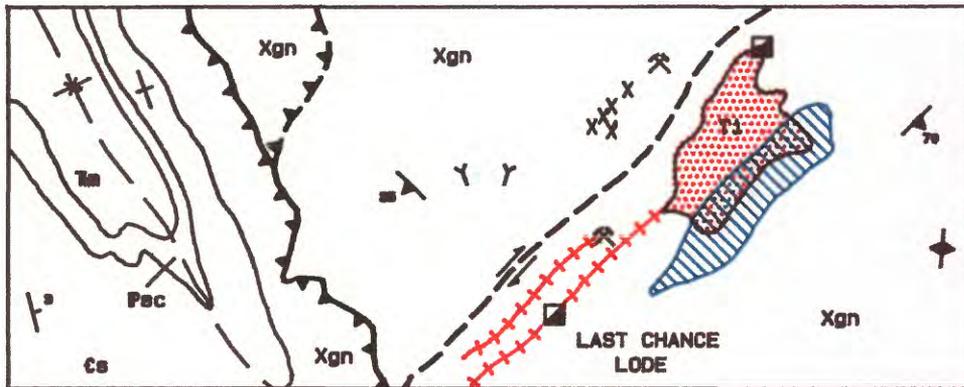


STATES DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

GSDRAW AND GSMAP VERSION 4.0:

PROTOTYPE PROGRAMS FOR THE IBM PC AND COMPATIBLE MICROCOMPUTERS
TO ASSIST COMPILATION AND PUBLICATION OF
GEOLOGIC MAPS AND ILLUSTRATIONS

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Open-File Report

87-496A Documentation (Paper Copy)
87-496B Executable GSMAP/GSDRAW Disk
87-496C Source Code Disk GSMAP/GSDRAW and Utility Programs
87-496D Executable Utility Program Disks
87-496E Tutorial (Paper Copy)

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Although program tests have been made, no guarantee (expressed or implied) is made by the authors or the U.S. Geological Survey regarding program correctness, accuracy, or proper execution on all computer systems.

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Documentation

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INTRODUCTION

GSDRAW and GSMAP are programs for IBM PC (and compatible) microcomputers to assist geologists and illustrators in compilation and publication drafting of geologic maps and illustrations. These programs attempt to do for geologic map compilation and drafting what digital word processing has done to facilitate composition and publication of text. As a set of practical "graphics programs", they enable digital compilation of graphical elements, ease the process of modification in response to second thoughts, editorial comments and scale changes, and lead from initial compilation to publication without redigitizing or redrafting. Design goals focused on an "office-scale" system, with an affordable price.

GSDRAW and GSMAP use a high precision digitizer and plotter for entry and plotting of digital data . Program capabilities include modification of databases by deletion of unwanted entries or additions at any time. Part or all of the data in a database can be plotted. Words and alphanumeric characters are entered using a word processing program, and their locations are entered by digitizing. Entries are numbered by the program, and edited or deleted according to this number. Although results can be partly viewed on screen, the primary output is to the plotter. Plots can be made in two modes; the "draft" mode provides entry numbers; the "publication" mode draws plots without entry numbers.

This document describes GSDRAW and GSMAP Versions 4.0. GSDRAW is based on storage of X-Y coordinate data unique to each illustration; GSMAP is based on storage of geodetic coordinates (latitude/longitude). The two programs are otherwise very similar. GSDRAW is used for illustrations, cross sections, and maps where there is either no latitude/longitude grid, or the use of a latitude/longitude system is not necessary; GSMAP enables digitizing a geologic map in pieces, and combination of the pieces in their proper places. GSMAP supports digitizing and plotting in Universal Transverse Mercator, Lambert Conformal Conic, Albers Equal Area, and Mercator map projections. A basic set of line and geologic symbol types has been included; additions can be made by users. These programs do not attempt the sophistication of commercial CAD systems available for engineers, and are plotter oriented rather than screen oriented. Screen graphics are used to assist digitizing and editing, rather than as primary tools in design or output.

Version 4.0 of GSDRAW and GSMAP adds capabilities and refinements to previously released versions of these programs. Changes and additions are listed in Appendix 2.

SYSTEM REQUIREMENTS

Hardware for Version 4.0

GSDRAW and GSMAP are designed for use on IBM PC (or compatible) microcomputers, and require digitizers and plotters for operation.

A small complete system would include:

Microcomputer

PC (DOS operating system) with at least 256K RAM, and two floppy disk drives; two serial ports (one for the digitizer, the second for the plotter; one parallel port (for the printer); 8087 co-processor chip (required); graphics card equivalent to the IBM color/graphics adapter (Hercules graphics are **NOT** supported); monitor suitable for use with the graphics card (IBM color/graphics equivalent; CGA and EGA graphics are supported).

Printer with screen dump capability.

Digitizer

Example: GTCO Digi-Pad 5, 11"x17" digitizer (or larger)/16-button cursor required

Plotter

Example: Hewlett-Packard HP-7550A 11"x17" plotter

The programs have been successfully operated on Compaq, Columbia, Sperry AT, IBM PC, XT, and AT, GRID, and Leading Edge computers.

Version 4.0 of GSDRAW and GSMAP were designed and tested using GTCO digitizers with 16 button cursors. The programs have been operated with Calcomp digitizers, and probably can be used with any digitizer with multi-button cursor, that sends ASCII character strings and communicates with the PC through an RS232 serial port. Version 4.0 of GSDRAW and GSMAP support Hewlett-Packard plotters model numbers HP 7470A and above. Plotters with configurable memory support special geologic characters; plotters without configurable memory will substitute blanks for these characters. Closed polygons can be patterned by certain plotters, but not others; plotter documentation provides information on availability of polygon fill; plotters lacking polygon fill will plot outlines of areas but will not pattern the areas.

Version 4.0 of GSDRAW and GSMAP can use the EGA color adapter and color Monitor, if available, to display different kinds of lines in different colors. The EGA color graphics adapter card must have 256K memory to plot color on screen in EGA mode.

Software

The minimum software requirements for utilizing the programs are PC/DOS 2.0 or higher, the release diskettes and a word processing program capable of producing ASCII files. A RAM-resident program such as SIDEKICK is very useful during operations.

Installation of software

Installation of the GSDRAW and GSMAP programs requires specification of the designation of the computer's serial port connected to the digitizer, the baud rate setting of the digitizer, the designation of the computer's serial port connected to the plotter, and the baud rate setting of the plotter. Five files on the executable program disk are necessary and sufficient for the operation of GSMAP and GSDRAW.

For old hands

IF the digitizer has the exact settings of the GTCO, and **IF** the plotter has the exact settings of the HP, configured as recommended in the hardware installation section, copy and use the five files on Disk 1. These files are the executable programs GSMAP.EXE and GSDRAW.EXE, and three configuration files.

CONFIG.SCR provides configuration specifications for the screen (CGA, EGA, color or monochrome). Without modification the file supplied can be used with CGA color or monochrome monitors, or for EGA, but with CGA resolution.

CONFIG.DIG provides configuration specifications for the digitizer; without modification, it requires that the **digitizer be connected to COM2, be set to 1200 baud, and to a resolution of 1/1000 inch.**

CONFIG.PLT provides configuration specifications for the plotter; without modification it requires that the **plotter be connected to COM1, and set to 2400 baud.**

The first line of the CONFIG.DIG or CONFIG.PLT files can be changed to reset communication parameters for digitizer or plotter (port designation and/or baud rate). The first lines of these two files correspond to the CONFIG.CAD file of Version 3.0. The GSCAD.SYM file of Version 3.0 is not used with Version 4.0. The CONFIG.CAD file is not used.

CONFIG files can be configured to meet the requirements of different systems, and to take advantage of EGA adapters and EGA color monitors. Please refer to the Installation section of this documentation, APPENDIX 1, for details and worksheet (p.66).

Manuals supplied with computer, digitizer, and plotter contain details and explanations of parameters needed in the installation of particular hardware.

GSDRAW OR GSMAP ?

These two programs are similar but are not identical.

Use GSMAP for latitude/longitude dependent data, especially where digitizing will be conducted in several pieces and merging of databases will be needed. Lettering will NOT change scale in GSMAP if the plot scale is changed. For accurate digitizing, maps must have been drawn using one of the supported projections. GSMAP databases can be merged; the data can be plotted using any of the supported projections (see p. 50).

Use GSDRAW for diagrams and maps lacking latitude/longitude data, or where plotting of lettering should change size with change of scale. GSDRAW databases can be merged at positions and scales of choice. GSDRAW should be used for very large scale maps even if latitude/longitude coordinates are available. For example, a sample map at 1"=50' is better done with GSDRAW because the precision of latitude/longitude coordinates may NOT be adequate to retain the precision of location required by this scale. Changing of map projections is essentially meaningless to the small areas covered by very large scale maps.

A few essential definitions

ENTRY NUMBER - A sequential number, starting with 1 for each illustration is assigned by the program for each entry, whether it is a line, a symbol, text, etc. Additions, deletions, and modifications to the digital file are based on the number of the entry being changed. THE ENTRY NUMBER is supplied on the screen during digitizing, is drawn on "draft mode" plots (the ENTRY NUMBER is plotted to the left of the first point digitized for each entry), and can be obtained from listings on the screen or on the printer. It is displayed on-screen during plotting as each entry is printed.

CODE - A number, 1-998 is entered by the user from the digitizer keypad. Functions are defined by the program for each of seven different groups. Codes are selected by the user within those groups. Details of the functions of different code groups in digitizing and plotting are provided in the reference section of this report.

LINE TYPE - A number, 0-12, is defined in the plotter for different kinds (patterns) of lines - solid, dotted, dashed, etc. The width of a line is determined by the pen used to draw it; the a "pattern" by specifying LINE TYPE when plotting. All lines are digitized as if solid.

MAP PROJECTION FILES- Operation of GSMAP requires a file that describes the characteristics of the map projection desired for digitizing or plotting. These files are described in the reference section of this report.

OPERATING THE PROGRAMS - GSDRAW AND GSMAP

Hardware ready and software installed ?? Make sure that all equipment is operational and turned on. Rebooting the system after turning on digitizer and plotter will help avoid problems in communication between the computer and these devices.

GSDRAW and GSMAP are invoked by entering the name of the program desired. The first screen is a "disclaimer" screen with a "Mini-menu" in the lowermost part providing a choice of three options. All working sessions must start by either starting a new data base or with opening an existing data base. Selection of option 3 from the Mini-menu allows a quick return to the DOS prompt.

MINI-MENU

1. Start a new data base
- 2 Open an existing data base
- 3 Exit

If option 1 is selected, procedures for opening a data base will be prompted on the screen; the steps in opening a data base are described below, see Option 1 from the Main Menu. The screen will show the GSMAP and GSDRAW files that are resident on the default drive. After opening a database, the screen will show the Main Menu.

If option 2 is selected, the next screen will prompt for entry of a database; entry of the name of a database (extensions are not entered) will open the database and bring the screen to the Main Menu.

MAIN MENU

GSDRAW and GSMAP operate from Main Menu screens

CURRENT DATA BASE:
MAP TITLE:

- 1 - START A NEW DATA BASE
- 2 - OPEN AN EXISTING DATA BASE
- 3 - DIGITIZE NEW ENTRIES
- 4 - DELETE ENTRIES
- 5 - RECOVER ENTRIES
- 6 - CHANGE PARAMETERS FOR ENTRY
- 7 - LIST CONTENTS OF DATA BASE
- 8 - PLOT ON THE SCREEN
- 9 - PLOT ON THE HARD COPY PLOTTER
- 10 - MERGE ANOTHER DATA SET INTO CURRENT DATA SET
- 11 - COMPUTE POLYGONAL AREA
- 12 - EXIT

ENTER CHOICE BY NUMBER:

1. START A NEW DATA BASE

MENU OPTIONS FOR GSDRAW AND GSMAP

Option 1. Starting a new data base, GSDRAW

Entering 1 from the Main Menu will start operations to open a new data base.

The first prompt requests:

ENTER MAP DATA BASE NAME:

This request is for the name of the file that will contain the data base for the map or illustration - the next prompt requests:

ENTER TITLE OF MAP:

This requests the name that will be associated with the map. after entry of the MAP DATA BASE NAME the screen will clear, and the next prompt (in some cases this prompt may be shown several times) will be:

ENTER 0(ZERO) ON CURSOR KEYPAD TO SYNCHRONIZE DIGITIZER INPUT

Follow this instruction, lightly tapping the "0" key until the request on the screen asks for entry of a corner of the map on the digitizer. During synchronization, the cursor can be at any location in the active area of the digitizer. The next prompts will be:

ENTER UPPER LEFT CORNER ON DIGITIZER:

ENTER LOWER LEFT CORNER ON DIGITIZER:

ENTER LOWER RIGHT CORNER ON DIGITIZER:

ENTER UPPER RIGHT CORNER ON DIGITIZER:

Use the "0" key on the digitizer keypad to enter the points requested. The cursor must be precisely located, with cross-hair at the point being entered when the "0" key is pressed. Note that UPPER, LOWER, LEFT, AND RIGHT apply to the map, not to the digitizer. The orientation of the map on the digitizer is not important. The UPPER LEFT CORNER and the LOWER LEFT CORNER define the vertical direction for the database. The horizontal direction is perpendicular to the vertical, and not set by the chosen position for other corners.

Completion of entries of corners from the digitizer will cause return to the MAIN MENU screen.

Option 1: Starting a new data base, GSMAP

Entering 1 from the Main Menu will start operations to open a new data base.

The first prompt requests:

ENTER MAP DATA BASE NAME:

This request is for the name of the file that will contain the data for the map. The next prompt requests:

ENTER TITLE OF MAP:

This asks for the name that will be associated with the map; The next prompt requests -

ENTER EARTH'S QUADRANT(1=NW,2=NE,3=SE,4=SW

This prompt requests entry of a number (1 for the conterminous US) specifying the quadrant of the earth that the map lies within, see p. 51. After entry of the number for the quadrant, the screen will clear and the next set of four prompts will ask for entry of the latitude/longitude coordinates of the four corners of the map:

ENTER LAT/LON OF

NORTHWEST CORNER Note: enter coordinates

DD,MM,SS,DDD,MM,SS in the format specified

ENTER LAT/LON OF SOUTHWEST CORNER degrees, minutes, seconds.

DD,MM,SS,DDD,MM,SS

ENTER LAT/LON OF SOUTHEAST CORNER

DD,MM,SS,DDD,MM,SS

ENTER LAT/LON OF NORTHEAST CORNER

DD,MM,SS,DDD,MM,SS

Unlike GSDRAW, There will be no request for entry of these points on the digitizer at this time. Completion of input of the four coordinates in required form (commas separating the numbers for degrees, minutes and seconds - note format of screen prompt), will cause return to the menu. Seconds can be supplied as a decimal number if this precision is needed.

Notes:

- The MAP DATA BASE NAME is the name of the file that contains the data base for the map (or illustration); no more than eight letters (or numbers) can be used.

- The TITLE OF the MAP is a name that will be associated with the map, and shown on the Main Menu screen and on listings of the contents of the database. No more than eight letters (or numbers) can be used.

- In both GSDRAW and GSMAP, if you attempt to use a MAP DATA BASE NAME that is already in use, the computer will inform you of this with a warning prompt:

A FILE WITH THE NAME OF _____ ALREADY EXISTS

DO YOU WANT TO CONTINUE(Y/N)?

- If you answer Y, the program will continue and the old file will be overwritten.

- If you answer N, the program will once again request entry of a new MAP DATA BASE NAME

The corner points chosen on the hard copy are very important. Proper indexing to the digitizer requires that the points be readily identifiable and precisely located. One kind of mark that is easily identified and very precise is a shallow cross cut with a knife blade in a mylar original; a plus made with a 9H pencil serves well for a paper original.

Option 2: OPEN AN EXISTING DATA BASE

Entering 2 from the Main Menu of either GSDRAW or GSMAP will elicit the following prompt:

ENTER MAP DATA BASE NAME:

In GSMAP, entry of the map data base name will cause the latitude/longitude coordinates of the four corners of the database to be displayed on screen, then, hitting any key will cause return to the Main Menu.

In GSDRAW, entry of the database name will cause immediate return to the Main Menu.

If no data base with the name entered exists in the files accessible to the computer, a request for a proper DATA BASE NAME will be made -

AN ERROR HAS OCCURRED OPENING DATABASE _____
CHECK DATABASE NAME. HIT ANY KEY TO RETRY

When the prompt requesting entry of a map data base name is on the screen - Hitting any key will cause the request for a map data base name to return to the screen. Striking Control C (^C) will return the system to the DOS prompt so that directories can be consulted

Notes:

- Each session with GSDRAW or GSMAP must start either by starting a new data base (Option 1) or by opening an existing data base (Option 2).

Option 3. DIGITIZE NEW ENTRIES

Digitizing in GSDRAW

Entering 3 from the Main Menu clears the screen, and opens the program for digitizing new entries.

The first prompt will request:

DISPLAY PREVIOUS DATA? (Y/N)

Entry of "N" instructs the program not to display existing entries before starting digitizing; only new entries will be shown. Entry of "Y" will cause all previous entries to be displayed, as well as new entries as they are digitized.

If the digitizer has not been indexed to the hard copy during the current session, the next prompts will request:

ENTER 0(ZERO) ON CURSOR KEYPAD TO SYNCHRONIZE DIGITIZER INPUT

Follow this instruction until the request changes to ask for entry of the four corners of the map from the digitizer keypad (use the "0" key). During synchronization the cursor can be at any point inside the active area of the digitizing tablet.

The prompts for indexing the map to the digitizer tablet are as follows -

ENTER UPPER LEFT CORNER ON DIGITIZER:
ENTER LOWER LEFT CORNER ON DIGITIZER:
ENTER LOWER RIGHT CORNER ON DIGITIZER:
ENTER UPPER RIGHT CORNER ON DIGITIZER:

Move the cursor to each corner in turn, and at each location use the "0" key on the digitizer keypad to index the map to the digitizer tablet. Following the entry of the fourth corner, the screen will clear. If "Y" (display previous data) was selected, the data will be plotted on the screen; when plotting is complete, a high pitched tone will sound to indicate that the system is ready to receive new entries. If "N" was chosen, the high pitched tone sounds almost immediately after the fourth corner is entered, and data entry can begin. The scale for screen display will be set to maximize use of the screen's area. The X and Y scales are equal.

After the first keypad entry, a line of characters on the bottom line of the screen will show the status of the current entry (the number of the current entry, values entered for PARA1 and PARA2, and the number of points digitized, NO OF PTS.

ENTRY ____ CODE ____ PARA 1 ____ PARA 2 ____ NO. OF PTS ____

Codes, the 7 code groups, and the meanings assigned to Parameter 1 and Parameter 2 for each code group are described in the Reference section of this report.

Three entries are made from the keypad of the digitizer before entering data points:

Code, 1-3 digits (if less than 3, the "A" key is used to complete this entry)

Parameter 1 (PARA1), 0-6 digits (if less than 6, the "A" key is used to complete this entry)

Parameter 2 (PARA2), 0-6 digits (if less than 6, the "A" key is used to complete this entry).

After entering CODE, PARA1, and PARA2, the program is ready to accept data points. The 0 key, 1 key, 2 key, and 3 key are used to enter data points. Each key has specific uses. Instructions for digitizing entries in each of the seven code groups are given in the Reference Section.

Digitizing in GSMAP

Entering 3 from the Main Menu clears the screen, and opens the program for digitizing new entries.

The first prompt will request input of the file name (including extension) for the projection parameter file:

ENTER FILENAME OF PROJECTION PARAMETERS:

Following entry, the next prompt asks:

DISPLAY PREVIOUS DATA? (Y/N) N

"Y" will cause all previously digitized lines to be shown on the screen. "N" will start the digitizing session without showing previous entries.

If the digitizer has not been indexed to the hard copy during the current session, prompts will request entries to synchronize the digitizer: follow directions. The cursor may be at any position in the active area of the digitizer table during synchronization.

ENTER 0 (ZERO) KEY ON CURSOR KEYPAD TO SYNCHRONIZE DIGITIZER INPUT
- After synchronization, four prompts will then ask for entry of the four corners of the map from the digitizer keypad (use the "0" key).

ENTER NORTHWEST CORNER ON DIGITIZER:

ENTER SOUTHWEST CORNER ON DIGITIZER:

ENTER SOUTHEAST CORNER ON DIGITIZER:

ENTER NORTHEAST CORNER ON DIGITIZER:

Move the cursor to each corner in turn, and at each location use the "0" key on the digitizer keypad to index the map to the digitizer tablet.

After entry of the fourth corner, the X and Y scales of the map will be shown on the screen.

X SCALE= _____ Y SCALE= _____

The computer will compare the X and Y scale to check for possible problems with the match between the corner points entered and the latitude/longitude coordinates of the data base.

If the X and Y scales differ by more than 2 percent, a message will be shown on screen, and a warning tone sounded:

SCALE DIFFERS BY MORE THAN 2 % IN X AND Y
CONTINUE? (Y/N)

"N" will return you to the menu screen. "Y" will allow you to proceed. This message should prompt careful checking of all parameters entered into GSMAP and the hard copy being digitized.

If no scale problem is identified after digitizing the fourth corner point or a "Y" answer is given to the CONTINUE? question, digitizing can proceed with entry from the keypad of the code desired for the first entry to be digitized.

The scales for screen display will be set to maximize use of the screen's area; the X and Y scales will be set to the same value.

After the first keypad entry, a line of characters on the bottom line of the screen will show the status of the current entry; the number of the current entry, values for PARA1 and PARA 2, and the number of points digitized in this entry.

ENTRY___ CODE ___ PARA 1 ___ PARA 2 ___ NO. OF PTS ____

Codes, the 7 code groups, and the meanings assigned to Parameter 1 and Parameter 2 for each code group are described in the Reference Section of this report.

Three entries are made from the keypad digitizer before entering data points:

Code, 1-3 digits (if less than 3, the "A" key is used to complete this entry)

Parameter 1 (PARA1), 0-6 digits (if less than 6, the "A" key is used to complete this entry)

Parameter 2 (PARA2), 0-6 digits (if less than 6, the "A" key is used to complete this entry)

After entering CODE, PARA1 and PARA2, the program is ready to accept data points. The 0 key, 1 key and 2 key are used to enter data points; each key has specific uses. Instructions for digitizing entries in each of the six code groups are given in the Reference Section.

Ending a digitizing session, code 999

A code of 999 entered from the keypad will end a digitizing session and return program execution to the MAIN MENU screen.

Notes and suggestions:

- WARNING - Errors will result if the hard copy moves on the digitizer, so fix it securely (so that it won't move). If it should, go back to the menu, and re-enter the database (option 2). Then properly index the copy to the digitizer.
- So long as a session within the same database is continuous, reindexing of hard copy with the digitizer tablet will not be required.
- BE CERTAIN THAT the hard copy is properly indexed to the digitizer whenever data is being digitized. Improperly digitized data can't be "fixed", but must be deleted and the entries re-digitized.
- The hard copy used for digitizing for either GSMAP or GSDRAW can be at any scale, providing that it is properly indexed to the digitizer tablet.

Option 4. DELETE ENTRIES

A 4 entered from the Main Menu of either GSDRAW or GSMAP enables deletion of individual entries.

The first prompt asks if graphical display of data is desired. "Y" will provide a screen display; "N" goes directly to the process of deleting entries.

GRAPHICAL DISPLAY ? (Y/N):?

Entry of "N" brings the prompt:

ENTRY# TO DELETE (0 TO QUIT):?

Entering the number of the entry deletes the entry, and causes redisplay of the ENTRY# TO DELETE prompt. Entry of "0" returns program execution to the Main Menu.

GRAPHICAL DISPLAY ? (Y/N):?

Entry of "Y" will permit the display of data for selected code(s) or all of the entries in the database to be displayed on the screen.

The prompt:

CODE TO PLOT(-1=ALL 0=NONE):

will be shown until all desired codes are plotted, and a 0 is entered. The 0 will Bring the prompt:

ENTRY# TO DELETE (0) TO QUIT):?

This prompt requests the number of the entry to be deleted. The on- screen plot of the entry will be deleted from the screen; a second query will appear the on screen - DELETE? (Y/N)?

This allows second thoughts; and requires confirmation that the entry is indeed to be deleted. A "N" causes the entry to be replotted on the screen, a "Y" will cause a repeat of the prompt:

ENTRY # TO DELETE (0 TO QUIT):?

A "0" supplied in answer to the ENTRY# TO DELETE prompt returns program execution to the Main Menu.

Option 5. RECOVER ENTRIES

Entry of a 5 from the Main Menu of either GSDRAW or GSMAP enables a deleted entry to be recovered.

The first prompt:

ENTRY# TO RECOVER (0 TO QUIT):?

Requests the number of the entry to be restored to the active data base. Entry of a "0" causes return to the Main Menu.

Option 6. CHANGE PARAMETERS OF AN ENTRY

Entry of a 6 from the Main Menu of either GSDRAW or GSMAP enables change of Code, Parameter 1, and Parameter 2, for a single entry or for multiple entries. Such changes might be needed to modify the size of lettering, plotting characteristics, character of lines, or to correct errors made during digitizing. The global option permits changing Code, PARA1, or PARA2 for all entries in the database with a particular code. Entries are prompted from the screen.

The first prompt:

Global Change ?(Y/N/Q)?

A "Y" allows you to make changes to entries with a specified code throughout the database, and change CODE, PARA1, or PARA2. Entry of a "Y" causes the following prompt to appear:

CODE TO BE CHANGED:?

Entry of the code number brings another prompt
CHANGE CODE (CODE), PARA1(P1), PARA2(P2)?

Example:

entry of CODE brings a prompt for entry of the code to be changed. The prompt:

NEW CODE:?

Requests entry of the new code. After entry of the new code, the system returns to the initial prompt:

Global Change ?(Y/N/Q)?

A "N" will cause a series of prompts: enter the information requested.

ENTRY# TO BE CHANGED (0) TO QUIT:

This prompt calls for the number of the entry to be changed. On-screen information will be supplied showing the "old" code and parameters 1 and 2 for the entry, and will request the desired "new" parameters - For example:

OLD PARAMETERS= 1 0 0

ENTER NEW VALUES(CODE,PARA1 PARA2):

Entry of the desired code, the value of parameter 1, and the value of parameter 2 (separated by commas) causes the requested changes in the database, and a return to the prompt:

ENTRY# TO BE CHANGED (0) TO QUIT:

Entry of a "0" causes return to the prompt:

ENTRY# TO BE CHANGED (0) TO QUIT: Entry of a 0 returns the screen to the prompt:

Global Change ?(Y/N/Q)?

Entry of a "Q" returns execution of the program to the Main Menu.

Option 7. LIST CONTENTS OF DATA BASE

Entry of a 7 from the Main Menu of either GSDRAW or GSMAP will provide a listing of information for entries in the data base, either on the screen or the printer, as specified.

A screen prompt begins the listing process -
PRINT ON SCREEN OR PRINTER (S/P):

Entry of "S" (screen) or "P" (printer) as desired is followed by message on the last line of the screen -
FUNCTION KEY 9 TO PAUSE, Q TO QUIT, RETURN TO CONTINUE
Information supplied will be:

MAP NAME

Coordinates of upper left point, coordinates of upper right point, Coordinates of lower left point, Coordinates of lower right point

The next prompt requests the code for data desired:
ENTER LINE CODE(-1 FOR ALL, 0 TO QUIT)

Entry of the desired code will provide the following listing, on the screen or printed, as previously specified. The prompt will be repeated to permit entry of all codes desired.

The GSDRAW Listing provides:

Entry number, Parameter 1, Parameter 2, X and Y coordinates of the first and last points of each entry, and the number of points in the entry. The X and Y coordinates are measured in inches. The lower left corner of illustration is the origin, the line connecting the two left points is the Y axis. The X axis is perpendicular to the Y axis, not defined by other corner points.

The GSMAP Listing provides

Entry number, Parameter 1, Parameter 2, latitude/longitude coordinates of the first and last points of each entry, and the number of points in the entry.

Entry of CODE "0" causes return to the Main Menu.

Notes:

- If the option for screen display is chosen, the display will pause after display of 20 entries. During the pauses, the prompt "HIT ANY KEY TO CONTINUE, Q TO QUIT" Hitting the "Q" key during the pauses will cause return to the Main Menu; during the pauses the F9 key is not required for return to the Main Menu; it is required during the scrolling of the screen display.

Option 8. PLOT ON THE SCREEN

Entry of an 8 from the Main Menu of either GSDRAW or GSMAP will start the screen plot sequence. The entries in the current database can be displayed on the screen. Lines and outlines of polygons will be plotted as lines; polygons may be filled if desired. Numbers, letters, and symbols, will be plotted as points, not as text entries or symbols. During the plotting on the screen, the process can be halted using the F9 key; it will resume after the RETURN key is pressed.

A screen prompt begins the screen plot sequence.

CODE TO PLOT (-1=ALL, 0=NONE): ?

Enter the desired code; entries of this code will be displayed on screen in the order digitized. After all entries with this code have been drawn on the screen, the previous prompt will be displayed again, new codes can be entered, and these entries drawn on the screen.

If a 400-499 code or -1 for "all" is selected, a screen prompt will be displayed.

FILL POLYGONS? (Y/N): ?

IF "N" is entered only the outline of the polygons will be drawn; if "Y" is entered the polygons will be filled.

Entry of a code of 0 (zero), or two strokes of the "Enter" key will bring the screen back to the Main Menu.

Notes:

- The algorithm for polygon fill is complex. Filling a polygon on the screen requires a closed polygon. If a polygon is too narrow, part of it may not fill. At the scale plotted on screen, at least one empty pixel must separate the pixels drawn as the borders of the polygon if complete filling is to take place. Under certain circumstances the entire screen may be filled ! Use of the F9 key followed by the "Q" key will bring the program back to the Main Menu.

- If the computer is in GRAPHICS mode, and EGA is NOT being used, a screen print can be made by simultaneously striking the Shift and PrtSc keys. Distortion due to the low resolution of the printer is to be expected. Distortion due to screen scaling in previous Versions of GSMAP and GSDRAW is not present in Version 4.0.

- Latitude and longitude values are plotted on the screen as if X and Y coordinates in GSMAP. No map projection is used; tests with standard map projections showed that use of these projections greatly increased the time required for screen display.

Option 9. PLOT ON THE HARD COPY PLOTTER

Entry of 9 - from the Main Menu invokes a series of prompts:

Before reacting to the prompts

MAKE SURE THAT THE PLOTTER IS READY TO FUNCTION AND IS LOADED WITH PENS AND PAPER - if it isn't everything will come to a complete halt after you answer the first question !!! Prompts ask for input of specifications for plots; familiarity with a plot parameters is required.

Batch command files

Batch files are ASCII files that contain answers to the on-screen queries from the computer during interactive plotting, and should be used for complicated plots, plots that take a considerable amount of time, or for replicate plots. It works well to make the first plot of a diagram without using a batch command file, preserve the questions and answers by printing the screen, and write a batch file using this set of answers as its contents. The contents of a batch command file for plotting will be described at the end of this section.

Batch command files can be created using any text editor that produces an ASCII file. Wordstar in Non document mode is one example of such an editor.

Offsets

XOFF and YOFF are "offsets", designed to allow moving the entire illustration to a new place on the plotting media. The desired X offset and Y offset are entered in inches (and decimal inches) to position the illustration. X and Y are defined during digitizing, see page 18 of this documentation. The X and Y offsets are measured in inches from the lower left corner of the illustration, Y vertical, X horizontal, and increasing from this corner. The offsets, XOFF, YOFF, are separated by a comma when entered.

Draft Mode

In Draft Mode, the entry number number will be plotted to the left of the first digitized point for each entry. If Draft Mode is not specified, entry numbers will not be plotted (publication mode).

Rotation

Rotation is a plotter feature enabling rotation of a plot by 90 degrees on the plotter media. Check the plotter manual for rotation instructions. In most cases if the X dimension of the plot exceeds the Y, no "rotation" should be specified.

Speed and Force

Speed and force are plotter characteristics. Pen speed is specified in (cm/sec) and force by integers 1 to 8 that set the force. Optimum speed and force depend on pen type and plot media. Default settings provided by Hewlett-Packard are given here in parentheses. The quality of final plots is generally improved by slowing the pen speed.

PEN TYPE	SPEED cm/sec	FORCE values	Force values = grams	
Fiber	25 (50)	1 (2)	1 = 10 g	
Roller	30 (60)	3 (6)	2 = 18 g, 3 = 26 g	
Refillable ink pens	12 (30)	2 (2)	4 = 34 g, 5 = 42 g	
Disposable ink pens	15 (15)	1 (1)	6 = 50 g, 7 = 58 g	
			8 = 60 g	

Width and height for label characters

The width and height of the characters which will be used as the labels of line numbers in draft mode is specified in inches (.1, .15 are good values to use; values of .069, 0.1 produce characters of about the smallest legible size. This entry is always required whether draft mode is used or not. The sizes specified for label characters are the sizes used for posting of numbers for 101-199 codes; see Reference Section for uses.

Plotting in GSDRAW

At the very start a warning message furnishes a reminder that the plotter should be ready.

PLOTTER SHOULD BE TURNED ON AND PAPER LOADED !!!!!!!

The sequence of prompts is as follows -

"DO YOU WANT TO USE A BATCH COMMAND FILE?(Y/N):

"Y" will bring a prompt requesting entry of the complete file name of the Batch Command File; plot commands will be read from this file. "N" will cause a series of prompts requesting information to appear on the screen; plot commands will be entered from the keyboard; these prompts are as follows:

ENTER SCALE OF MAP TO BE PLOTTED(X,Y):

Scale is entered in relation to the scale from which the illustration was first digitized using a multiplying factor. For example 1,1 indicates a same size plot, .5,.5 a half size plot. X and Y may be different (to stretch or expand an illustration). The size of lettering is scaled to the X scale specified and is independent of the Y scale of the plot.

ENTER XOFF,YOFF: See above.

DRAFT MODE(LABEL LINES W/LINE #) (Y/N): See above.

MAP SIZE(X,Y) 7.978001 11.9879 (this message provides the map size in inches; no response is required.

ROTATE (Y/N/Q)? The "Q" entry returns the operation of the program to the start of the sequence of plot specification, in case mistakes have been made, or the size of the plot exceeds plotter media size.

ENTER SPEED, FORCE: See above.

ENTER WIDTH,HEIGHT FOR LABEL CHARACTERS: See above.

Following these entries defining plot characteristics, a series of prompts will request information on entries to be plotted; The code, pen to be used (specified by its numbered position in the carousel), line type and symbol type must be entered; each is specified by a number followed by a comma(,). "Comments" are useful in batch files, but are not usually appropriate when plotting interactively. Plotting of entries is done from the following prompt: after plotting of all entries with a specified code, the same prompt will enable plotting of additional codes.

ENTER CODE,PEN,LINE TYPE,SYM TYPE,COMMENTS:

- The meaning of the LINE TYPE and SYM TYPE entries depends on the line code group; see REFERENCE SECTION for details.

A plotting session is ended by entering 0,0,0,0, in response to the request for LINE CODE,PEN,LINE TYPE,SYM TYPE,COMMENTS:

0,0,0,0, induces three prompts : Responses to these prompts are not included in Batch command files.

REPLOT SINGLE ENTRY (Y/N):

"Y" allows replotting (or replotting of a single entry. After providing entry number, and appropriate plot specification (Prompted from the screen). "N" brings the prompt:

DO YOU WANT TO DRAW CORNER BRACES (Y/N):

"Y" causes plotting of corner brackets (the plot corners are the corners of the GSDRAW database, unless windowed.

"N" brings the prompt:

DO YOU WANT TO GENERATE INTERNAL GRID TICK MARKS? (Y/N):

"Y" will bring a prompt asking for the desired spacing (in inches), and cause plotting of "plus" signs to define a grid with origin at the lower left corner of the database. "N" returns operations to the Main Menu. The default answer to the final three prompts is "N" (Strike the Return key at appropriate times)

Example of GSDRAW batch command file

Comments on the right not enclosed in quotation marks are not part of the file.

Entry in Batch Command File	Comments
1,1	X,Y scales
1,2	X,Y offsets
N	Draft mode, N
Y	Rotate, Y
25,1	Speed 25, Force 1
0.1,0.15	X,Y size of labels
1,1,0,0, "solid line contacts,use 00 pen"	Lines
4,5,0,0, "solid line faults, use 1 pen"	Lines
400,1,0,0, "igneous rocks, solid fill"	Polygons
1,50,0	Fill type 1,spacing,angle
401,2,0,0, "rock alteration, use red pen"	Polygons
3,60,45	Fill type 3,spacing,angle
555,1,0,0, "rock unit labels"	Rock units
FILENAME.TXT	File with rock unit labels
1,1,1,0, "dotted line contacts"	Lines
300,2,0,0, "plot with red pen"	Symbols
N	Don't randomize orientation
0,0,0,0,	End of the plot file

There must be a carriage return at the end of the final line of the batch command file.

Answers to the REPLOT SINGLE LINE ?, DRAW CORNER BRACES ?, and GENERATE INTERNAL GRID TICK MARKS ? prompts must be supplied from the keyboard after the plot file instructions have been completed (the default is N).

GSDRAW, REMEMBER THAT IF A WINDOW HAS BEEN SET FROM THE DIGITIZER, ONLY THE AREA INSIDE THAT WINDOW WILL BE PLOTTED.

Plotting in GSMAP

At the very start a warning message furnishes a reminder that the plotter should be ready.

PLOTTER SHOULD BE TURNED ON AND PAPER LOADED !!!!!

The first prompt requests the name of the projection parameter file. See p. 51 for description of these files.

ENTER FILENAME OF PROJECTION PARAMETERS:

After entry, another prompt will be shown:

DO YOU WANT TO PLOT USING A BATCH COMMAND FILE?(Y/N)?

Entry of "Y" will bring a prompt requesting entry of the complete file name of the Batch Command File; plot commands will be read from this file. Entry of "N" will invoke a series of prompts.

The first prompts request definition of the plot area, by specifying the latitude longitude coordinates of its corners.

ENTER LAT/LON OF NORTHWEST CORNER OF PLOT AREA

DD,MM,SS,DDD,MM,SS:

ENTER LAT/LON OF SOUTHWEST CORNER OF PLOT AREA

DD,MM,SS,DDD,MM,SS:

ENTER LAT/LON OF SOUTHEAST CORNER OF PLOT AREA

DD,MM,SS,DDD,MM,SS:

ENTER LAT/LON OF NORTHEAST CORNER OF PLOT AREA

DD,MM,SS,DDD,MM,SS:

Entry of the latitude/longitude coordinates of each of the four corners of the plot area in Degrees, Minutes, and Seconds is needed, in the format requested -- (numbers separated by commas). The plot area does not have to be the same as the database area. If the plot area is larger, the data may not be attractively positioned on the sheet. If the plot area is smaller, a true geographic window based on latitude and longitude will trim the data plotted to that included in the specified area. **In the interactive plot mode, the default for entry of each the four corners is the appropriate corner of the data base.**

The next prompts set plot specifications:

ENTER SCALE OF MAP TO BE PLOTTED(X,Y):

The map scale in X and the scale in Y must be entered using the denominators of the scale fractions, separated by commas (ie. 24000,24000). Do not use extra commas. Different X and Y scales may be required to precisely fit plots to base maps.

ENTER XOFF,YOFF: See above.

DRAFT MODE (LABEL LINES W/LINE #)(Y/N): See above.

The message, MAP SIZE(X,Y) provides the map size in inches. No response is required.

ROTATE (Y/N/Q)? See above.

ENTER SPEED, FORCE: See above.

ENTER WIDTH, HEIGHT FOR LABEL CHARACTERS: See above.

Following these entries defining plot characteristics, a series of prompts will request information on entries to be plotted; The code, pen to be used (specified by its numbered position in the carousel), line type and symbol type must be entered. Each is specified by a number followed by a comma(,). "Comments" are useful in batch files, but are not usually used when plotting interactively.

Plotting of entries is done from the following prompt: After plotting of all entries with a specified code, the same prompt will enable plotting of additional codes.

ENTER CODE,PEN,LINE TYPE,SYM TYPE, COMMENTS=

The meaning of these LINE TYPE and SYM TYPE entries depends on the code group; see REFERENCE SECTION for details.

A plotting session is ended by entering 0,0,0,0, in response to the request for LINE CODE,PEN,LINE TYPE,SYM TYPE,COMMENTS: 0,0,0,0, induces three prompts : Responses to these prompts are not included in Batch command files.

REPLOT SINGLE ENTRY (Y/N):

A "Y" allows replotting of a single entry. after providing entry number, and appropriate plot specification (Prompted from the screen)

An "N" brings the prompt:

DO YOU WANT TO DRAW CORNER BRACES (Y/N):

"Y" causes plotting of corner braces at the corners specified for the plot:

An "N" brings the prompt:

DO YOU WANT TO GENERATE INTERNAL GRID TICK MARKS? (Y/N):

"Y" will bring a prompt asking for the desired spacing (in degrees as prompted), and cause plotting of "plus" signs to define a grid with origin as close as possible to the lower left corner of the plot specified area (the grid will start at the closest even degree (or degree plus the specified grid interval.

An "N" will return operations to the Main Menu.

- The default answer to the final three prompts (strike the return key at appropriate times is "N"

Example of GSMAP batch command file

Comments to the right not enclosed in quotation marks are not a part of the file.

Entry in Batch Command File	Comments
39,0,0,106,0,0	Lat/Lon NW corner
38,0,0,106,0,0	Lat/Lon SW corner
38,0,0,104,0,0	Lat/Lon SE corner
39,0,0,104,0,0	Lat/Lon NE corner
500000,500000	X,Y scales
N	Draft mode, N
Y	Rotate Y
25,1	Speed 25, Force 1
0.1,0.15	X,Y size of labels
1,1,0,0, "solid line contacts, use 00 pen"	Lines
4,5,0,0, "solid line faults, use 1 pen"	Lines
400,1,0,0, "igneous rocks, solid fill"	Polygons
1,50,0	Fill type 1,spacing,angle
401,2,0,0, "rock alteration, use red pen"	Polygons
3,60,45	Fill type 3,spacing,angle
555,1,0,0, "rock unit labels"	
FILENAME.TXT	File with rock unit labels
1,1,1,0, "dotted line contacts, use 00 pen"	Lines
300,2,0,0, "plot with red pen"	Symbols
N	Don't randomize orientation
0,0,0,0,	End of the plot file

- There must be a carriage return at the end of the final line of the batch command file.

The answers to the REPLOT SINGLE LINE ?, DRAW CORNER BRACES ?, and GENERATE INTERNAL GRID TICK MARKS ? PROMPTS must be supplied from the keyboard after the plot file instructions have been completed.

INSTRUCTIONS GIVEN FOR WINDOWING plots FROM THE DIGITIZER FOR GSDRAW DO NOT APPLY TO GSMAP The corners of the GSMAP plot are specified in the plot procedure.

Option 10. MERGE ANOTHER DATA SET INTO CURRENT DATA SET

Merging of data bases, GSDRAW

Entry of a 10 from the Main Menu will prompt a series of entries enabling contents of another data base to be added to the data base currently being used. Screen prompts will be displayed:

ENTER NAME OF DATA BASE TO BE MERGED WITH CURRENT DATA BASE:
ENTER XOFF,YOFF:
ENTER SCALE FACTOR (X,Y):

Answers to these questions will add the data in the named data base to the current database with the specified X and Y offsets, and at the scale requested (offsets are measured in inches), the scale factor entered as a number. For example, a halsize copy would be specified by 0.5,0.5. Offsets and scale factors can be negative numbers. A database can be added to itself, enabling production of special effects.

Merging of data bases GSMAP

Entry of a 10 from the GSMAP Menu will invoke the following screen prompt:

ENTER NAME OF DATA BASE TO BE MERGED WITH CURRENT DATA BASE:

This asks for the name of the database that is to be added to (or "merged" with) the one currently active. Just the name of the data base is entered, without extension. Entry of this data base name will cause the computer to add the data from the named database to the existing data in the one currently active. In this process, the entry numbers of the "added" base are changed to become sequential with (and follow) those of the active base (to avoid duplication), and "deleted" entries in the added data base are dropped.

If you change your mind and do not want to add a database hit the RETURN key instead of entering a database name, and operations will return to the Main Menu screen.

The process of merging a data base can be watched; a screen prompt will be displayed:

GRAPHICAL DISPLAY? (Y/N):

Entry of a "Y" will invoke the screen plot routine. The entries in the current database will be drawn first, then the additions from the database being merged. Outlines of polygons will be shown; polygons will not be filled.

Note:

- The process of merging (adding) a large data base may take several minutes, especially if a graphical display is being shown. When the process is complete, the Main Menu screen will appear.

Option 11. COMPUTE POLYGONAL AREAS

GSMAP. Entry of an 11 from the Main Menu of GSMAP starts a sequence that enables computation of the area in square miles of previously digitized closed polygonal areas (400-499 line codes).

The first screen prompt asks for the name of the file containing the projection parameters -
ENTER FILENAME OF PROJECTION PARAMETERS:

- After entering the appropriate filename and extension, another screen prompt will be seen:

PRINT ON SCREEN OR PRINTER S/P:

Entry of an "S" will cause the data to appear on the screen; Entry of "P" will cause the data to be printed on the printer; be sure that the printer is ready !

The next screen prompt will show:
ENTER CODE(400 SERIES ONLY, 0 TO QUIT):

Entry of a code (400-499 group only (used for closed polygons, see Reference section for details) will cause computation of areas in square miles in the data base, and printing of the data as in the example shown below:

CODE 401 (ALL VALUES IN SQ. MILES)

LINE NUMBER =	12		
AREA OF EXTERIOR POLYGON =	0.01		
AREA (EXT. - INT. POLYGONS FOR LINE	12 =		0.01
LINE NUMBER =	37		
AREA OF EXTERIOR POLYGON =	0.19		
AREA (EXT. - INT. POLYGONS FOR LINE	37 =		0.19
TOTAL FOR CODE 401 =			0.20

- Entry of "0" returns program execution to the Main Menu.

GSDRAW. Entry of an 11 from the Main Menu starts a sequence that enables computation of the area in square inches of closed polygonal areas.

The first prompt allows selection of data display on-screen, or as a print out on the printer -

PRINT ON SCREEN OR PRINTER S/P:

Entry of an "S" will cause the data to appear on the screen; Entry of "P" will cause the data to be printed on the printer; be sure that the the printer is ready.

The next prompt asks for entry of the code (400 series) for which area calculations are needed. The results of the calculation are displayed on the screen or printed by the printer, as previously selected. The format is as shown below, in this example, for code 402:

402 (ALL VALUES IN SQUARE INCHES)

```
ENTRY NUMBER =      139
AREA OF EXTERIOR POLYGON =      1.10
AREA OF INTERIOR POLYGON =      0.18
AREA (EXT. - INT. POLYGONS) FOR LINE 139 =      0.92

TOTAL FOR CODE 402 =      0.92
```

- Entry of a "0" code causes return to the Menu.

WARNING IF the "P" option is selected and the printer is not ready, the program will hang up, a "TIMEOUT" error message will be displayed on the screen, and the computer system will probably have to be re-booted. !!!

12. EXIT

Entry of a 12 from the Main Menu will end the session in these programs, and return operation of the system to the DOS prompt.

REFERENCE SECTION

DIGITIZING - USES OF KEYS ON THE KEYPAD

Non-numeric Keys

The "A" key - is used only to complete entries of CODE, PARA 1, and PARA 2; not during the process of digitizing points. Its function is to end an entry or to enter a 0 and simultaneously complete an entry.

The "B" key - is used to set the area shown on the screen during the process of entering points (to set a new window). Entry of a "B" from the keypad, followed by a "0" at the lower left (southwest) corner of the window desired, followed by a "0" at the upper right (northeast) corner of this window, will reset the area shown on the screen for the current session of the program. All lines in the windowed area will be shown on screen. Resetting the window is most useful when examination of details in a small part of the map is needed.

THE "D" key - "DUPLICATE" digitizer settings is used to set CODE, PARA1 and PARA2 equivalent to those of the previous entry. When the digitizer is ready for input of the code, hitting the "D" key will provide immediate setting of the three entries from the key pad to the settings used for the previous entry. If the "D" key is used just after opening a database, default values of 1,0,0 will be used for CODE, PARAMETER 1, and PARAMETER 2. Use of the "D" key can greatly speed the digitizing process; one key stroke is substituted for a series of entries.

The "E" key - "PUNT", or, "ESCAPE" - is used to recover from mistakes made during keypad entry. At any time during digitizing of an entry, hitting the "E" key (the "ESCAPE" key) will return the system to the starting point for entering the CODE. Information from the partially completed entry will not be added to the database; this avoids the necessity of completing a defective entry during digitizing. This key performs its function from the start of entry of code, until the digitizing of data for an entry has been completed by a stroke of the 1 or 2 key.

The "F" key - is the toggle between the digitizer's point and stream mode. The digitizer should be maintained in point mode at all times. If the green light on the keypad of the digitizer is turned on, touch the "F" key to turn it off. The "F" key toggles between point and stream mode. Use of the "stream mode" risks data over-run.

Numeric keys

During entry of CODE, PARA1 and PARA2, the numbered keys are used to enter their number value.

- The 0, 1, 2, and 3 keys are used for digitizing data points.
 - The 0 (zero) key sends the X,Y coordinates of the point at crosshair of the cursor to the computer.
 - The 1 key sends the X,Y coordinates of the point at the crosshair of the cursor to the computer, **AND** closes the entry.
 - The 2 (two) key sends the X,Y coordinates of the point at the crosshair of the cursor to the computer, **AND** causes the computer to add another point at the end of the data string with X,Y coordinates identical with the first point of the data string for that entry (thus closing a polygon exactly, **AND** closes the entry.
 - The 3 key sends the X,Y coordinates of the point at the crosshair of the cursor to the computer, **AND** causes the computer to add another point at the end of the data string with X,Y coordinates identical with the first point of the data string for that entry (thus closing a polygon exactly), but it does not close the entry. It is used during digitizing of polygons to close a polygon, but leave entry of points open so that another polygon (eg. internal polygon), can be digitized into the same entry. The 3 key should only be used with 400-499 codes.

CODE GROUPS

GSDRAW and GSMAP utilize seven code groups, each with specific and different functions. Use of these code groups is reviewed in the following section. As codes are assigned during digitizing according to plot requirements, digitizing and plotting procedures are discussed together in the Reference Section to facilitate comparison.

Codes	Function
1-99	Lines and decorated lines.
100-199	Posting of tabular data.
200-299	Individually rotatable symbols.
300-399	Other symbols.
400-499	Polygons.
500-599	Alphanumeric characters.
600-699	Splined lines.

LINES AND DECORATED LINES - CODES 1-99

Codes 1-99 are assigned by the user to various kinds of lines. All lines are digitized as if solid. Patterns, line weights, and/or decorations are specified for each code when plotting. Enough different codes should be used to accommodate patterns such as solid, dashed, dotted, and combinations of dashes and dots and different line weights (different pens). Other codes should be assigned to lines decorated by various symbols, such as the triangle for thrust faults and the railroad track pattern for dikes.

Digitizing

Three entries from the digitizer keyboard are required:

1. CODE: user defined on the basis of the kind of line desired. Criteria to be considered in planning codes include, line type (pattern, solid, dashed, dotted, etc) see Fig.1, line weight, contacts at .005", faults .015", etc., "decorations", triangles for thrust faults, etc. Following entry of the code, "A" is used to complete the entry.
2. PARA 1: "A"
3. PARA 2: "A"

During entry from the keyboard, three tones will be sounded, C, F, and finally A (low, medium, high) indicating that the system is ready to receive data points. Digitize the line using a series of "0" key entries until the last point. A "1" will end the line at the point indicated, a "2" will close the line by entering the point digitized and adding the first point digitized, thus closing the line defining the border of a polygon.

Plotting

Plots of codes 1-99 require a set of four entries separated by commas. Plots of decorated lines also require a second set to specify the spacing desired for decorating symbols. During plotting in the interactive mode, prompts will request all entries. Each set is specified on one line of a batch command file, see examples on p. 23 and p. 26.

The first set, provides response to the prompt:
ENTER CODE,PEN,LINE TYPE,SYM TYPE,COMMENTS:

- Entry 1: the code specified (1-99) as defined by the user during digitizing, then a comma (,)
- Entry 2: the pen number (1 through 8), then a comma (,)
- Entry 3: the line type; uses line types 0-12 as specified for the plotter (see fig. 1), then a comma (,)
- Entry 4: "0" for all lines without decorations; for thrusts and other "decorated" lines the appropriate symbol number should be used (GSCAD.SYM file); entry 4 must also be followed by a comma (,). Comments may be added after the final comma, and are useful in plot files; a final carriage return is required.

The second set. If Entry 4 is a number other than 0, the screen will request "ENTER DELTA SPACING:" this is the spacing between symbols that are used to decorate the line, measured in inches.

Notes:

- Use of some regular convention for codes for common kinds of lines will aid digitizing and plotting. One convention easily remembered is to use CODES 1, 2, and 3 for fine solid, dashed, and dotted lines (contacts), 4, 5, and 6 for heavy solid, dashed, and dotted lines (faults); reserve codes 1-15 for geologic lines, and code special lines such as area outlines or neat lines, starting with other codes.
- A single line (entry) can contain no more than 500 points.
- If thrust faults are always digitized so that the "teeth" are on one side in the direction of digitizing, a single code is needed, rather than two.
- Experience will assist in answering the question "how many points?" are needed during digitizing. The factors to consider will include the curvature of the line, the kind of line (dotted lines require fewer points than solid lines), and the scale of the plot anticipated relative to the scale of the digitizing.
- Start and end lines at natural points such as branches or intersections, just as a draftsman would. These minimize defects caused by pen starts and stops.
- The size of the symbol plotted to decorate a line is set by the program as 100 raster units; there is no way to change this size without coding a new smaller or larger symbol!
- The symbol on a decorated line will be rotated during plotting to preserve a constant angular relationship between the symbol and the line.
- If LINE TYPE 99 is specified in the plot file, no line will be drawn! BUT this non-line can be decorated. Any symbol can be selected and spaced at specified intervals (DELTA). The symbol will be drawn at a standard size (corresponding to selection of a 100 raster size (see description of 300-399 codes).

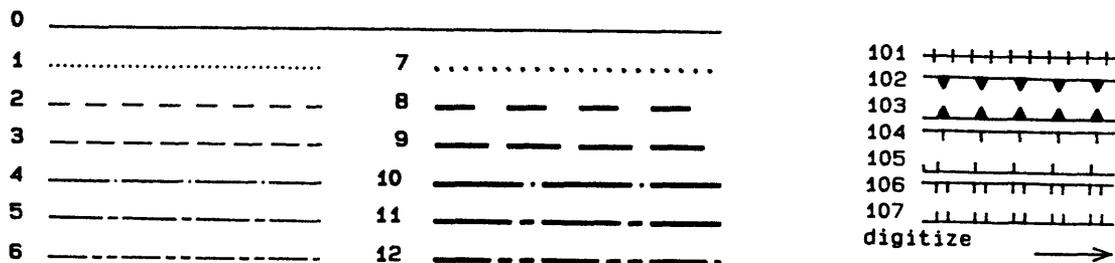


Figure 1._ Line types, NOT CODES; numbers to left of decorated lines are the number of the symbol in the CONFIG.PLT file.

POSTING OF TABULAR DATA - CODES 100-199

Codes 100-199 are used to plot tabular data and symbols.

Data files must be organized as follows:

Locality number, value 1, value 2, value 3, etc., a table might look like the sample below: TEST.SAM contains a locality number column and four data columns (for four records). This example is from a geochemical study; the data columns represent values in ppm for Cu, Mo, Pb, and Zn.

410,	50,	10,	100,	200	A table like this can be
411,	15,	2,	20,	200	created using a standard
414,	30,	50,	150,	200	ASCII word processing program.
416,	70,	10,	300,	500	

Digitizing

Three entries are required from the digitizer keypad:

1. CODE (100-199 (select according to symbols required
2. PARA 1: Locality number (any number containing up to 6 digits), and an "A" to complete entry if less than 6 digits)
3. PARA 2: Angle of rotation of plotted posting, in degrees, measured counterclockwise from the horizontal, closed by an "A" (the default value of 0 put in using the "A" key without other entry posts values to the right of the point).

Note: Angles between 91 and 269 degrees cause posting of numbers to the LEFT of the locality point, Angles 270-360, 0-90 degrees plot to the right of the point, see Fig. 2.

During entry from the keypad three tones will sound, C, F, and finally A, to indicate that the computer is ready to receive a data point.

A "1" is used to digitize the point.

Plotting

Plots of codes 100-199 require three sets of entries: During plotting in the interactive mode, prompts will request all entries. Each set is specified on one line of a batch command file.

The first set, provides response to the prompt:
Enter CODE,PEN,LINE TYPE,SYM TYPE,COMMENTS:

Entry 1: Code (100-199), then a comma (,)
Entry 2: the pen number, then a comma (,)
Entry 3: the number of the symbol desired from file GSCAD.SYM, then a comma (,)
Entry 4: the size of the symbol desired (raster units, approximately 1/1000 inch per unit); entry 4 must be followed by a comma (,). Comments may be added after the final comma, and are very useful in batch command files.

The second set, provides response to the prompt:
ENTER FILENAME FOR TABLE - this asks for the name of the file containing the data to be plotted.

Entry 1: enter the complete name of the file, including extension.

The third set, provides response to the prompt:
"# COLS, COL # TO PLOT"

Entry 1: the number of columns of data in the table (not including the locality number column)
Entry 2: the number of the data column containing the data that is to be plotted; if 0 is specified, the locality number will be plotted, 1 will cause data from the first column of data to be plotted, 2, the next, and so on.

Notes:

- Posting will be done with a space between the symbol and the adjacent number equal to the half the symbol size specified plus the width specified for the label characters.
- The size of the numbers used for posting will be the size specified in answer to the prompt ENTER WIDTH,HEIGHT FOR LABEL CHARACTERS entered when setting up plot parameters.

Notes:

- If no symbol is wanted, use symbol 30 (has no pen down moves) and nothing will be posted as a symbol at the point digitized.
- If NO posting is wanted, use a carriage return as the answer to the FILENAME FOR TABLE prompt (or in the batch file at the appropriate place) Specify that the file has one data column, and request plotting from column 1.
- If locality numbers are wanted without the bother of creating a data file, use any non-blank character followed by a carriage return as the answer to the FILENAME FOR TABLE prompt. Specify that the table has 1 data column, and that you wish column 0 plotted. The program will pick up the locality number from the PARA1 in the database, and plot it.

- Locality numbers (first column of the table must be numbers (no alpha characters; other columns in the table may contain numbers and or letters.

The plot below illustrates several capabilities of code group 100-199. Locality numbers on the left side were plotted without using an ASCII file, the numbers were plotted from digitizer entry as PARA1. The central group of sample numbers and letters were taken from an ASCII file (previous versions of GSMAP and GSDRAW would not plot letters); numbers near symbols on the right side of the diagram specify the angle specified as PARA2 to illustrate different positions for posting of data.

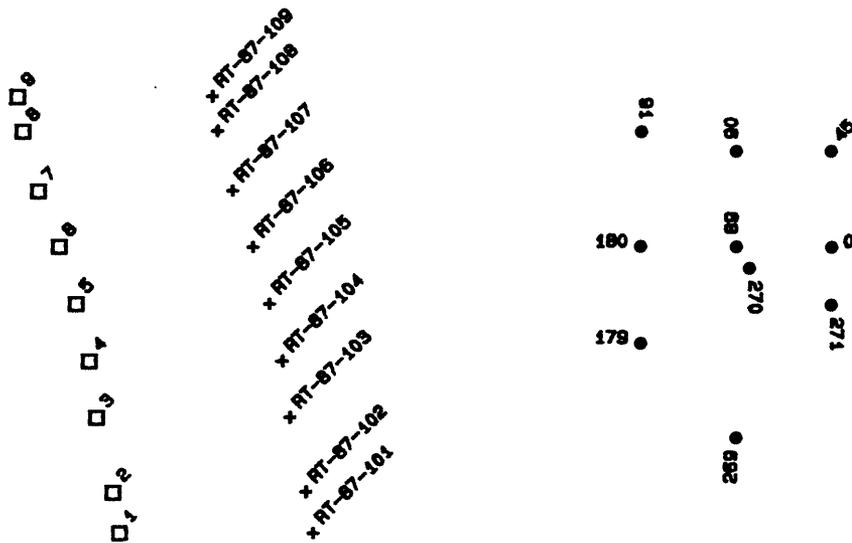


Figure 2._ Plots to illustrate symbols and posting of tabular data using 100-199 codes.

INDIVIDUALLY ROTATABLE SYMBOLS - CODES 201-299

Codes 200-299 are used for individually rotatable symbols. Unlike other code groups, each code has a specific use. Each symbol is specified by CODE number. Symbols that are included in the standard CONFIG.PLT file are the following:

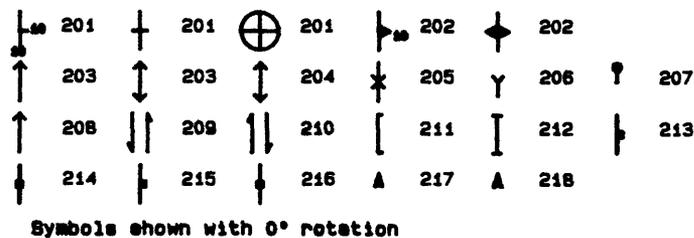


Figure 3. Standard symbols, codes 201-218. The angle of dip or plunge will be posted for symbols 201, 202, and 203. Posting is not done for other symbols.

Digitizing

Three entries from the digitizer keypad are required:

1. CODE: a code is entered to select the desired symbol from the CONFIG.PLT file.
2. PARA 1: the angle of rotation of the symbol (degrees) in a clockwise direction, followed by an "A":
3. PARA 2: the angle of dip or plunge (degrees) to be posted, followed by "A". If no angle is required for the symbol chosen, enter "A"

During entry from the keypad three tones will sound, C, F, and finally A, indicating that the system is ready to receive data points.

The position of the symbol is entered using a "1" at the location desired. The rotation of the symbol during plotting uses this point as its axis.

Most symbols, including dip and strike, foliation, lineation, anticline arrows and syncline arrows rotate from the center of the symbol, but the bar and ball rotates from the end to be plotted on the fault trace -- each axis has been chosen to assist the drafting process.

Plotting

Plots of each symbol type, CODES 200-299, require one set of four entries from the keyboard. During plotting in the interactive mode, prompts will request all entries. Each Code is specified on one line of a batch command file.

Entry 1: the CODE specifying the particular symbol type to be plotted, followed by a comma (,).

Entry 2: the pen number, followed by a comma.

Entry 3: 0, followed by a comma.

Entry 4: 0, followed by a comma. Comments may be added after the final comma.

Notes:

- GSDRAW AND GSMAP: The size of the symbol is set by the program and does not change with the scale of the plot; the size is set at 100 raster units by the program.
- Fine tip pens must be used or the numbers that are posted will not be legible.
- Rotatable symbols that do not require posting of numbers can be added to the CONFIG.PLT file using unassigned numbers up to 299.
- Three different symbols are drawn for symbol type 201 - dip and strike, depending on the dip angle specified; these are the standard symbols for dip and strike, for vertical dip and for horizontal dip.
- Two different symbols are drawn for symbol type 202 - foliation, depending on dip angle specified; these are the standard foliation symbol and the vertical foliation symbol.
- Two different symbols are drawn for symbol type 203 - lineation, depending on the plunge angle specified; these are the standard arrow, and the double ended arrow for horizontal lineation.

USER-DEFINED SYMBOLS - CODES 300-399

CODES 300-399 are used for symbols (user-defined codes). The kind and size of the symbols can be individually specified during digitizing. During plotting all symbols of a certain code can be rotated by a specified angle as a group, but not individually within a group. During plotting of a specific code, the orientation of symbols can be "randomized"; each symbol differently rotated using a random number generator. The instructions to the plotter that define symbols are contained in the file named CONFIG.PLT. Additions to this file are easily made. The following numbered symbols are in the standard file supplied with GSDRAW AND GSMAP, version 4.0:

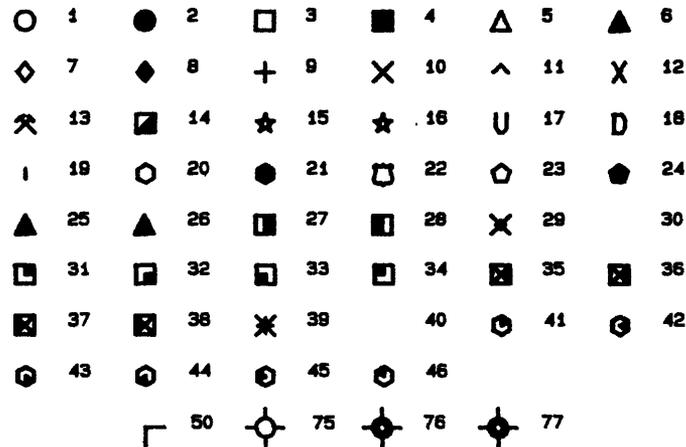


Figure 4._ Standard symbols plotted at a size of 100 (rasters)
Digitizing

Three entries from the digitizer keypad are required:

1. CODE: user defined, on the basis of pen to be used, and rotation desired in plotting.
2. PARA 1: symbol number, (fig. 5)
3. PARA 2: symbol size (raster units, about 1/1000 inch)

During entry from the keypad, three tones will sound, C, F and finally A, indicating that the system is ready to receive data points.

If a single symbol is desired, a "1" is used. If a number of the same kind of symbol with the same size and rotation are desired, a series of "0"s are used, until the final point, where a "1" should be used to end the entry.

Most symbols are centered at the point digitized. For example, symbol 13 is centered at the crossing point of the pick and hammer. The point digitized for symbol 11 is at the top of the symbol.

Plotting

Plots of symbols and symbol groups, CODES 300-399 require two sets of entries from the computer keyboard. During plotting in the interactive mode, prompts will request all entries. Each set is specified on one line of a batch command file.

The first set, provides response to the prompt, ENTER
CODE,PEN,SYM TYPE,COMMENTS:

Entry 1: the CODE specified by the user when digitizing, followed by a comma (,).

Entry 2: pen number, followed by a comma.

Entry 3: 0, followed by a comma.

Entry 4: the angle in degrees (+ clockwise) that all symbols in a given code are to be rotated, assuming that rotations are not to be randomized, followed by a comma. Comments may be added after the final comma.

The second set:

Entry 1: following these entries the question "RANDOMIZE PATTERN (Y/N)?" is asked: "N" will cause all symbols to be rotated the same amount (Entry 4 above); "Y" will cause "random" rotation based on a random number generator.

Notes:

- Although the random number generator is "random" in one sense, it always contains the same series of "random" numbers - like a printed random number table if you always start at the same place. Therefore, sequential plots will have the same symbols rotated to the same degree.
- GSDRAW: Sizes of Symbols are plotted at sizes specified by PARA2 scaled according to the X scale of the plot.
- GSMAP: Sizes of Symbols (CODES 300-399 are plotted at sizes specified by PARA 2 and are independent of the scale of the plot.

POLYGONS AND FILLS - CODES 400-499

Codes 400-499 are used for closed polygons so that they can be filled with a pattern during plotting. The area is outlined as a closed area during digitizing. Fill types and the kind of line used for the outline are specified in the plotting process. A closed polygon can be identified from the data listing because the coordinates of the first and last point are the same.

Digitizing

Three entries from the digitizer keypad are required:

1. CODE: user defined, on the basis of fill required for the plot.
2. PARA 1: "A"
3. PARA 2: "A"

During entry from the keypad three tones will sound, C, F, and finally A, indicating that the system is ready to receive data points.

The outline of the polygon is digitized using a series of "0" key entries until the last point before closing. This last point is digitized either as a "2", which records the point and closes the polygon, or with a "3", which closes the external polygon but leaves the entry open, for digitizing internal closed polygons which will not be filled. Internal polygons are digitized with a series of "0"s, and closed with a "3", except for the last, which must be closed with a "2"; when plotted, these internal polygons will be left as unfilled "windows" inside the filled polygon.

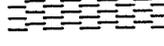
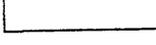
Line type	Fill type	Spacing	Angle	
0	4	30	90	
1	3	30	0	
0	4	60	45	
1	4	30	0	
7	9	60	0	
2	9	30	0	
8	10	60	45	
0	0	0	0	

Figure 5. Examples of polygon fills (patterns). All parameters can be varied by the user, to produce different patterns from the four basic fill types.

Plotting

Plots of filled polygons, CODES 400-499, require two sets of entries from the computer keyboard. During plotting in the interactive mode, prompts will request all entries. Each set is specified on one line of a batch command file. Examples of batch command files using 400 and 401 codes are provided on p. 23 and p. 26.

The first set provides response to the prompt:
Enter CODE,PEN,LINE TYPE,SYM TYPE,COMMENTS:
A second prompt then asks for fill type, line spacing, and angle of rotation:

The first set:

Entry 1: the CODE specified (between 400 and 499) as defined by the user when digitizing, followed by a comma (,).
Entry 2: pen number, followed by a comma.
Entry 3: line type, uses line types from 0-12 as specified for the plotter (see fig. 1), followed by a comma.
Entry 4: 0 (decorated lines should not be used), followed by a comma (,). Comments may be added after the final comma.

The second set:

Entry 1: fill type is a number from 1 to 4, or 7-10; it is defined by plotter firmware; specifying a fill type 0 "zero" will cause the outline of the area to be drawn without fill.

Plotter-defined fill types

0 -- outlines only, no fill
1 -- solid fill, drawn by a pen with closely spaced parallel lines (forth and back), edged after fill complete
2 -- solid fill, drawn by the pen with closely spaced parallel lines, then redrawn with closely spaced parallel lines that drawn in one direction only, edged after fill complete
3 -- a set of parallel lines filling the polygon
4 -- two sets of mutually perpendicular parallel lines (grid) filling the polygon, edged after fill complete
7, 8, 9, and 10 correspond to 1, 2, 3, and 4 except that they are NOT edged (with a line around the external and internal polygons).

Entry 2: spacing, is entered in terms of raster units (1/1000 inch) and applies to the spacing between lines for fill types 3 and 4. For fill types 1 and 2, a default setting is used to attain a solid fill; enter any reasonable number (like 40) and the computer will ignore it to good effect.

Entry 3: angle, specifies the angle measured from the horizontal (+ counterclockwise, - clockwise) for the direction of the first set of lines drawn

Notes:

- Do not attempt to fill anything except a polygon that has been properly closed on digitizing; if you do, the results are more apt to be amusing than useful.
- The effect of a stipple pattern is obtained by using line type 1, and a spacing of about 30, or line type 7 and a spacing of about 60. The outline of the polygon is done with the same line type as that used in the fill. A solid-line boundary can be drawn by replotting using fill type 0, line type 0.
- No more than 500 points can be used to define both exterior and interior polygons for a single entry.

ALPHANUMERIC ENTRIES - WORDS, LETTERS, NUMBERS AND A FEW SPECIAL CHARACTERS

CODES 500-599 are used for alphanumeric entries. The letters/numbers to be plotted are entered into an ASCII data file that will be called by its file name during plotting, and their positions digitized.

Choice of CODES is based on, 1) pen type needed for plotting, 2) slant angle for letters (block letters or italics), and angle that the character, word, or block of text is to be entered on the page. Separate groups of text entries accordingly into different CODES.

Digitizing

Three entries from the digitizer keypad are required:

1. CODE: user defined on the basis of pen to be used and rotation desired in plotting, numbered between 500 and 599
2. PARA 1: the number of the entry to be placed on the plot corresponding to the number in the ASCII data file.
3. PARA 2: the size of the lettering, expressed in raster units (1/1000 inch); this assumes a 1:1 original:final plot scale.

During input of the three parameters from the keypad, three tones, C, F, and finally A will sound, indicating that the system is ready to receive data points.

The initial point, either a "0 or "1" on the keypad places the text block or symbol; the point is digitized at the lower left corner of the first character in the block of text:

- If a "1" is used, the entry is complete
- If a "0" is used, the block of text is placed, and a succeeding "0" and "1" defines a straight-line leader between the positions of the two points, and completes the entry.
- Multiple leaders can be drawn. Use the "0" key for all but the final point. Points 2 and 3, 4 and 5 (etc.) will be connected to draw leaders.

The screen will show the position of the point, and leader(s), but not the words or characters that will be plotted. No attempt has been made to show the characters because of the limited resolution of the screen.

Plotting

Plots of codes 500-599 require two sets of entries: During plotting in the interactive mode, prompts will request all entries. Each set is specified on one line of a batch command file.

The first set provides response to the prompt:
Enter CODE, PEN, LINE TYPE, SYM TYPE, COMMENTS:

The first set.

Entry 1: the CODE, between 500 and 599, followed by a comma (,).

Entry 2: pen number, followed by a comma (,).

Entry 3: slant angle of letter (an angle measured clockwise from the vertical; 0 degrees for block lettering, about 30 degrees for simulated italics, followed by a comma (,).

Entry 4: angle of rotation of block of text on plot (an angle measured from the horizontal, + counterclockwise, - clockwise), followed by a comma. Comments may be added after the final comma.

The second set: (one entry)

Entry 1: Entry of the name of the file containing the data to be plotted is required in answer to the question:

ENTER FILENAME FOR TEXT:

Entry of the complete filename with its extension is required.

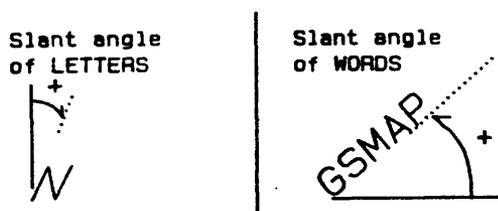


Figure 6. _ Examples of slanted letters, and rotated words.

Notes:

- The block of text rotates around the initial digitized point during plotting.
- For GSDRAW the size of the lettering that will be plotted varies with the X scale of the plot, ie. a half-sized plot (as scaled in the X dimension) will have letters half the size of the raster size indicated during digitizing. The size is independent of the scale in Y.
- For GSMAP the size of the lettering will not be scaled according to plot scale; the size will remain as specified during digitizing (PARA2), or as changed in the data base using option 6.

- If a number is entered for Parameter 2 that does not correspond to an entry in the text file called, no entry will be plotted, but the missing entry will be noted on the screen.

Word and character file

Words and symbols are typed into files in the format specified below for retrieval by GSDRAW and GSMAP programs using codes 500-599. Any name can be specified for this file. The file name will be given as the second entry during plotting of this data. In this file, the number is the label for the succeeding words, characters, or numbers which constitute the entry which will be plotted on the diagram. The number corresponds to Parameter 2 entered from the keyboard during digitizing. The "EOT" is the label marking the end of the entry to be plotted and must be placed on the line below this entry (EOT stands for 'end of text'). Commas are used to separate the three parts of the table entry.

Number, "Label",
"EOT"

The files (ASCII files) are prepared using a word processing program that does not leave embedded characters (such as nondocument mode Wordstar) and must have a format like the example below (taken from a map explanation) -- there must be no heading for the file.

1, "EXPLANATION",
"EOT"
2, "Mississippi Valley-type lead-zinc deposits",
" "
"Outline Iowa part of Upper Mississippi Valley district",
"Outline of mineralized subdistricts",
"Outline of mineralized areas outside main district",
" "
"Bedded phosphate occurrences in basal Maquoketa Shale",
"EOT"
3, "0",
"EOT"
4, "5 MILES",
"EOT"
5, "1",
"EOT"

Special characters

Five characters have been "redefined" so that they plot differently than they appear on the keyboard and screen; these are of special use to geologists:

\	&	@	{	}	Keyboard
€	ℙ	℞	°	”	Plotted symbol

Figure 7._ Special characters and keyboard equivalents.

Notes on word and character files:

- A file that looks like this:

```
27,"UNKNOWN",  
"RESOURCE",  
"POTENTIAL",  
"EOT"
```

will plot as :

```
UNKNOWN          -- because the 27," in front of the U is  
RESOURCE         not plotted, nor are succeeding ",  
POTENTIAL        " and "EOT" characters.
```

- An easy way to set up a file in desired format is to type all of the entities that will be plotted, then add the numbers, quotation marks, commas, and "EOT" in the proper positions.

- The syntax of the file is very important. Characters or punctuation in the wrong place will cause problems during plotting.

- Quotation marks (") cannot be used in a label because they are a delimiter in BASIC. A substitute is provided by redefining the } character, as shown above.

- A maximum of 150 characters (including blanks) can be enclosed between the quotation marks on a single line. This is a limitation imposed by the plotter firmware.

- Other formats for these files can be used. This one is recommended because it is easily checked for syntax.

SPECIAL CHARACTERS ARE NOT SUPPORTED BY PLOTTERS LACKING CONFIGURABLE MEMORY: BLANKS, RATHER THAN THE SPECIAL CHARACTERS CALLED FOR THE \, &, @, {, OR } KEYBOARD SYMBOLS WILL BE "PLOTTED" BY THESE PLOTTERS.

SPLINED LINES - CODES 600-699

CODES 600-699 have the same function as CODES 1-99, but the lines be SPLINED (curve-fitting to a cubic equation) during plotting.

Digitizing and plotting are done in the same ways as for codes 1-99, described earlier in this section.

The effect of splining is to to smooth the "curve" drawn by the pen, and on the screen; the database is not modified. Splining is done for entries made up of 6 to 250 digitized points. If there are 5 or fewer data points, or 251 or more, no splining will be done. The splined line plotted will consist of a series of straight line segments; the line will pass through ALL digitized points. It will appear to be curved, because the splining algorithm creates a series of equally spaced points to fit a series of cubic curves calculated to fit each set of four digitized points in sequence down the line. The plotted line passes through these calculated points as well as through all of the data points. For the details of the procedure, see Covington (1986).

The maximum effect of splining will be seen with entries that have fewer than 100 points. If digitized points are not equally spaced, the maximum effect will be seen where points are most widely spaced. In effect, if the digitized points are close together, the line joining them is relatively straight; if points are far apart, more curvature is allowed.

Entries digitized as codes 1-99 can be changed to codes 600-699 for plotting by using Option 6.

WARNING: although the curve-fitting done during plotting of codes 600-699 can improve the appearance of lines, splining can create strange effects at sharp corners; see squares in Fig. 7.

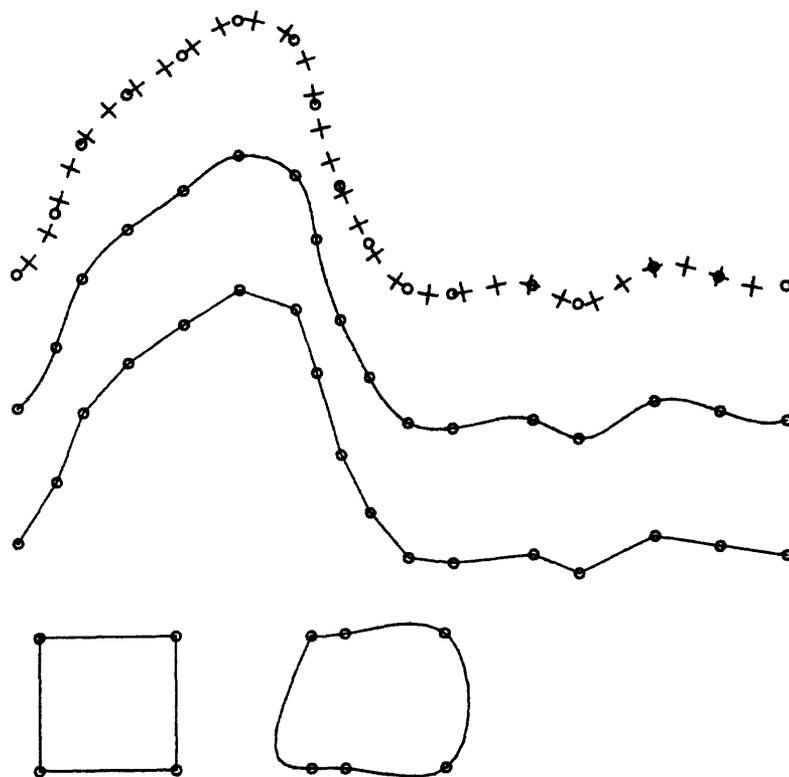


Figure 8._ The upper three curves were digitized using 17 points, each (circles); the uppermost was plotted using CODE 1, line type 99, symbol 9; the center curve was plotted as a CODE 601, and splined to a smooth curve; the lower curve was plotted as code 1, line type 0, and clearly shows breaks where data points are located. The two polygons were plotted using CODE 601, digitized points are shown by circles. The upper left corner of each polygon was digitized twice (to close the polygon. As the square on the left is defined by 5 points, no splining took place. The figure on the right was digitized as a square, (7 points) and splined to its deformed shape.

MAP PROJECTIONS - GSMAP

Version 4.0 of GSMAP can work with the Lambert Conformal Conic (one or two parallels), UTM (Universal Transverse Mercator), Albers Equal Area, and Mercator projections. These projections are specified by user-created ASCII files external to the GSMAP program. Information on map projections used by the U.S. Geological Survey is contained in USGS Bulletin 1532 (Snyder, 1982).

The map projections used for USGS maps are designated on each map.

7 1/2 and 15 minute quadrangles

Lambert Conformal Conic and Polyconic projections are used for detailed quadrangle maps. Although there are mathematical differences between these projections, the Lambert Conformal Conic (two parallels) can be used for 7 1/2 and 15 minute quadrangles in the lower 48 states, whether designated as Lambert Conformal Conic or as Polyconic. The UTM projection can also be used. Errors due to use of the "wrong" projection in the 700-800 mm diagonals can be expected to be between about 0.001 and 0.05 mm (Snyder, 1982, p. 127).

1° X 2° Sheets

The 1 X 2 degree 1:250,000 sheets of the Army Map Service series are Transverse Mercator projections. For GSMAP, use the UTM Projection, but specify the Meridian central to the map rather than using the UTM principal Meridian for the zone containing the map.

State Maps

Recent State (1:500,000) maps have been drawn using Lambert Conformal Conic projections (two parallels)

National Maps

The Albers Equal Area projection is used by the USGS for sectional maps of the 50 States in the National Atlas of 1970, and for most other U.S. maps at scales of 1:2,500,000 and smaller.

Projection parameter files

Line 1

The first line of each projection parameter file is a number that designates the **QUADRANT** of the earth:

- | | | |
|---|-----------|--------------------------------|
| 1 | Northwest | North latitude, West longitude |
| 2 | Northeast | North latitude, East longitude |
| 3 | Southeast | South latitude, East longitude |
| 4 | Southwest | South latitude, West longitude |

Line 2

The second line of the file is a number that designates the map projection:

- | | |
|---|--|
| 1 | Lambert Conformal Conic - 1 standard parallel |
| 2 | Lambert Conformal Conic - 2 standard parallels |
| 3 | UTM (Universal Transverse Mercator) |
| 4 | Albers Equal Area |
| 5 | Mercator projection |

Line 3

The third line of the file provides the equatorial radius of the Earth in kilometers: for most maps the equatorial radius of Clarke, 1866 is used -- 6378.2064 km.

Line 4

The fourth line of the projection file provides the polar radius of the Earth in kilometers: for most maps the polar radius of Clarke, 1866 is used -- 6356.5838 km.

Line 5

Lambert Conformal Conic - 1 parallel

Enter the Standard Parallel of the map in degrees and decimal degrees.

Lambert Conformal Conic - 2 parallels

Enter the Standard Parallels of the map in degrees and decimal degrees separated by a comma (for the lower "48", 45 and 33 degrees are the standard parallels; see Snyder 1982, p. 101 for other maps).

UTM

Enter the Principal Meridian for the map; this is the line of longitude (a whole number of degrees) that has 3 as a factor but does not have 6 as a factor(eg. 99, 105, etc., not 102) that is closest to the map center.

Albers Equal Area

Enter the standard parallels for the map in degrees and decimal degrees (for the lower "48" use 45.5,29.5; for Alaska use 65,55; for Hawaii use 18,8).

Mercator

No entry.

Line 6

Lambert Conformal Conic - 1 parallel

Enter the central meridian for the map in degrees, minutes, and seconds; normally this is the line of longitude centrally located with respect to the map.

Lambert Conformal Conic - 2 parallels

Enter the central meridian for the map in degrees, minutes and seconds; normally this is the line of longitude centrally located with respect to the map sheet.

UTM

Enter the Scale Factor for the map: the standard scale factor is 0.9996

Albers Equal Area

Enter the meridian central to the map in degrees, minutes, and seconds

Mercator

No entry

Examples of projection parameter files

Lambert Conformal Conic - one parallel

```
1          Quadrant of Earth ("1" specifies NW)
1          "1" specifies LCC - one parallel
6378.2064  Equatorial radius in KM, Clarke, 1866
6356.5838  Polar radius in KM, Clarke, 1866
45         Standard parallel for map
105,0,0    Meridian central to map
```

Lambert Conformal Conic - two parallels

```
1          Quadrant of Earth ("1" specifies NW)
2          "2" specifies LCC - two standard parallels
6378.2064  Equatorial radius in KM, Clarke, 1866
6356.5838  Polar radius in KM, Clarke, 1866
45,33     Standard parallels for map
105,0,0    Meridian central to map
```

Universal Transverse Mercator - UTM

```
1          Quadrant of Earth ("1" specifies NW)
3          "3" specifies UTM projection
6378.2064  Equatorial radius in KM, Clarke, 1866
6356.5838  Polar radius in KM, Clarke, 1866
105,0,0    Standard meridian for map
0.9996     Scale factor
```

A special spherical form of the Transverse Mercator projection was chosen for the 1979, 1:5,000,000 scale map of North America; this map was adopted by the Geological Society of America as the base for publications in the DNAG (Decade of North American Geology) series.

This "DNAG" projection can be achieved by using the projection parameters below:

```
1          Quadrant of Earth ("1" specifies NW)
3          "3" specifies UTM projection
6371.204   Radius of earth
6371.204   Radius of earth
100,0,0    Meridian central to map
0.926     Scale factor unique to this map
```

Albers Equal Area projection

1 Quadrant of Earth ("1" specifies NW)
4 "4" specifies Albers Equal Area projection
6378.2064 Equatorial radius in KM, Clarke, 1866
6356.5838 Polar radius in KM, Clarke, 1866
45.5,29.5 Standard parallels for "Lower 48"
100,0,0 Meridian central to map

Mercator projection

1 Quadrant of Earth ("1" specifies NW)
5 "5" specifies the Mercator projection
6378.2064 Equatorial radius in KM, Clarke, 1866
6356.5838 Polar radius in KM, Clarke, 1866

CODING OF NEW SYMBOLS

New symbols can be encoded by the user and included in the CONFIG.PLT file. Coding is easier than might be anticipated. Symbols are drawn with straight lines and/or with circles. Areas and or circles may be filled.

Starting

To be consistent with other symbols, sketch a square with sides of unit length, with a point at the center. Assume that the pen is at the center point of the square. Each line of the code describing the symbol provides one instruction to the computer: the center of the square is the point that is digitized. A symbol is drawn using straight line segments (moves) and circles; moves can be either with pen up (no line drawn) or with pen down (line drawn); moves can be combined to define polygons which will be filled (solid fill); circles may either be filled or not filled.

The first line of the code for a symbol specifies the number assigned to the symbol and the number of lines (records) required to define that symbol. Subsequent lines consist of a series of instructions for the plotter. No more than 25 lines may be used.

Moves

A line starting with a "PU" tells the the pen in the plotter to move to a new position with the PEN UP (no line drawn), a line starting with "PD" specifies that the move is made with PEN DOWN (drawing a line). All moves are relative to the last point. After a "PU" or "PD" at the start of a line a comma must be used; the number after this comma specifies the X distance to the next point, then a comma must be used; the number after the second comma specifies the Y distance to the next point. Each line that begins with a "PU" or "PD" instruction, also specifies coordinates in X and Y for the next point, relative to the current pen position.

Polygons

A line starting with a "PM" is an instruction to the plotter about a polygon.

"PM",0,0 defines the start of a polygon.

"PM" 2,0 ends a polygon and ends polygon mode in the plotter.

The polygon defined between "PM",0,0 and "PM",2,0 instructions will be filled (solid fill pattern).

Moves between "PM"0,0 and "PM,2,0 instructions should define a closed polygon); if the polygon is not closed, the "PM"2 instruction forces a closing of the polygon to the point occupied by the pen when the "PM",0 instruction was issued.

Exterior and interior polygons

"PM",1,0 ends a polygon but leaves the computer in polygon mode. This instruction is used, for example, between moves that define an external polygon and moves that define an internal polygon to be left unfilled.

The "PM",1,0 instruction forces a closing of the polygon back to the position of the pen at the time the "PM",0,0 instruction was issued.

Circles

A line of code starting with a "CI" instruction calls for the drawing of a circle; the "CI" must be followed by a comma; the number following the comma specifies the diameter of the circle to be drawn; this number is followed by a comma, then by a 0 (zero). The diameter is specified in units relative to the unit square, see Fig. 8.

The center of the circle is the point occupied by the pen at the time the "CI" instruction is given. A "CI" instruction defines a complete polygon; it is equivalent to a set of moves between "PM"1,0 instructions, but counts as a single line.

Additional information on coding is given in the Interfacing and Programming Manual supplied with HP plotters. Please note that all of the HPGL commands **ARE NOT SUPPORTED** by GSMAP and GSDRAW. Use only the commands provided above.

Examples to illustrate symbol coding

Effect of instructions diagrammed on Fig. 9

Symbol 209; Uses PU and PD moves

```
209,6          - symbol number, number of lines of code
"PU",0.2,-0.5
"PD",0.0,1.0
"PD",0.1,-0.2
"PU",-0.5,0.2
"PD",0.0,-1.0
"PD",-0.1,0.2
```

Symbol 14; Uses PU and PD moves, and one filled polygon

```
14,8          -symbol number, number of lines of code
"PU",0.5,0.5  - move to the upper right corner of symbol; PU
"PD",-1.0,0.0 - move to upper left corner; PD
"PD",0.0,-1.0 - move to lower left corner; PD
"PM",0,0      - starts polygon to be filled
"PD",1.0,0.0  - move draws lower line of filled triangle
"PD",0.0,1.0  - move draws right edge of filled triangle
"PD",-1.0,-1.0 - move draws hypotenuse of filled triangle
"PM",2,0      Ends definition of filled polygon
```

- Filling of triangular polygon

Note: the "PM 0,0" instruction starts definition of a polygon to be filled; the "PM,2,0" ends the polygon's definition

```

77,14; Uses PU and PD moves, two circles, one defined as polygon
"PU",0,1.0
"PD",0,-0.5
"PU",0,-0.5
"PM",0,0           -starts filled polygon=circle
"CI",.5,0         -specifies circle, diameter 0.5
"PM",2,0         -ends filled polygon=circle
"PU",0,-0.5
"PD",0,-0.5
"PU",-1.0,1.0
"PD",0.5,0.0
"PU",1.0,0.0
"PD",0.5,0
"PU",-1.0,0.0
"CI",1,0         open circle; polygon not specified; circle
                  will not be filled

```

- The "units" for the diameter of the circles are specified in the same "units" as the "moves" for the pen, based on the unit square
- Lines for symbol 77 go outside the unit square; this is permissible. The only reason for the unit square is to assist in keeping symbols similar in size.
- Symbol 209 with coding as drawn here was found to be too small; current CONFIG.PLT files contain a symbol which is twice the size of this one.

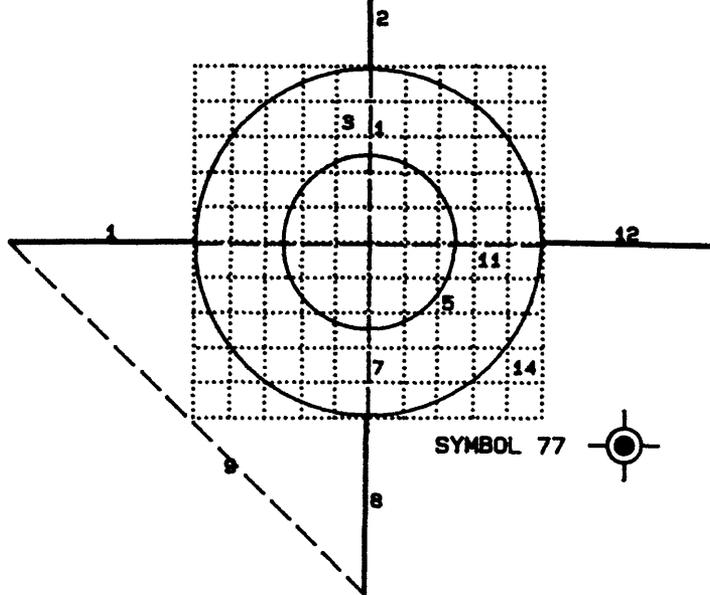
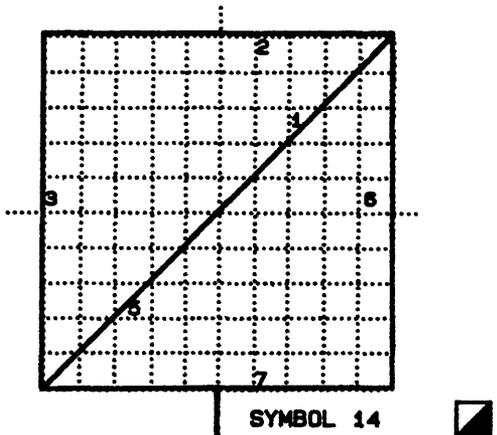
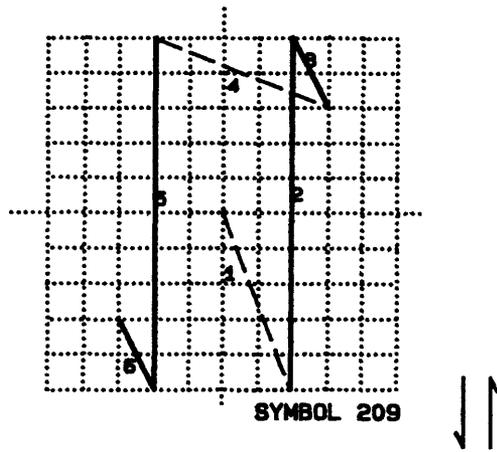


Figure 9. Examples of coding of symbols. Unit square shown by dotted lines, pen up moves by dashed lines, pen down moves by solid lines.

APPENDIX 1

HARDWARE INSTALLATION PROCEDURE

This section deals with the physical installation of the digitizer and plotter, the connection of these devices to the computer, and verification of correct installation. A work sheet is supplied to assist recording of settings, see p.66.

The plotter and the digitizer must be connected to serial ports; there must be a match between the port connections, the communications parameters of these devices, and the settings of the programs. The printer must be connected to parallel port #1 (LPT1:).

DIGITIZER

The digitizer must have the following characteristics:

- Transmit data to the computer using RS232C communications protocol
- Send information in the form of ASCII characters followed by a carriage return. When a key is depressed on the keypad of the digitizer, the digitizer must send three pieces of information as a part of the string; a character representing the key depressed, the X coordinate, and the Y coordinate. This string must not contain commas or quotation marks.
- It must have a multi-button cursor keypad with the 10 numeric keys and four other non-numeric keys that can be assigned to program functions.
- It should have a resolution of 0.001 inches.

Digitizer installation

1. Connect the cable from the digitizer to one of the asynchronous communication adapters (ports); note whether the port is COM1 or COM2 on the work sheet.
2. Set the digitizer switches for the communications speed you want to operate; we have found 1200 baud to be satisfactory; record the baud rate on the work sheet.
3. Set digitizer switches for parity; generally you will have a choice of the following:

- S - SPACE: Parity bit always transmitted and received as a space (0 bit)
- N -NONE; No transmit parity, No receive parity checking
- O - ODD: Odd transmit parity, odd receive parity checking
- E -EVEN: Even transmit parity, even receive parity checking
- M -Mark: Parity bit always transmitted and received as a mark (1 bit)

We normally use N; record the setting on the work sheet

4. Set the number of databits per character on the digitizer switches. The choice is generally 7 or 8. We generally use 8. Record the value on the work sheet
5. Set the number of stopbits on the digitizer switches. The choice is 1 or 2; we use 1; record the setting on the work sheet.
6. Set the digitizer switches to transmit a carriage return only; set switches to NOT transmit a line feed.

The following BASIC (BASICA) program can be used to check transmission between the digitizer and computer. It may require modification to reflect the values set in previous steps. It is set up using the values we normally use. Modifications normally are on line 10; refer to the BASIC manual supplied with your computer for a description of the OPEN COMn: command.

```

10 OPEN "COM2:1200,N,8,1" FOR INPUT AS #1
20 PRINT "HIT KEYS ON DIGITIZER KEYPAD ONE AT A TIME"
30 LINE INPUT #1, DSTRING$
40 PRINT DSTRING$
50 GOTO 30
60 END

```

If the above program does not run, check switch settings and/or cable connections, and retry the program. If it still does not work, check the digitizer manual, and seek assistance.

For the GTCO Digi-Pad series of digitizers, connect a null-modem cable from the computer serial port (COM2:) to port J5 on the digitizer (cable diagram is shown in the User's Manual, Appendix on RS232 interfacing, Fig. 1, DTE-to-DTE cabling. The following switch settings are used.

	1	2	3	4	5	6	7	8	
S1	1	1	1	0	0	0	0	1	1 = ON
S2	1	1	1	0	1	0	0	0	0 = OFF
S3	0	1	1	0	1	0	0	0	

PLOTTER

GSDRAW/GSMAP were designed to work using Hewlett-Packard plotters. They may work with other plotters that use the Hewlett-Packard Graphics Language.

Plotter Installation

1. Connect the cable from the plotter to the remaining asynchronous communications adapter (port); note on the work sheet whether it is connected to COM1 or COM2
2. Set the plotter switches (hardware or software) for the communication speed at which you want to operate; we have found 2400 baud to work well. Record the baud rate on the work sheet.
3. Set the plotter switches for parity. Generally you will have a choice of the following:

S - SPACE: Parity bit always transmitted and received as a space (0 bit)
N -NONE; No transmit parity, No receive parity checking
O - ODD: Odd transmit parity, odd receive parity checking
E -EVEN: Even transmit parity, even receive parity checking
M -Mark: Parity bit always transmitted and received as a mark (1 bit)

We normally use N; record the setting on the work sheet

4. Set the number of stop bits on the plotter switches. You will have a choice of 1 or 2; we use 1. Record the setting on the work sheet.

5. Check other settings on the plotter; we use the following.

Remote
Standalone
Handshake: hardwire Direct
Duplex: Full

The following BASIC program (BASICA) can be used to check transmission between the plotter and computer. It may require modification to reflect values set in previous steps. It is set up for the values we normally use. Modifications normally are one line 10. This program came from the Hewlett-Packard operation and Interconnection Manual for the HP 7550A Graphics Plotter; refer to the BASIC manual supplied with your computer for a description of the OPEN COMn: command.

```

10 OPEN "COM1:2400,N,8,1,RS,CS65535,DS,CD" AS #1
20 PRINT #1 "IN;OI;"
30 INPUT #1,ID$
40 PRINT #1,"LB";ID$;" COMMUNICATION OK";CHR$(3)
60 PRINT #1, "PA O,O;SP0;"
70 END

```

The program will read the model of the plotter and plot the following message on the plotter using the pen in carousel position one.

```

7550A COMMUNICATIONS OK
(YOUR MODEL #, if not a 7550A)

```

If the above program does not run, check switch settings and/or cable connections, and then retry the program. If it still does not work, check the plotter manual, and seek assistance.

For the HP 7585B plotter the following switch settings apply: the cable must be connected to the COMPUTER/MODEM port.

RS232C	NORMAL
	NORMAL
STANDALONE	NORMAL
Parity	OFF
	ODD
Duplex	ODD
HARDWIRE	NORMAL

For the HP 7475 plotter, the following switch settings apply:

0	S2
0	S1
0	Y
1	US
0	B/A3-.A/A4
1	B4
0	B3
1	B2
0	B1

SCREEN and GRAPHICS ADAPTER

On the worksheet, make a record of the kind of Graphics adapter (CGA or EGA, and the kind of Monitor (Color or Monochrome).

GSMAP/GSDRAW do NOT support Hercules or Hercules compatible graphics adapters.

Version 4.0 provides support for the IBM Enhanced Graphics adapter (EGA), either with monochrome or color monitor. To implement this support, lines in the CONFIG.SCR file are used to specify colors for individual codes. Using CGA with color monitors, only the text screens will appear in color. With EGA, and a color monitor, lines, points, and polygons will also be shown in color.

The colors for individual codes are selected from 16 available colors for each code desired by specifying choices during the software installation procedure, or by adding lines to the CONFIG.SCR file at some later time. Each line has the following format; code, color number. A carriage return is required at the end of each line.

Colors are specified by number (see BASIC Manual)

0	Black	8	Gray
1	Blue	9	Light Blue
2	Green	10	Light Green
3	Cyan	11	Light Cyan
4	Red	12	Light Red
5	Magenta	13	Light Magenta
6	Brown	14	Yellow
7	White	15	High Intensity White

INSTALLATION WORKSHEET

DIGITIZER

Port	_____	Key Char position	_____
Speed	_____	X Coordinate Starting	_____
Parity	_____	Width of X Coordinate	_____
Bits/Char	_____	Y Coordinate Starting	_____
Stop bits	_____	Width of Y Coordinate	_____

Non Numeric Keys:

A Labeled	_____	Transmits as	_____	ASCII code	_____
B Labeled	_____	Transmits as	_____	ASCII code	_____
D Labeled	_____	Transmits as	_____	ASCII code	_____
E Labeled	_____	Transmits as	_____	ASCII code	_____

ASCII codes are listed in the back of the BASIC Manual

PLOTTER

Port _____
Speed _____
Parity _____
Bits/Char _____
Stop bits _____

SCREEN

Graphics adapter _____
Monitor _____

SOFTWARE INSTALLATION

Installation of software

1. If the digitizer is connected to COM2 and set to 1200 baud and is a GTCO Digipad 5, or emulates the GTCO, and, the plotter is connected to COM1, and set to 2400 baud, both set as recommended in the hardware installation section, copy the following five files from the executable program disk to the default drive.

- | | |
|---------------|-----------------------------------|
| 1. GSMAP.EXE | GSMAP program |
| 2. GSDRAW.EXE | GSDRAW program |
| 3. CONFIG.DIG | Digitizer configuration |
| 4. CONFIG.PLT | Plotter configuration and symbols |
| 5. CONFIG.SCR | Screen configuration |

GSMAP and GSDRAW will operate with the monitor in CGA mode using these files.

The contents of the CONFIG files, and changes that may be made to accomodate different systems are described on subsequent pages, with printouts of sample files annotated to explain their contents.

CONFIG.DIG

Parameters apply to GTCO digitizer. Annotations are not a part of the file

```
"COM2: 1200,N, 8, 1" |           Port, baud rate, see OPEN COM, instruction
  1,1                 | Position, # characters sent when a key is depressed
2, 5, .001           |           Start position, field length X coordinate
8, 5, .001           | Start position, field length Y coordinate, resolution
14                   |           Length character string
0,0                 | The final 14 lines contain the character sent by the
1,1                 | digitizer, a comma, and the label on the key of the
2,2                 | digitizer keypad
3,3                 |
4,4                 |
5,5                 |
6,6                 |
7,7                 |
8,8                 |
9,9                 |
:,A                 |
;,B                 |
=,D                 |
>,E                 |
```

No blank lines are allowed at the beginning or end of the file
Without comments the file is as below.

```
"COM2: 1200,N, 8, 1"
  1,1
2, 5, .001
8, 5, .001
14
1,1
2,2
3,3
4,4
5,5
6,6
7,7
8,8
9,9
:,A
;,B
=,D
>,E
```

- No blank lines are allowed at the beginning or end of the file

CONFIG.SCR

For CGA adapter with color or CGA monochrome monitor,
CONFIG.SCR file contains one line

"CGAC"

For EGA adapter with EGA monochrome monitor, CONFIG.SCR contains
one line.

"EGAM"

For EGA adapter with color monitor, CONFIG.SCR is as follows:

"EGAC"

1,8	Each succeeding line contains a code number, a
2,6	comma, and a color number (see p. 66) 15 colors
4,1	different from background (#0) are available
5,14	so that entries of different codes will be drawn
8,10	in different colors on the screen
9,2	
11,12	
300,14	
400,12	
401,11	

No blank lines are allowed at the beginning or end of the
file

Notes:

- The PGA (Professional graphics adapter) is not supported.

CONFIG.PLT

The first line of the CONFIG.PLT file sets communication parameters between the computer and the plotter. The rest of the file contains the code for symbols (see p. 55-59. These parameters are described in the BASIC manual, see OPEN COM statement.
the

Part of CONFIG.PLT [code after symbol 2 not printed]

```
"COM1: 2400,N, 8, 1,RS,CS65535,DS,CD"  
50,4  
"PU",1.0,0.0  
"PD",-1.0,0.0  
"PD",0.0,-1.0  
"PU",0.0,1.0  
1,2  
"PU",0.0,0.0  
"CI",1.0,0.0  
2,4  
"PM",0,0  
"PU",0.0,0.0  
"CI",1.0,0.0  
"PM",2,0
```

Appendix 2.

UTILITY PROGRAMS

A group of programs have been created to modify or create GSMAP and GSDRAW data bases, to speed operations, and to help import and export data. We expect that the users of these utility programs will have some experience with GSMAP and GSDRAW. The programs lack the polish of GSMAP and GSDRAW, but we have chosen to release them to assist the user community. Please read the documentation carefully, and follow instructions to avoid overwriting of databases. Many of the programs copy data from one database into another; do NOT assume that warnings will be given if database names provided duplicate those already in use. GSMAP and GSDRAW provide such warnings; these utility programs DO NOT

GSMSUB and GSDSUB

The utility programs GSMSUB and GSDSUB offer the capability of setting up a new GSMAP or GSDRAW database by selecting desired entries belonging to one or more codes from an existing database, and creating a new database with this selected data in it. This is useful, for example, to create a structure map showing faults and fold axes and not have to wait during plotting for the program to go through the entire data base and skip contacts, rock unit labels and other parts of a geologic map. Another important use is to organize a database for efficient plotting and minimize the time required. When GSMSUB and GSDSUB are used to create a new organized data base, several changes result.

1. Entries of codes to be plotted with a particular pen can be grouped together to minimize plot time by cutting down on time for pen- swapping and data base search.
2. During operation of GSMSUB and GSDSUB "deleted" entries are NOT copied into the new data base. This reduces the size of the data base.
3. Codes not needed for a particular plot need not be added to the new data base.

GSMSUB is used with GSMAP databases; GSDSUB is used with GSDRAW databases.

Operating GSMSUB and GSDSUB

GSMSUB.EXE or GSDSUB.EXE must be present on the default drive or in the active path. The new data base will be created on the drive where the old data base is located.

Start GSMSUB or GSDSUB by entering the name of the program.

Screen prompts will ask for the "INPUT" data base name (the source data base from which data is to be copied, THE "OUTPUT" data base name (the name of the new data base), and the codes for the entries to be copied to the new data base -

```
ENTER INPUT DATA BASE NAME:  
ENTER OUTPUT DATA BASE NAME:  
ENTER CODE TO BE SELECTED (-1=ALL, 0 EXIT):
```

Enter the desired codes in the sequence wanted. The prompt -
ENTER CODE TO BE SELECTED (-1=ALL, 0 EXIT): will return
after entry of a code until either, a code of 0 (to exit) or
-1 (for all codes) is entered, causing the program to return
to the DOS prompt.

Notes:

- The latitude/longitude coordinates of the corners of the new GSMAP database created by GSMSUB will be the same as those of the old data base;
- The coordinates of the corners of the new GSDRAW database created by GSDSUB will be the same as the corners of the old GSDRAW database.
- The CODE, PARA1 and PARA 2 of the copied entries will be the same in the new data base as those in the old data base. The entry numbers may not be the same.
- Deleted entries will not be copied into the new database.
- Entries in the new data base will be numbered in sequence starting with 1, in the order that they are copied into the new data base. The effect is that the entry numbers of almost all entries will be different from those in the original database.
- GSMSUB and GSDSUB are quick ways of creating new databases, when databases identical corner coordinates are needed.
- **WARNING** If you provide a name for a new database that is already in use, the pre-existing data base will be overwritten and thus destroyed.

GSMASC, GSDASC, ASCGSM, ASCGSD

These four programs have been written to convert GSMAP and GSDRAW databases to ASCII files, and ASCII files to GSMAP or GSDRAW databases.

GSDASC	GSDRAW database to ASCII file
GSMASC	GSMAP database to ASCII file
ASCGSD	ASCII file to GSDRAW database
ASCGSM	ASCII file to GSMAP database

Uses for these utility programs include:

- Generation of ASCII files to enable export of GSMAP or GSDRAW databases to other systems.
- Import of ASCII data in properly formatted ASCII files into GSMAP or GSDRAW databases.
- Editing of files to correct mistakes, including changing the title for a database.
- Changing of the coordinates of corners of data bases.
- Selecting of CODES from GSMAP and GSDRAW databases (an editable equivalent of GSMSUB and OGSDSUB for GSMAP and GSDRAW)

Operating GSDASC and GSMASC

GSDASC.EXE or GSMASC.EXE must be present on the default drive or in the active path. The ASCII file will be created on the drive where the data base is located.

Start GSDASC or GSMASC by entering the name of the program.

Screen prompts will ask for the "INPUT" data base name (the data base from which data is to be converted to the ASCII format, and the codes for the entries to be copied in ASCII format into the new file. The name of the ASCII file will be the same as that of the INPUT data base; the extension will be ASC; database INPUT will be converted to a file named INPUT.ASC

Prompts will request -

ENTER INPUT DATA BASE NAME:

ENTER CODE TO BE SELECTED (-1=ALL, 0 EXIT):

Enter the desired codes in the sequence wanted. The prompt - ENTER CODE TO BE SELECTED (-1=ALL, 0 EXIT): will return after entry of a code until a code of 0 (to exit) is entered, causing operations to return to the DOS prompt.

Operating ASCGSD and ASCGSM

ASCGSD.EXE or GSMASC.EXE must be present on the default drive or in the active path. The new database will be created on the drive where the ASCII file is located.

Start ASCGSD by entering ASCGSD

A prompt will request:

ENTER MAP DATA BASE NAME:

Enter the name of the ASCII file to be converted to a GSDRAW data base. After entry of the data base name, the program will operate. When it is finished, operations will return to the DOS prompt.

Start ASCGSM by entering ASCGSM

A prompt will request -

ENTER MAP DATA BASE NAME:

Enter the name of the ASCII file to be converted to a GSMAP data base. After entry of the data base name, the program will prompt:

ENTER EARTH QUAD # (1=NW,2=NE,3=SE, 4=SW):

Enter the quadrant of the Earth that applies to the data base. After entry of the quadrant number, the program will operate. When it is finished, operations will return to the DOS prompt.

Notes:

- **WARNING** ASCGSM and ASCGSD transform an ASCII file named OUTPUT.ASC into a database named OUTPUT.ASC, and will **OVERWRITE** a pre-existing GSMAP or GSDRAW database with the same name.

Data formats for GSDRAW and GSMAP data are described on the READ file released on the SOURCE CODE disk, 87-466D. Examples of ASCII files are provided below.

GSDRAW. The first line of the file contains the title of the data base (not the name); The first 6 characters in this line of the file will be used as the title for the database. The next 4 lines contain the coordinates of the data base corners; X and Y separated by a blank or other BASIC delimiter. The next line has the Entry number, number of points in the entry, CODE, PARA1 and PARA 2 separated by blank spaces

Example:

```

SPLINE          "The first line of the file contains the title"
0.000  4.655          | X and Y coordinates of the UL corner
0.000  0.000          | X and Y coordinates of the LL corner
5.023  -0.014         | X and Y coordinates of the LR corner
5.020  4.650          | X and Y coordinates of the UR corner
   1   5   601   0     0 |           Entry# #points PARA1 PARA2
                   0.474  1.675 | X coordinate Y coordinate
                   0.676  1.992 |
                   0.814  2.350 |
                   1.049  2.605 |
                   1.333  2.805 |
   2   3  601   0     0 |
                   0.474  2.375 |
                   0.676  2.692 |
                   0.676  2.692 |

```

GSMAP. The first line of the file contains the title of the data base (not the name); The first 6 characters in this line of the ASCII file will be used as the title for the database. The next 4 lines contain the coordinates of the four database corners; Latitude, Longitude separated by a blank or other BASIC delimiter. The sequence is as in GSMAP entry: NW,SW,SE,NE.

Latitude and longitude are specified in decimal degrees. N Longitudes are positive, S latitudes negative, W latitudes are positive, E longitudes negative.

The remainder of the file contains data for entries. For each entry, the first line for the entry contains the Entry number, number of points in the entry, CODE, PARA1 and PARA 2 separated by blank spaces

Subsequent lines contain the latitude and longitude coordinates of data points (latitude and longitude separated by a blank or other BASIC delimiter).

Latitude and longitude are specified in decimal degrees. N Longitudes are positive, S latitudes negative, W latitudes are positive, E longitudes negative.

Latitude and longitude are specified in decimal degrees. N Longitudes are positive, W latitudes are positive.

Example:

```

ECON
50.000000 -125.000000 | Lat/Lon NW corner
30.000000 -115.000000 | Lat/Lon SW corner
25.000000 -75.000000 | Lat/Lon SE corner
45.000000 -65.000000 | Lat/Lon NE corner
  1    5    1    0    0 | Entry# #points PARA1 PARA2
      40.674453 -119.800559 | Lat/Lon of digitized point
      40.705072 -119.776908 |
      40.727699 -119.757452 |
      40.729308 -119.732134 |
      40.723412 -119.707951 |
  2    3    1    0    0 |
      40.284576 -118.906325 |
      40.318361 -118.908715 |
      33.994469 -118.157566 |
  3    1   201    0    45 |
      32.979038 -116.430075 |

```

DBASE2MA

The utility program DBASE2MA.EXE (created to move plot files from GS MRDS (uses dBASE III) to GSMAP (Taylor, R.B., Selner, G.I., and Johnson, 1986), and can be used to create a GSMAP data base from a formatted ASCII files.

A "point" file" is created in the following format:

```
00001 38 37 53.026N 106 00 15.630W AM
00002 38 30 32.095N 106 11 44.514W SM
00003 38 30 42.178N 106 11 43.953W SM
00004 38 38 13.027N 105 59 54.550W AM
00005 38 35 21.653N 106 01 11.669W SM
```

An "area" file is required if line data is to be entered, and the format must be as shown below:

```
00001
  41 14 07.708N092 47 43.281W
  41 14 39.870N092 47 33.553W
  41 14 39.978N092 46 31.286W
EOD
00004
  41 01 28.873N092 37 38.784W
  41 01 13.224N092 37 07.747W
  41 01 13.236N092 36 22.568W
EOD
```

In sequence, the "point" file consists of a 5 digit locality number ("0"s to fill out a number with less than 5 digits) latitude in degrees, minutes, and seconds (xx xx xx.xxxN), longitude in degrees, minutes, and seconds (xxx xx xx.xxxW), and two letters.

- If the first letter is an S (site), the point will be entered into a GSMAP file.
- If the first letter is an A, the program will enter the point, then find and enter the line data from an "area" record with the same number.
- The format of the point and area files must be followed precisely.

The program is started by entering -
DBASE2MA

Screen prompts will call for entry of data for the GSMAP data base that will be created from the point and area files -

```
ENTER MAP DATA BASE NAME: NEWBASE
ENTER TITLE OF MAP: NEWTITLE
ENTER QUAD # (1=NW,2=NE,3=SE,4=SW): 1
ENTER LAT/LON OF NORTHWEST CORNER
DD,MM,SS,DDD,MM,SS: 39,0,0,106,0,0
ENTER LAT/LON OF SOUTHWEST CORNER
DD,MM,SS,DDD,MM,SS: 38,0,0,106,0,0
ENTER LAT/LON OF SOUTHEAST CORNER
DD,MM,SS,DDD,MM,SS: 38,0,0,104,0,0
```

ENTER LAT/LON OF NORTHEAST CORNER
DD,MM,SS,DDD,MM,SS: 39,0,0,104,0,0
ENTER FILENAME OF POINT RECORD FILE: point.pnt
ENTER CODE FOR POINTS: 102
ENTER FILENAME OF AREA RECORD FILE: area.saf
ENTER CODE FOR AREA RECORDS: 12
ANOTHER FILE?(Y/N) N

Notes:

- The format of data entry above follows standard GSMAP practice. Answering "Y" to the "ANOTHER FILE?(Y/N)" query allows entry of data from other "point" and "area" data files.
- 100 series CODES should be used for point data. The program will enter the specified CODE, the specified point number as Parameter 1, and a "0" for Parameter 2. Specification of plot symbols and sizes will then be done in the plot procedure. Changes to other line CODES, symbols, or angle of posting can be done on an entry by entry basis using the GSMAP program, or changed globally.
- 1-99 or 400-499 group line codes can be used for the area records. If 400-499 codes are used, be sure that all "area" records begin and end with the same point, or strange fill patterns may be created during plotting.
- If no line data is to be entered, entry of an arbitrary line code and file name will enable execution of the program, as it won't check the contents of the "area" file unless directed to it by an "A" in the point file.

GSDROT

The utility program GSDROT.EXE rotates a GSDRAW database around its lower left corner. After entering GSDROT, prompts will ask for the name of the data base to be rotated, and for the angle of rotation desired. GSMAP has no counterpart to the GSDRAWS' GSDROT, as the latitude/longitude coordinates of GSMAP are unlike the arbitrary X/Y coordinates of GSDRAW.

Invoke GSDROT by entering the name of the program (the program must be in an active Directory).

The first prompt will ask for the name of the database to be rotated -

ENTER DATA BASE NAME:

After entry of the data base name, the next prompt will ask for the angle of rotation -

ENTER DEGREES OF ROTATION:

Enter the angle of rotation needed. Entry of a positive angle will rotate the data base in a clockwise direction, a negative angle will rotate the database in the counterclockwise direction. After entry of the angle, the program will operate, and when it is finished, will return operations to the DOS prompt.

Notes:

WARNING

- The original database will be overwritten by the new rotated database; work on a renamed copy, if you wish to retain the original.
- The program can only be applied to databases with 0,0 coordinates for the lower left corner.
- The program rotates the data base corner points as well as the data.
- Attempts to draw plots of rotated databases may encounter plotter clip limits, unless proper offsets are used.
- The entire contents and corners of the database are rotated.
- Watch out for effects of rotating symbols and text; orientation of dip and strike symbols depends of vertical, as defined by the line connecting the two left corner points.

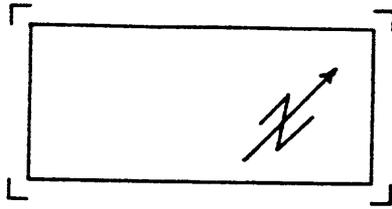


Figure 11A. Original drawing, corner braces shown.

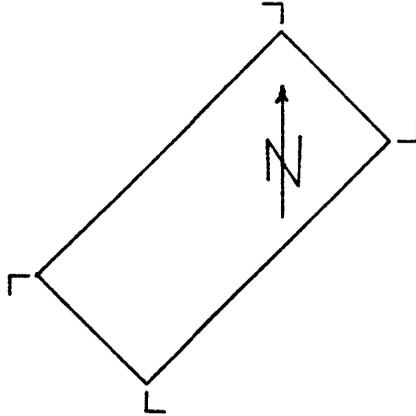


Figure 11B_ Rotated drawing, corner braces shown.

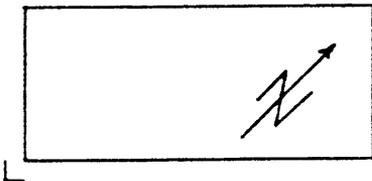
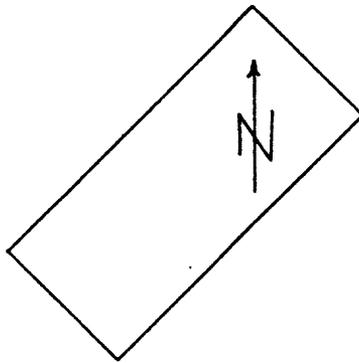


Figure 11C._ Original drawing, plus rotated drawing, both merged into a new larger data base; corner braces shown.

GSDTRIM and GSMTRIM

GSDTRIM and GSMTRIM are trimming programs for use with GSDRAW and GSMAP databases, respectively. The programs copy the part of a database inside a closed digitized polygon and create a new data base from this data.

Procedure

Open a database with **Exactly** the same corner coordinates as those of the database containing the data to be selected by trimming. The programs GSDBSUB and GSMSUB are easy ways to start the required database with matching corner coordinates. Use GSDRAW or GSMAP, open the new database, digitize a **CLOSED** polygon (use any code) that encloses the area selected for trimming. The first entry in the new database will be used as the trim border by the trimming algorithm on GSDTRIM/GSMTRIM.

Invoke GSDTRIM or GSMTRIM as appropriate, by entering the name of the program (the program must be in an active Directory).

Prompts will ask for the name of the database containing the border, the name of the containing the data to be selected, and the name of the database to contain the selected data -

```
ENTER NAME OF DATA BASE CONTAINING BORDER:  
ENTER NAME OF DATA BASE TO BE TRIMMED:  
ENTER NAME OF OUTPUT DATA BASE:
```

Follow the prompts, and enter the data base names in the sequence requested (do not enter the extension). After entry of the output data base name, the program will operate. During operation, the bottom line of the screen will display the entry numbers of data being selected so that operations can be followed. After all data has been selected, operation will return to the DOS prompt.

The program will trim the desired data from the original database (without modifying the original) and create a new database containing the data inside the border. The polygon used for trimming (border) will be the final entry in the new (trimmed) database.

NOTES:

- Entries belonging to all codes except CODES 400-499 will be trimmed, and copied into the new data base. Problems in closing of polygons, especially interior polygons if a polygon is cut apart, indicate that great care should be taken with 400-499 codes. Polygons cut apart by trimming probably will not be filled properly.
- If you want to trim polygons, change CODES to numbers other than 400-499. Trimming will be successful **IF** the trim border completely surrounds the polygon. Trimming will **NOT** be successful if an internal polygon is intersected by the trim border.

GSDPOLY and GSMPOLY

GSDPOLY and GSMPOLY are programs for use with GSDRAW and GSMAP databases, respectively. The programs enable building of polygons (codes 400-499) from a series of previously digitized lines. They work by copying abstracting entries, specifying them by entry number, from an existing database and building polygons in another database with corner coordinates identical to those of the original. The original database is not modified.

Three basic operations can be performed:

- 1) Entries (lines) with adjoining ends can be joined to form a single entry (line).
- 2) Entries (lines) that outline a closed figure can be joined into a closed polygon.
- 3) A closed polygon internal to another polygon (or to a series of line segments that form a closed polygon) can be combined to create a single entry (external polygon with internal polygon/s).

Before using these programs, identify the entries (by **NUMBER**) that you wish to combine into polygons, and determine the sequence required to generate the needed polygon. **AND determine the start and end of the first line for each polygon.**

- We suggest making a draft mode plot of the data base before using GSDPOLY or GSMPOLY so that entry numbers are available for the lines to be used in building polygons
- A printed listing of the contents of the database is very helpful in planning polygons so that the 500 point limitation for a single entry is **NOT** exceeded.
- "Closing" a polygon adds the first point of the entry to the end of the entry, thus precisely "closing the figure. Closing the external polygon is required so that a closed internal polygon will be recognized by the plotter.

Operation

Invoke GSDPOLY or GSMPOLY (as appropriate) by entering the name of the program (the program must be in an active directory). Follow the prompts. A new database will be created in the default directory.

The sequence of prompts is:

ENTER CODE FOR NEW POLYGON (0 TO EXIT)? Enter code for new polygon.

ENTER ENTRY NUMBER (0 =COMPLETED) Enter entry number for first line in new polygon (a 0 indicates that no more entries are needed to form the polygon.

CLOSE POLYGON? Y/N: Answer "Y" to close the polygon.
Answer "N" if polygon is not to be closed.

ADD INTERIOR POLYGON? Y/N Answer "Y" to add internal polygon
Answer "N" if no internal polygon is needed

CLOSE POLYGON? Y/N:
Answer "N" to proceed with program operation; closing the polygon after adding an internal polygon is generally not desirable.

ENTER ENTRY NUMBER (0 =COMPLETED): Enter 0 to proceed with program operation.

ENTER CODE FOR NEW POLYGON (0 TO EXIT)? Enter code for another new polygon if desired
Enter 0 to exit from the program.

Entry of a "0" returns operations to the DOS prompt.

Notes:

- It is important to know the starting point of the first line of the polygon. The next line will be added to the final point of the first line. The end point of the succeeding line closest to the final point of the preceding will be chosen to continue the building process.
- Remember that the final polygons can NOT exceed the 500 points limit for a single entry.

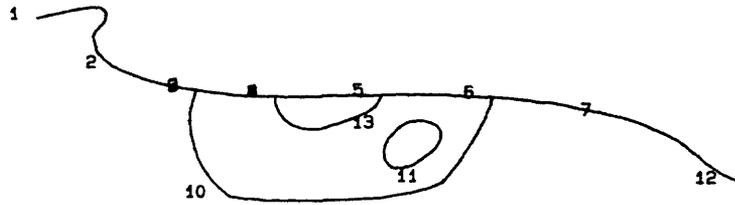


Figure 12A_ Draft mode plot of original digitizing. 13 line segments were digitized as code 1 or code 2. Labels for entries 3&9, 4&8, over-plotted, and are not legible.

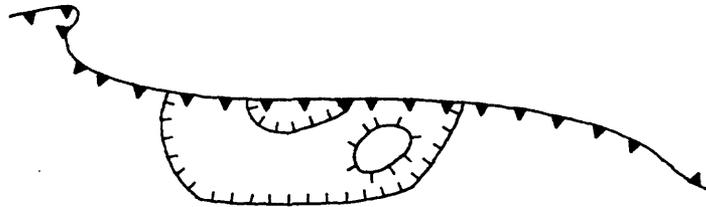


Figure 12B._ Plot of same data base, Code 1 entries drawn as a thrust decorated with symbol 102, code 2 decorated with symbol 105.

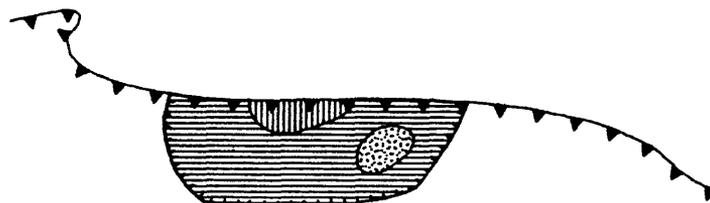


Figure 12C._ Plot of the same data from a new data base created using a POLY utility. Line segments 1+2+3+4+5+6+7+12 have been combined into one line, 3+13+6+11+10+9 with internal polygon 13 were combined to form a single polygon, 4+13 form one polygon, 9+10+11 were combined into one line, polygon 13 retained as a polygon. Polygon fills and line decorations make full use of new data base properties, including polygon fills, and line decorations.

APPENDIX 3. DIFFERENCES BETWEEN VERSION 4.0 AND PREVIOUS VERSIONS OF GSMAP AND GSDRAW

- Screen display capabilities for both programs have been improved.
- The X and Y scales of the screen displays are set so that true shapes are displayed.
- IBM-CGA or IBM-EGA and compatible display adapters are supported, with color or monochrome monitors. A configuration file, CONFIC.SCR is used to configure the graphics system. Almost twice the resolution of CGA is available with EGA. With EGA color any of the 16 available colors can be specified for a particular code; color is available for all screen displays.
- Digitizer support has been broadened to include all digitizers with multi-button keypads that generate ASCII characters and export data through an RS232 port; an ASCII file (CONFIG.DIG) is used to specify data format and characters so that operation is possible even if characters and format of data strings differ from those of the GTCO digitizers (with 16 button cursor) used to develop these programs.
- The map projections supported by GSMAP for digitizing and plotting now include UTM, Transverse Mercator, Albers Equal Area, Lambert Conformal Conic (one or two parallels), and Mercator.
- GSMAP and GSDRAW have been rewritten to fully utilize the structured concepts of Microsoft QuickBasic. The programs cannot be tested or executed under BASICA; they have been compiled using Microsoft QuickBasic, Version 2; and support the 8087 chip using 87BASIC from MicroWay which modifies the standard libraries to call the 8087 co-processor; the 8087 chip is required.
- A mini-screen speeds startup of a GSDRAW/GSMAP session. A new data base can be started, or an existing one opened from this Mini-Menu screen.
- Option 2 (OPEN AN EXISTING DATA BASE): After opening a data base (GSMAP), the latitude and longitude of the data base corners are displayed on the screen.
- Option 3 (DIGITIZE NEW ENTRIES): After the fourth corner point has been entered when indexing the hard copy to the digitizer, the X and Y scales will be displayed on the screen.
- Option 4 (DELETE ENTRIES): You can selectively display entries for one or more codes in the GRAPHICAL DISPLAY mode.
- Option 6 (CHANGE PARAMETERS FOR ENTRIES): global changes can be made to a specified code, and/or to PARA1 and PARA2 for the specified code.

- Option 7 (LIST CONTENTS OF DATA BASE): if the screen option is chosen, there will be a pause after each set of 20 lines is displayed.

- Option 8 (PLOT ON THE SCREEN): codes can be separately or sequentially plotted, and polygons can be outlined or filled.

- Option 9 (PLOT ON THE HARD COPY PLOTTER): at the end of the plot sequence, grid points can be generated at user specified intervals (GSMAP, geodetic grid, GSDRAW, inches. Corners of GSMAP, GSDRAW are changed in shape (using symbol 50) to distinguish from grid marks. Corners can be plotted on draft mode or publication mode plots. A new line type 99 allows plotting of "decorations" without a connecting line. The posting of numerical data, codes 100-199 is no longer restricted to the right side of the digitized point. PARA2 is now used to specify a rotation angle for posting enabling choice of the position of posting for each point.

- Option 10 (MERGE ANOTHER DATA SET INTO CURRENT DATA SET: the process of merging data bases can be displayed on-screen.

- Option 11 (COMPUTE POLYGONAL AREA): The area of polygons defined by 400 series codes can be computed: GSMAP (.xx square miles); GSDRAW (.xx square inches), and the results either printed on the printer, or **displayed on screen**.

- Symbols, The "CI" circle immediate" instruction can now be used, so that circles can be drawn at any position in a symbol without coding a lengthy series of moves; "PM" instructions are now used to define polygons to be filled.

- Utility programs for use with GSMAP and GSDRAW Version 4.0 now include: GSMASC, ASCGSM, GSDASC, ASCGSD, GSMSUB, GSDSUB, GSMTRIM, GSDTRIM, DBASE2MA, GSDPOLY, GSMPOLY and GSDROT; SUBSET can be used, but has been replaced by GSMSUB. Functions of these utility programs are described in this documentation.

- ASCII tables utilized by Code Group 100-199 can contain alphanumeric data in all columns except the first (locality identifier)

- Code group 600-699 is used for lines, like Code group 1-99, but lines are splined by curve fitting to a cubic equation during plotting.

Description of contents of Disks in this Open-File Report.

87-496B Executable program disk

Contents, Disk 1

GSDRAW.EXE	GSDRAW program
GSMAP.EXE	GSMAP program
DRAW.NDX	Example of GSDRAW database (index file)
DRAW.LSF	Example of GSDRAW database (data file)
DRAW.RU	Example of ASCII word and character file
DRAW.PLT	Example of GSDRAW plot file
MAP.NDX	Example of GSMAP database (index file)
CONFIG.PLT	CONFIG.PLT for HP plotter
CONFIG.DIG	CONFIG.DIG for GTCO Digipad 5 digitizer
CONFIG.EGA	Sample of CONFIG.SCR for EGA with color monitor
CONFIG.SCR	CONFIG.SCR for CGA monitor
MAP.PRJ	Sample projection file (UTM, 105 Principal Meridian)
MAP.PLT	Sample plot file for GSMAP

The database DRAW contains the illustration shown on the front cover of this documentation; plot on 8 1/2 X 11 inch paper; pen 1, fine black, pen 2, fine red, pen 3, fine blue, pen 5, heavy black. The data base Map is empty, but can be used for digitizing using the MAP.PRJ projection file, the plus signs as corners for the map.

87-496C Source code disk

Contents (Disk 2)

GSMAP.BAS
DSPLINE.BAS
PROJLIB.BAS
POTLIB.BAS
GSDRAW.BAS
SPLINE.BAS
GSMASC.BAS
GSDASC.BAS
ASCGSM.BAS
ASCGSD.BAS
GSMSUB.BAS
GSDSUB.BAS
GSMTRIM.BAS
GSDTRIM.BAS
GSMPOLY.BAS
GSDPOLY.BAS
DBASE2MA.BAS
GSDROT.BAS

README.DOC

The README.DOC file on this disk contains a description of the database structure for GSMAP and GSDRAW, and directions for compilation of the programs on this disk.

87-496D Executable Utility Program Disks

Contents (Disk 3) GSMAP Utilities.

GSMSUB.EXE
GSMASC.EXE
ASCGSM.EXE
GSMTRIM.EXE
DBASE2MA.EXE
GSMPOLY

Contents, (DISK 4) GSDRAW utilities.

GSDSUB.EXE
GSDASC.EXE
ASCGSD.EXE
GSDTRIM.EXE
GSDROT.EXE
GSDPOLY

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REFERENCES

- Covington, M. A., 1986, Smooth curves: PC Tech Journal, August, p. 110-120.
- Hall, J. K., 1975, PTLOC - a Fortran subroutine for determining the position of a point relative to a closed boundary: Journal of the International Association for Mathematical Geology, v. 7, No. 1, p. 75-80.
- Newman, W.M., and Sproull, R.F., 1979, Principles of interactive computer graphics, second edition: McGraw-Hill, 541 p.
- U.S. Geological Survey, 1986, Software documentation, General cartographic transformation package: U.S. Geological Survey, National mapping program, Technical Instructions, unpublished report, 68 p.
- Snyder, J. P., 1982, Map Projections used by the U.S. Geological Survey, U.S. Geological Survey Bulletin 1532, 313 p.
- Taylor, R.B, Selner, G.I., Johnson, B.R., 1986, GS MRDS - a system based on the data fields used in the national MRDS system but using dBASE III and a microcomputer (IBM PC or compatible) for organizing data on mineral resource occurrences and providing tabular and graphic output, U.S. Geological Survey, Open-file report 86-450A (documentation), and 86-450B (program disk).