM asks for the file type whether it be a scattered data, polygon, grid or other. Choose the file type, press carriage return and ISM will display that file again.

Graphic Editing

To use the graphic editor go to Edit/Create under File Operations. Give the file name and answer "Y" to graphic edit. The terminal will plot the file onto the screen and list the editing commands. The commands are different for each file type. To use the commands the user must be on a graphic terminal that has the cross-hair feature. Place the cross-hairs in the command box, For example, "+ add polygon" press the space bar once and press the carriage return once. To exit the graphic editor place the cross-hairs in the exit file box, press the space bar once, and press the carriage return once. ISM will ask if the user wants to save the file or not. At this point ISM will update the file changed, enter the newly created file or do nothing to the users directory.

Using Pacer as a link to ISM

Pacer is the data base management system that operates and stores the NCRDS data bases. A Pacer file may be formatted in Pacer using USTRAT data for use in ISM. Two files, named DGZ.FMT and FMTZ1Z2, must first be copied into the users directory from <USNC>OPUNIT>MFJOHNSON>ISMJUNK>FILENAME. DGZ.FMT contains formulas of 14 new variable definitions that will be used in the formatted listing FMTZ1Z2. FMTZ1Z2 formats a listing for the point id, longitude, latitude, surface elevation, and elevations at the top and base of the stratigraphic unit to be used in ISM. In the following example, the user has previously searched the USTRAT data base for the Upper Freeport coal bed and created a file of 14 records named UPFREE. The DEFINE command is called and the DGZ.FMT file is read in, then the "LIST" command is called and the FMTZ1Z2 file is read in. The resultant list file is ready for input to ISM.

ISM will ask for the following information regarding this file:

Field Name	Starting Column	Ending Column	Numeric field
point id	02	17	No
X (longitude)	19	27	Yes
Y (latitude)	29	36	Yes
surfelv	38	44	Yes
top	46	52	Yes
base	54	60	Yes

Consult "Edit/Create Scattered Data File dialogue" under File Operations.

```
OK, LD

<BCRUSE>MDCARTER>DCISM (ALL access)
110 records in this directory, 110 total records out of quota of 0.

28 Files.

AMES.SP             AMES1               AMES2               AMESCOMB
AMESG               AMESISM             AMESPLUS14.SP       AMESSRFG
AMESTEST            AMESTESTBASE        AMESTESTTOP         BC.SP
BCISM               BEDS3Z.SI           CAPISM91.SP         CRAWISM
CRAWISMSE           DGZ.FMT             FMTZ1Z2             FMTZ3Z4.SF
FMTZ5Z6.SF          INDEX               ISM.TOC             MDC.DEF
ONELINE.CPL         PCRTOISM.DOC        UFISM               UPFREE

OK, PACER
PRESS CARRIAGE RETURN25
ENTER DATABASE NAME: USTRAT



ENTER COMMAND:  DEFINE
 ENTER LIST OF NEW VARIABLE DEFINITIONS
 1. READ DGZ.FMT
  1. ILAT=INT(LATITUD/1000)
  2. RLAT=LATITUD/1000
  3. LATD=INT(ILAT/10000)
  4. LATM=INT((ILAT-LATD*10000)/100)
  5. LATS=RLAT-INT(LATD*10000+LATM*100)
  6. DDEGLAT=(LATD*3600+LATM*60+LATS)/3600
  7. ILONG=INT(LONGTUD/1000)
  8. RLONG=LONGTUD/1000
  9. LONGD=INT(ILONG/10000)
 10. LONGM=INT((ILONG-LONGD*10000)/100)
 11. LONGS=RLONG-INT(LONGD*10000+LONGM*100)
 12. DDEGLON=-(LONGD*3600+LONGM*60+LONGS)/3600
 13. ZTOP=SURFELV-(FROM/12)
 14. ZBOT=ZTOP-(THK/12)
15.



ENTER COMMAND:  LIST
FILE: UPFREE
LINES/PAGE: 50
PRESS RETURN KEY TO CONTINUE ,A TO ABORT.
C, F, OR R : F
OUTPUT TO DISK? Y
DISK FILE NAME: UPFREEL
DO YOU WISH HEADINGS OUTPUTTED TO THE DISK FILE?N
ENTER THE LIST OF ITEM NAMES.

1.  .STORED FMTZ1Z2
7.
```

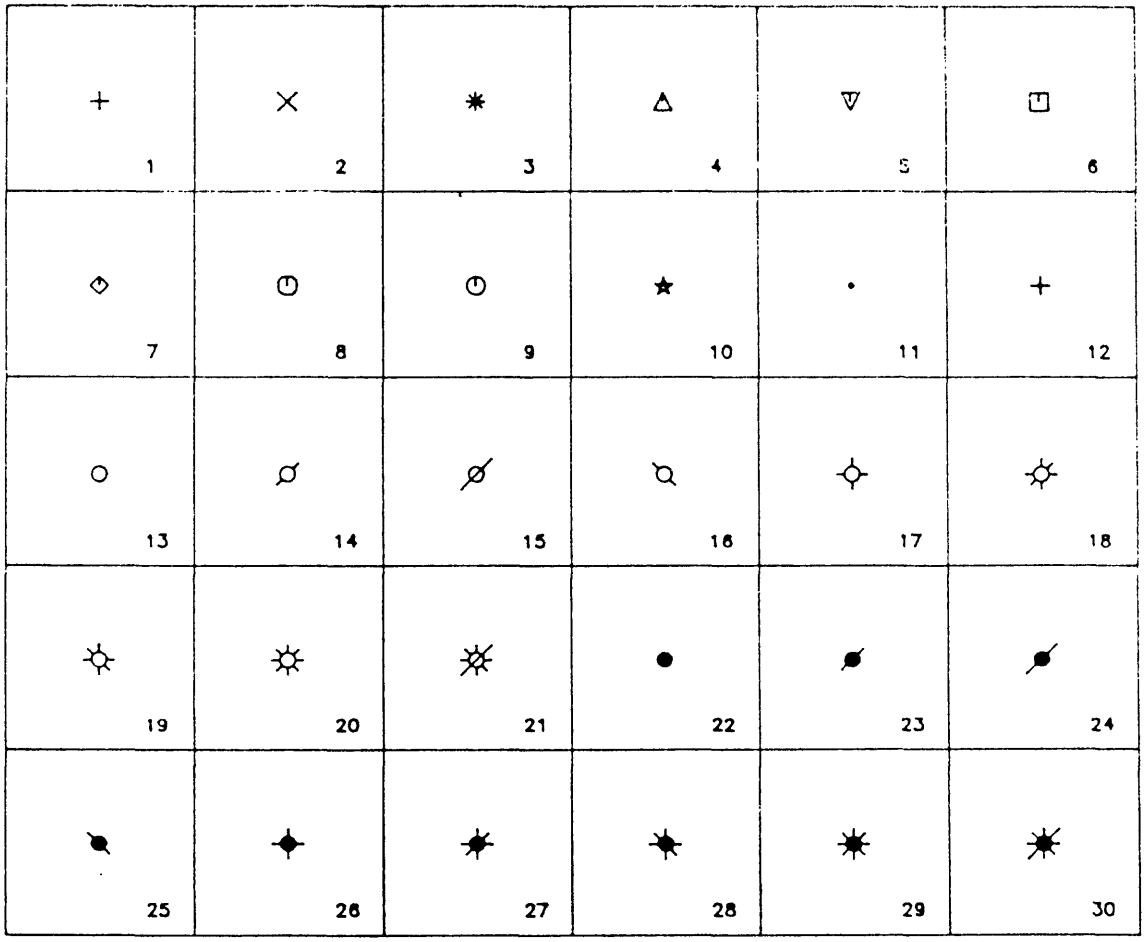
```
ENTER COMMAND:  QUIT
OK, LD

<BCRUSE>MDCARTER>DCISM (ALL access)
111 records in this directory, 111 total records out of quota of 0.

29 Files.

AMES.SP             AMES1               AMES2               AMESCOMB
AMESG               AMESISM             AMESPLUS14.SP       AMESSREG
AMESTEST            AMESTESTBASE        AMESTESTTOP         BC.SP
BCISM               BEDS3Z.SI           CAPISM91.SP         CRAWISM
CRAWISMSE           DGZ.FMT             FMTZ1Z2             FMTZ3Z4.SF
FMTZ5Z6.SF          INDEX               ISM.TOC             MDC.DEF
ONELINE.CPL         PCRTOISM.DOC        UFISM               UPFREE
UPFREEL

OK, SLIST UPFREEL
 8-P                -82.6828  38.2722 1030.00  478.25  478.25
 15-P               -79.8922  39.2403 1660.00 1345.50 1343.04
 15-P               -79.8922  39.2403 1660.00 1342.96 1341.92
 16-P               -79.8901  39.2204 1800.00 1324.00 1320.00
 17-P               -79.9032  39.2185 1660.00 1319.08 1318.08
 18-P               -79.9125  39.2189 1770.00 1367.33 1364.79
 18-P               -79.9125  39.2189 1770.00 1364.79 1364.67
 18-P               -79.9125  39.2189 1770.00 1364.67 1363.67
 19-P               -79.9039  39.2270 1735.00 1307.75 1306.33
 20-P               -79.9407  39.1955 1860.00 1547.33 1547.00
 20-P               -79.9407  39.1955 1860.00 1547.00 1544.50
 20-P               -79.9407  39.1955 1860.00 1544.50 1543.83
 13-P               -80.2664  39.3809 1030.00  455.29  455.29
 R-56               -81.9333  38.9333  590.00  -23.00  -23.33
OK, LOGOUT
```

This report was written to show potential users the step by step instructions on how to use the Interactive Surface Modeling Program owned by the National Coal Resource Data System of the U.S. Geological Survey.

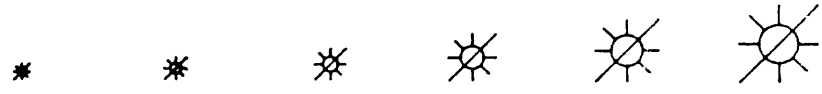
The program was designed by Dynamic Graphics, Inc. (address on page 1), and is currently being updated. Updated information will be available to users upon request.

APPENDIX I

SYMBOL TABLE



Symbol Size



PATTERN TYPES:

0 = EMPTY
1 = HORIZONTAL LINES
2 = VERTICAL LINES
3 = LEFT SLANTING LINES
4 = RIGHT SLANTING LINES
5 = HORZ. AND VERT. LINES
6 = RIGHT AND LEFT SLANTS
7 = BROKEN HORIZONTAL LINES
8 = ROCK PATTERN
9 = BRICK PATTERN
10 = SLANTING BRICK PATTERN
11 = SHARP WAVES

PATTERN SIZES:

.5(Smallest), 1.0, 1.5, 2.0, 3.0(Largest)

CHARACTER SET

ABCDEFGHIJKLMNOPQRSTUVWXYZ1234567890,.()—+*/=$

abcdefghijklmnopqrstuvwxyz

Character Size