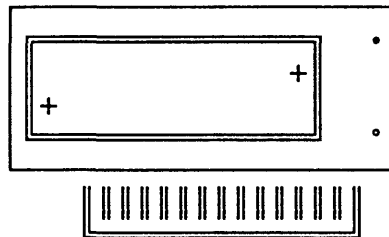UNITED STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

GSDEDIT and GSMEDIT, SCREEN EDIT PROGRAMS FOR GSDRAW AND GSMAP DATA BASES
USING A MICROCOMPUTER (IBM PC OR COMPATIBLE)

by
Gary I. Selner[1], and Richard B. Taylor[1]

Open-File Report 90-250 Documentation and program disk

DISCLAIMER

[1] Denver, Colorado

April 1990

GSDEDIT and GSMEDIT are programs for editing GSDRAW and GSMAP data bases. Editing is done on the screen using the keyboard of the microcomputer. The functionality of these programs is similar to that of the edit sequence in Option 3 of GSMAP Version 6.0, but a digitizer is not required. Entries or points can be deleted, points moved, CODE, PARA1=P1 and PARA2=P2 changed for entries, and lines broken into segments. Familiarity with GSDRAW and GSMAP Version 6.0 and availability of the documentation for this program is assumed.

System requirements

GSDEDIT and GSMEDIT require an IBM PC or compatible microcomputer with at least 512 Kbyte random access memory operating under DOS 2.0 or higher, and a graphics adapter and monitor. Although CGA graphics can be used, CGA resolution is not satisfactory for certain editing functions; EGA or VGA graphics are required for accurate editing. Monochrome Hercules graphics can also be used.

Reference

Selner, Gary I., and Taylor, 1988, Richard B, GSDRAW and GSMAP system Version 6.0: Graphics programs for the IBM PC and compatible microcomputers to assist compilation and publication of geologic maps and illustrations: U.S. Geological Survey Open-File Report 89-373A, documentation and tutorial, 156 p., and 89-373B, five executable program disks.

INTRODUCTION

Purpose

GSDEDIT and GSMEDIT are programs for editing GSDRAW and GSMAP data bases. Editing is done using the screen and the keyboard of the microcomputer. These programs have much the same function as the edit sequence (Option 3) of GSMAP Version 6.0 but do not require use of a digitizer. Entries or points can be deleted, points moved, CODE, PARA1=P1 and PARA2=P2 changed for entries, and lines broken into segments. Familiarity with GSDRAW and GSMAP Version 6.0 and availability of the documentation for this program (Selner, G. I. and Taylor, R. B., 1989) is assumed here.

System requirements

GSDEDIT and GSMEDIT require an IBM PC or compatible microcomputer with at least 512 Kbyte random access memory operating under DOS 2.0 or higher, and a graphics adapter and monitor. Although CGA graphics can be used, CGA resolution is not satisfactory for certain kinds of editing. EGA or VGA graphics are required for accurate editing. Monochrome Hercules graphics can also be used, see p. 9.

Required files

Program files
    GSMEDIT.EXE (for GSMAP data bases) and GSDEDIT.EXE (for GSDRAW data bases).

Configuration file
    The screen configuration file CONFIG.SCR must be configured to match the graphics adaptor and monitor.

Data base files
    Data base files DATABASE.LSF and DATABASE.NDX from GSDRAW or GSMAP are required for the data base being edited. Because these files are modified during editing we recommend that backup copies be made before editing is started.

Projection files
    Files containing map projection parameters (projection files) are required for GSMEDIT. These files are the same as those required by GSMAP Version 6. Map projections and the contents of projection parameter files are described, pages 10-14.

Installation

Copy files on the release disk to a working disk or to an appropriate subdirectory on a hard disk. Operation on a hard disk is urged if large data bases are to be edited. The file CONFIG.SCR must be configured to match the graphics adapter and monitor of the host system. This file is the same as the CONFIG.SCR file required for GSDRAW/GSMAP Version 6. For details see p. 9. Certain RAM resident programs create difficulties with the use of these edit programs, test if you wish but stay alert for possible problems.

Zoom and windowing

During editing a section of a map can be enlarged on the screen by windowing that area just as in GSMAP and GSDRAW. The term zoom and the factors XZM and YZM are used to describe the degree of enlargement on the screen created by windowing during editing. When opening a data base the program scales the screen graphics to best fit the screen window. The XZM and YZM zoom factors (for X and Y respectively) are defined as 1 at this point. The amount of zoom introduced by windowing is calculated as linear magnification relative to this first display scale. Zoom factors are limited to enlargement less than 500, in X and Y (XZM and YZM). This limit was established to avoid numerical overflow that can occur if unlimited zoom is allowed. During editing the screen display will show the XZM and YZM factors as well as familiar GSDRAW/GSMAP information on CODE, P1, and P2 for selected entries.

Example of scaling and zoom factors

A data base with the dimensions of a 1° X 2° quadrangle is first displayed on the screen at about 1:1,000,000 scale. If the XZM and YZM factors are adjusted to 2, by windowing, the linear scale is about 1:500,000, and one fourth of the area is shown on the screen. For precise matching of points with a data base of these dimensions, XZM and YZM factors in the range 300-400 are required. The required zoom factor is dependent on the dimensions of the data base: the smaller the dimensions, the lower the required zoom.

Resolution

Increments of cursor position on the monitor are quantized to pixel positions at the time of editing, as for example when entering the new position for a point that is to be moved. Enlargement on screen created by windowing is essential to accurate editing.

Cursor movement and resolution:

The cursor can be moved either in Fast mode or Slow mode using the arrow keys on the numeric keypad. In fast mode the cursor moves in 20 pixel increments, in slow mode, one pixel at a time. The precise positioning required for editing such as selection of a new position for a point should always be done using the slow mode.

Selection Criteria

selection of an entry for edit can include examination of all entries regardless of code, or of a single code can be examined. The prompt ENTER CRITERIA calls either for entry of the code of the desired entry or of A for all, so that the selection process will select from all codes in the data base. Enter either the code of the desired entry or A = all to select from entries of all codes. Specification of a particular code may greatly speed the identification process.

2

OPERATION

The program file GSDEDIT or GSMEDIT and the configuration file CONFIG.SCR should be on the active drive of the microcomputer. Start one of these programs by entering **GSMEDIT** or **GSDEDIT**. Data bases on the default drive will be listed on the screen. The first prompt will call for entry of the name of the data base to be edited:
ENTER DATA BASE NAME

Enter the name of the data base to be edited. Enter the name of the data base without file extension(s). The screen will then display the title of the data base and the coordinates of the corners of the data base. The next prompt will differ for GSDEDIT and GSMEDIT. This is indicated below.

```
GSDEDIT                         GSMEDIT
                                ENTER FILENAME OF PROJECTION PARAMETERS


ENTER EDIT DISTANCE (0.1):      ENTER EDIT DISTANCE IN METERS (30):
Default of .1" works well       The default distance of 30 meters is works well for 1:24,000 quads
except for very close work      300 meters usually is better for 1:250,000 quadrangles
```
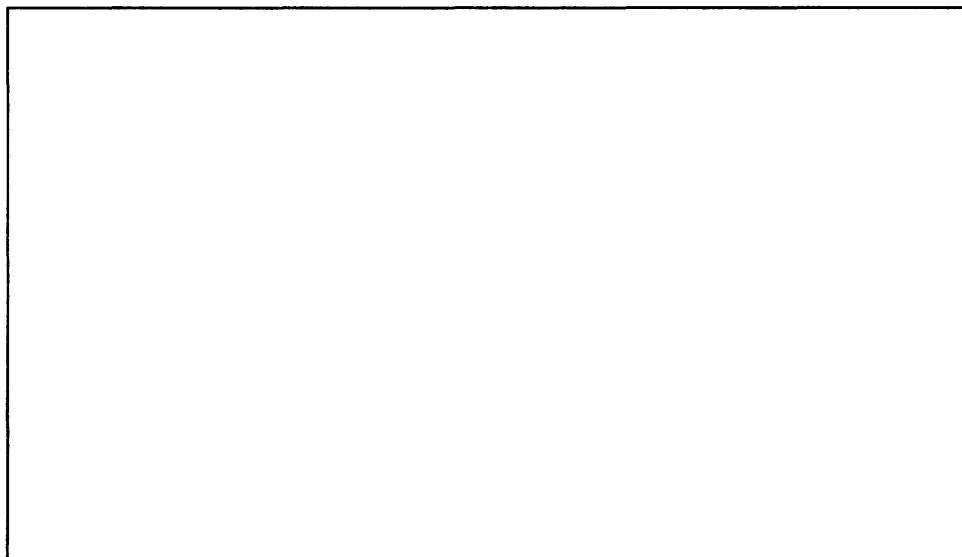
The edit distance is a specification of the maximum distance that the cursor can be from an entry to select it. Entries farther from the entry than the edit distance will not be identified. In GSDRAW data coordinates are usually in inches. For these data bases the specification of edit distance in GSDEDIT is in inches relative to the original drawing. GSMAP data bases use latitude, longitude coordinate values and GSMEDIT edit distances are measured in terms of distance on the surface of the Earth (meters). The default values for the edit distance are entered by hitting the **Enter** key.

After entry of the edit distance the data in the data base will be drawn on the screen inside a box. Information on the right side of the screen prompts steps in the edit process. The screen will appear as below. Entry of C=EXIT will return operation to the DOS prompt.

```
                                                    EDIT

                                                    SELECTION
                                                    CRITERIA

                                                    ---by---
                                                       CODE
                                                    ---or---
                                                       A

                                                    B=WINDOW
                                                    C=EXIT
                                                    D=PREV
                                                    E=RESTART

                                                    X ZM.   1
                                                    Y ZM.   1


ENTER CRITERIA:
```

If you want to end the process of drawing on the screen before all data has been displayed, hit the F9 key, then the Q key, and proceed with editing.

The X ZM. 1 Y ZM. 1 annotations on the screen are the initial X and Y zoom factors (defined as equal to 1 at the start of editing.

Responses to the <u>ENTER CRITERIA</u> prompt are made by typing the appropriate reply, then hitting the ENTER key. Many other responses do not require use of the ENTER key. Watch prompts and information messages carefully.
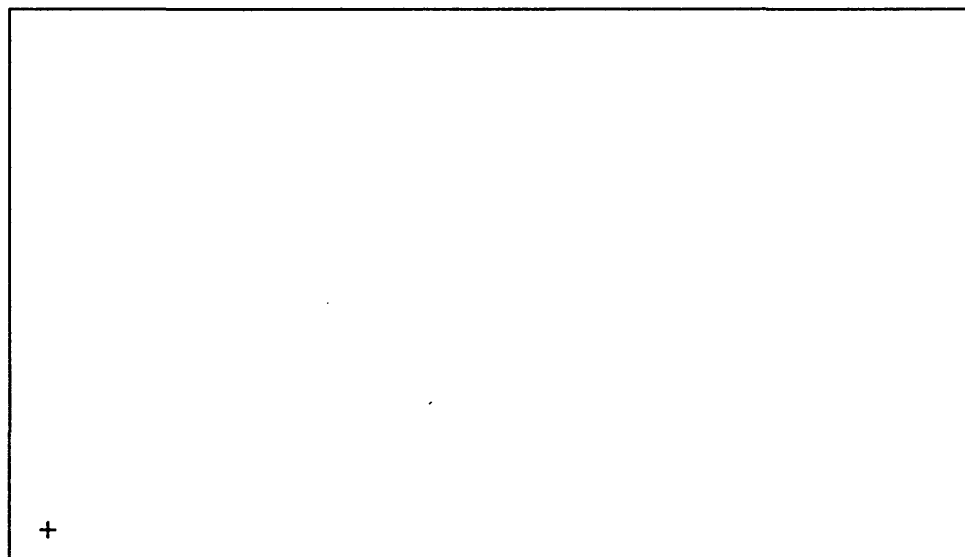
Windowing

Enter **B** (type B then hit the ENTER key) at the ENTER CRITERIA prompt to window. As increments of position are limited to one pixel on the screen at time of editing, windowing is essential for precise editing. After entering **B** a + sign will appear on the screen near the lower left corner of the edit window. The + sign is the cursor. It is moved from the initial position using the arrow keys on the numeric keypad:
→ right, ← left, ↑ up, ↓ down.

Fast or slow cursor movement.
The F (fast) or S (slow) keys changes the speed of movement of the cursor between the fast and slow modes. Cursor movement starts using 10 pixel increments. In fast mode the cursor moves in 20 pixel increments; in slow mode, one pixel at a time. Precise adjustments always should be made in <u>slow</u> mode. The screen will appear as below, with the prompt ENTER LOWER LEFT CORNER positioned below the left corner of the window box.

Setting the window

```
                                                    EDIT

                                                    SELECTION
                                                    CRITERIA

                                                    ---by---
                                                       CODE
                                                    ---or---
                                                       A

                                                    B=WINDOW
                                                    C=EXIT
                                                    D=PREV
                                                    E=RESTART


                                                    X ZM.   1
                                                    Y ZM.   1
  +
```

ENTER LOWER LEFT CORNER

Move the cursor to the lower left corner of the desired window using the arrow keys: hit the ENTER key to establish the position of the lower left corner of the window. This will bring a second cursor + to the upper right corner of the window box and the prompt:
ENTER UPPER RIGHT CORNER

4

Move the second cursor to the upper right corner of the desired window using the arrow keys, and when properly positioned, hit the ENTER key to establish the position of the upper right corner of the window. Data in the data base inside the window will be then be plotted on the screen. The proportions of the window box will change to correspond to the window specified. Windowing should be continued until the desired degree of zoom has been obtained for the editing task at hand. The screen will request entry of **CRITERIA**. Repeat windowing until the desired field is shown. For large data bases each windowing step takes time. On a complete geologic map of a 7 1/2 minute quadrangle, plotting to the screen using GSMEDIT took about 3 1/2 minutes running on an XT from the hard disk. The + cursors will move outside the boundary of the screen window; this allows increasing the size of the windowed area. The cursors are not plotted on the screen when outside the screen display window but their positions are in effect. The box outlining the screen window will be blanked out at the location crossed by the cursor as it leaves view. In this way windowing can be used to slightly increase the size of the windowed area. The E restart function generally offers the best way to increase the size of a window.

```
                                              EDIT

                                              SELECTION
                                              CRITERIA

                                              ---by---
                                                 CODE
                                              ---or---
                                                 A

                                              B=WINDOW
                                              C=EXIT
                                              D=PREV
                                              E=RESTART

                                           X  ZM.   129
                                           Y  ZM.   242
```
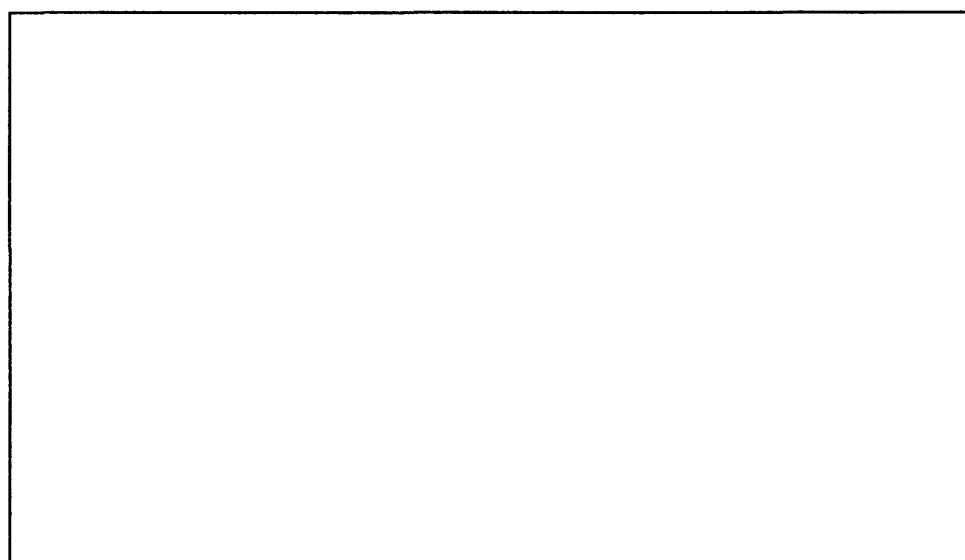
ENTER CRITERIA:

After windowing, proceed with editing, and at the ENTER CRITERIA prompt enter the code of the entry to be edited or A to select from all codes. Entry of D selects the code of the previous selection (code 1 at the opening of the editor). After entry of the criteria (code) a cursor + will appear near the lower left corner of the window box and the prompt will then call for the identification of the entry to be edited:

IDENTIFY ENTRY

Move the cursor + to a position on the entry, hit the ENTER key. The selected entry will be highlighted on the screen using high intensity white on a color monitor, and the screen will change to show the EDIT FUNCTIONS and display the CODE, P1, and P2 for the selected entry.

A=MOVE PT
B=BREAK
C=CHANGE
D=DELETE
E=EXIT

X ZM. 111
Y ZM. 92

ENT   4
CODE 1
P1 0
P2 0
PTS= 6

ENTER FUNCTION

Enter the edit function desired.

Edit functions

Enter A=MOVE PT if you wish to move a point from one position to another, e.g. to make the ends of two lines meet. By using this option single points can be moved new positions. To move several points of multi-point entries, move points one at a time.

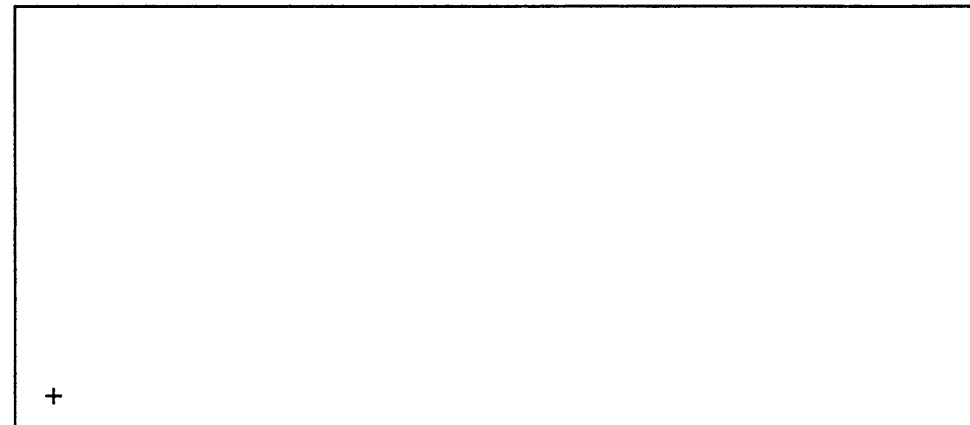Enter B=BREAK to break a line into two segments.

Enter C=CHANGE to change code, P1, or P2 for an entry.

Enter D=DELETE to delete a point or an entry.

Enter D=PREV to return to the previous screen.

Enter E=RESTART to go back to the first screen, as for example when editing has been completed using one window and you wish to return to the starting screen so that a different window can be set.

The sequence of operations depends on the function selected. If A (move a point) is selected the next screen allows a particular point on a multi-point entry to be selected so that its position can be changed. The point is selected by moving the cursor to the point:

```
                                                    EDIT
                                                    FUNCTIONS

                                                    A=ADV PT
                                                    B=BCK PT
                                                    C=CONFIRM

                                                    E=EXIT




                                                    X ZM.    111
                                                    Y ZM.     92

  +                                                 ENT    4
                                                    CODE   1
IDENTIFY POINT                                      P1   0
                                                    P2   0
                                                    PTS        6
                                                    PT=1
```

Move the cursor to the point desired. The A (advance a point) and B (backup a point) keys can be used to move the cursor from one point to another on a multi-point entry. When the proper point has been identified hit the ENTER key, then confirm using the C key.

The next prompt will call for entry of the revised position for the selected point:
ENTER NEW POINT

Move the cursor to the new position for the point, and when properly positioned hit the ENTER key. If correct confirm by hitting the C key. Coordinates for new position will be substituted for the original coordinates in the data base. Operation of the other edit functions is accomplished in much the same way as that described above.

During an editing session entries that have been edited will remain highlighted so that you can keep track of the editing that has been done. Refreshing the screen to remove the highlighting can be done using the window function.

Editing polygons

Only the exterior polygons for entries codes 400-499 are drawn on the screen. Editing other than changing parameters of complex polygons with both exterior and interior polygons should be avoided. It's easy to make mistakes. If you insist it is possible to separate an exterior and interior polygon into separate polygons and edit the outlines. To do this change the code of the entry from a 400-499 code to a 1-99 code. The edit program will then show the exterior and interior polygons connected by straight line segments. Editing can be done if the first and last points of external and interior polygons are not moved or deleted. To separate an exterior polygon from an internal polygon change the code to that of a line, then break the line segment connecting the two polygons near its center. Then delete the remaining segments of the line that formerly connected the two polygons by deleting the break points from each entry.

CONFIG.SCR

The CONFIG.SCR file must be configured to match the graphics adapter and monitor of the system.

For CGA color or monochrome the file consists of one line:
"CGAC"

For EGA monochrome the file consists of one line:
"EGAM"

For EGA or VGA color the file consists of a series of lines. The first line configures the system for EGA/VGA color, each succeeding line contains a code number, a comma, and a color number. These lines specify colors from a list of 16 (15 plus background=black). An example is printed below (the list of colors is not a part of the file). Highlighting uses color #15, thus would not create a change for an code using color #15.

```
"EGAC"              Specifies EGA color (change to "VGAC" for VGA color)
1,1                 Color #1=Blue
2,2                 Color #2=Green
4,3                 Color #3=Cyan
5,4                 Color #4=Red
8,5                 Color #5=Magenta
9,6                 Color #6=Brown
11,7                Color #7=White
300,8               Color #8=Gray
301,9               Color #9=Light Blue
400,10              Color #10=Light Green
401,11              Color #11=Light Cyan
500,12              Color #12=Light Red
201,13              Color #13=Light Magenta
202,14              Color #14=Yellow
205,15              Color #15=High Intensity White
206,0                Color #0=Black
```

If a code is used, but the color for this code is not specified in the CONFIG.SCR file, the default color is #1=Blue. The file supplied on the release disks named CONFIG.SCR is a sample file that can be used with EGA color systems or VGA color in EGA mode.

For Hercules monochrome the CONFIG.SCR file consists of one line:
"HERM"

If monochrome Hercules graphics are to be used, before starting GSMEDIT or GSDEDIT the system must be "set up" using the QBHERC.COM file included on the release disk. At the DOS prompt enter QBHERC. Then enter GSMEDIT or GSDEDIT to start the edit program.

MAP PROJECTIONS

Map projections and USGS practice are described (Snyder, 1982, 1987), in U.S.Geological Survey Bulletin 1532 and Professional Paper 1395. Information on the map projection is given in marginal notes on USGS maps, but the data on the parallels and meridian used to prepare the map is not provided. The summary below should help, but please read the original by Snyder. This bulletin and the Professional Paper answer questions you should have. Unless otherwise stated on the map margin or in the Snyder reports, use the Clarke 1866 Ellipsoid.

Small Scale Maps

Maps labeled Albers Equal-Area projection

When used for maps of the 48 conterminous states, the standard parallels are 29,30,0,N degrees and 45,30,0,N . The central meridian is 96,0,0,W.

For maps of Alaska, the standard parallels are 55,0,0,N degrees and 65,0,0,N degrees. The central meridian is 154,0,0,W.

For maps of Hawaii, the standard parallels are 8,0,0,N and 18,0,0,N. The central meridian is 157,0,0,W.

Maps labeled Lambert Conformal Conic

The Lambert conformal conic is used by the USGS for a map of the US showing all 50 states in true relative position. This map has been issued at scales of 1:6,000,000 and at 1:10,000,000. For this map the standard parallels are 37,0,0,N and 65,0,0 N. The central meridian is the line of longitude at the center of the sheet.

Maps labeled Transverse Mercator
In 1979 a spherical form of the Transverse Mercator was chosen for a base map of North America at a scale of 1:5,000,000 for tectonic and other geologic maps. The scale factor along the central meridian of 100,0,0,W longitude is reduced to 0.926.

State Scale Maps (1:500,000)

For the 500,000 scale base maps of the 48 contiguous states, the Lambert Conformal Conic projection was used. The standard meridian is the line of longitude central to the map.

1 x 2 Degree Maps (1:250,000)

Maps labeled Transverse Mercator
Army Map Service (AMS) 1 degree by 2 degree sheets use the Transverse Mercator projection. The principal meridian is the line of longitude central to the map.

Maps labeled Universal Transverse Mercator (UTM)
The UTM projection will be used by the USGS for 1 x 2 degree sheets as it updates the AMS series. The proper central meridian can be determined either by using tables listing the central meridian for the UTM Zone or by locating the nearest line of longitude of whole number of degrees that is divisible by 3 but not by 2.

30' x 60' Maps (1:100,000)

For all new 30 minute by 60 minute quadrangles, the UTM projection is used. The proper central meridian can be determined either by using tables listing the central meridian for the UTM Zone or by locating the nearest line of longitude of whole number of degrees that is divisible by 3 but not by 2.

Maps labeled Polyconic
Many 15 minute quadrangle maps have been drawn using the Polyconic projection. The central meridian is the line of longitude central to the map.

7 1/2' Quadrangles (1:24,000)

Maps labeled Polyconic
Many 7 1/2 minute quadrangle maps have been drawn using the Polyconic projection. The line of longitude central to the map can be used as the central meridian. The actual central meridian may be a line along the edge but the difference is negligible.

Maps labeled Lambert or Transverse Mercator
Beginning in the late 1950's the USGS began using projections that were based on the parameters that serve as the basis of the State Plane Coordinate system. Depending on the state, the projection will be either Lambert Conformal Conic, Transverse Mercator or Oblique Mercator (panhandle of Alaska only). USGS Bulletin 1532 (Snyder, 1982) presents an excellent description of the basis of the SPCS and the projection that is used for each State. This Bulletin also describes in Table 8 the projection parameters that are used for each zone of each State. Table 8 lists a scale reduction for Transverse Mercator such as 1:2500. The projection file requires a scale factor. The formula to compute scale factor from scale reduction is scale factor = 1.0 - (1/scale reduction) i.e. a 1:2500 scale reduction results in a scale factor of 0.9996 or scale factor=1.0 -(1.0/2500)=0.9996. A useful approximation for digitizing and plotting is to use the Polyconic Projection. The maximum difference in the 700-800 mm diagonals of 7 1/2 or 15 minute quadrangles between Transverse Mercator, Lambert, and Polyconic projections is about 0.05 mm. This is a much smaller figure than that expected due to size changes due to changes in humidity for a paper copy. It is only twice the accuracy attributed to a good digitizer.

Projections supported by GSMEDIT

Cylindrical:
Mercator, Transverse Mercator, Universal Transverse Mercator, Oblique Mercator
Conic:
Polyconic, Lambert Conformal Conic, Albers Equal Area, Equidistant Conic

PROJECTION FILES FOR GSMEDIT

Examples of Projection Files

Latitude,Longitude values are entered in Degrees, Minutes, Seconds and followed by the appropriate letter designating compass direction: for example, W longitude, N latitude in the conterminous U.S. Equatorial and polar radii are specified in kilometers.

Universal Transverse Mercator

File	Description of Contents
1	"1" designates Universal Transverse Mercator
6378.2064	Equatorial radius, in km, Clarke 1866
6356.5838	Polar radius in km, Clarke 1866
105,0,0,W	Longitude, Principal Meridian of UTM Zone
0.9996	Scale factor

Albers Equal Area

File	Description of contents
2	"2" designates Albers Equal Area
6378.2064	Equatorial radius, in km, Clarke 1866
6356.5838	Polar radius in km, Clarke 1866
45,30,0,N	Latitude, first standard parallel
29,30,0,N	Latitude, second standard parallel
100,0,0,W	Longitude, meridian central to map

Lambert Conformal Conic

File	Description of contents
3	"3" designates Lambert Conformal Conic
6378.2064	Equatorial radius, in km, Clarke 1866
6356.5838	Polar radius in km, Clarke 1866
33,0,0,N	Latitude, first standard parallel
45,0,0,N	Latitude, second standard parallel
105,0,0,W	Longitude, meridian central to map

Mercator

File	Description of contents
4	"4" designates Mercator
6378.2064	Equatorial radius, in km, Clarke 1866
6356.5838	Polar radius in km, Clarke 1866
105,0,0,W	Longitude, Meridian Central to map

Polyconic

File		Description of contents
5		"5" designates Polyconic
6378.2064		Equatorial radius, in km, Clarke 1866
6356.5838		Polar radius in km, Clarke 1866
105,0,0,W		Longitude, meridian central to map

Transverse Mercator

File		Description of contents
6		"6" designates Transverse Mercator
6378.2064		Equatorial radius, in km, Clarke 1866
6356.5838		Polar radius in km, Clarke 1866
105,0,0,W		Longitude, meridian central to map
0.9996		Scale factor

Parameters of special DNAG map for spherical Earth

File		Description of contents
6		"6" designates Transverse Mercator
6371.204		Radius of Earth in km
6371.204		Radius of Earth in Km
100,0,0,W		Longitude, meridian central to map
0.926		Scale factor unique to this map

Oblique Mercator Projection
The sample oblique mercator projection file provides parameters used in generating the Appalachian Map

File		Contents
7		"7" designates Oblique Mercator
6378.2064		Equatorial radius, in km, Clarke 1866
6356.5838		Polar radius in km, Clarke 1866
1.0		Scale factor along central axis
42,0,0,N		Latitude, center point of projection
73,0,0,W		Longitude, center point of projection
51,30,0,N		Latitude, S end of line defining axis
56,0,0,W		Longitude, S end of line defining axis
33,30,0,N		Latitude, N end of line defining axis
84,30,0,W		Longitude, N end of line defining axis

13

Equidistant Conic

File	Description of contents
8	"8" designates Equidistant Conic
6378.38584	Radius of Earth in km
6356.910	Radius of Earth in Km
9,0,0,N	Latitude, first standard parallel
4,0,0,N	Latitude, second standard parallel
66,0,0,W	Longitude, meridian central to map

Values in this example are for Venezuela maps labeled "Proyeccion Conico Secante Compensada." This projection is also used for certain maps in Alaska labeled "Modified Mercator", see Snyder, 1982.

References

Selner, Gary I., and Taylor, 1988, Richard B, GSDRAW and GSMAP system Version 6.0: Graphics programs for the IBM PC and compatible microcomputers to assist compilation and publication of geologic maps and illustrations: U.S. Geological Survey Open-File Report 89-373A, documentation and tutorial, 156 p., and 89-373B, five executable program disks.

Snyder, J. P., 1982, Map Projections used by the U.S. Geological Survey: U.S. Geological Survey Bulletin 1532 313 p.

Snyder, J. P., 1987, Map projections, a working manual: U.S. Geological Survey Professional Paper 1395, 393 p.

Source code

GSDEDIT and GSMEDIT have been written in QuickBasic and tested using the Microsoft QuickBasic Compiler Version 4.0. The source code is available on request from the authors: pleas send a formatted 360 Kbyte or 1.2 megabyte 5 1/4"floppy disk to Gary I. Selner or Richard B. Taylor, U. S. Geological Survey, Denver Federal Center, M.S. 905, Lakewood CO 80225.

Files on the release disk

GSDEDIT.EXE   Executable program file GSDEDIT
GSMEDIT.EXE   Executable program file GSMEDIT
CONFIG.SCR   Sample screen configuration file For EGA graphics or VGA in EGA mode.
QBHERC.COM   Initialization file for use with Hercules graphics