UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

DLGGSM: A program to load data from 1:24,000-scale and
1:100,000-scale topographic maps stored in the Digital
Line Graph-3 (Optional) format into a GSMAP Data Base.

By

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Open-File Report
90-459A Documentation (Paper Copy)
90-459B (Executable Program Disk)

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TABLE OF CONTENTS

INTRODUCTION

The U.S. Geological Survey (USGS) has published a series of digital data sets that contain information features from its standard topographic maps. Information from a 1:24,000 and 1:100,000 topographic map is stored in a standard format called Digital Line Graph-3 (Optional) (DLG-3 (Optional)). GSMAP is a microcomputer program that can be used in the compilation and drafting of geologic maps and illustrations. This OpenFile report provides a computer program (DLGGSM) and instructions to convert data stored in the DLG-3 (Optional) format into a GSMAP data base.

SYSTEM REQUIREMENTS

DLGGSM was written and tested using the Microsoft QuickBASIC Compiler Release 4.00b. The program described in this document should execute correctly on IBM PC/XT/AT microcomputers, and requires the following: at least 512 RAM, a hard disk, and a 8087 math co-processor. The program was tested on a Compaq Portable III with 640K of RAM memory and DOS 3.31. The minimum software required to use the program is MS-DOS (or PC-DOS) 2.0 or higher and the OpenFile release diskette.

RELEASE DISK

The release disk contains the following files:

DLGGSM.EXE   Executable code for DLGGSM
BAGGS.DLG   Example of public land survey data stored
                 in DLG-3 format.

INSTALLATION

The file DLGGSM.EXE should be copied from the release disk into any directory that is within the current PATH search list. If the user wishes to test the program using the included DLG example file, then the file BAGGS.DLG should be copied into the current working directory. When testing is completed, BAGGS.DLG and resulting output GSMAP data bases can be deleted. The release disk should be stored as a backup.

BACKGROUND

GSMAP Program

GSMAP (Selner, 1989) is a practical "graphics program" designed for the earth sciences to enable digital compilation of graphical elements. GSMAP utilizes an IBM PC's (or compatible) microcomputer, a digitizer and a plotter. GSMAP can operate on either geodetic (latitude,longitude) coordinates or on Cartesian (X,Y) coordinates. Map projections supported by GSMAP include Universal Transverse Mercator, Polyconic, Lambert Conformal Conic, Albers Equal Area and Equidistant Conic. Data can be digitized from maps that use any of these projections, then plotted using the same or another projection. Each different kind of data such as lines, symbols, areas or text, is assigned a different code. Up to 99 different codes can be assigned to identify lines with different attributes. An additional set of 99 codes is available to identify area data. The programs are oriented to the production of hard copy using a plotter. ALL or part of the data contained in a data base can be plotted.

The program is available from the Books and Open-Files Section, USGS, P.O. Box 25046, Denver, CO 80225 (303)-236-7476.

DLG-3 (Optional) Format

Fully topologically structured USGS DLG-3 (Optional) data files are available from the Earth Science Information Centers of the U.S. Geological Survey. These files are collections of significant points, lines, and polygons encoded with spatial relationships among data elements. DLG-3 files compiled before 1985 contain political boundaries, hydrography and the Bureau of Land Management (BLM) public land surveys. DLG-3 files created since 1985 may also contain transportation, significant manmade structures, hypsography, surface cover, non-vegetative surface features and survey control and markers. The USGS has published a data standard (USGS, 1985,1986) that contain a complete description of the content, format and attribute coding schemes utilized. The standard specifies that lines and areas can have a maximum of 12 pairs of major-minor codes. The codes are specific and describe the attributes of the feature. DLG-3 (Optional) data files from 1:24,000 and 1:100,000 maps specify the location of data in X-Y coordinates using a UTM projection.

DLG-3 (Optional) data files can be obtained from the Earth Science Information Center of the USGS located in Lakewood CO (303)-236-5829 as well as eleven other locations within the US.

2

PROGRAM DESCRIPTION

DLGGSM is a program designed to convert a DLG-3 data file into a GSMAP data base. A DLG-3 data file is stored as ASCII characters in a specific format (see above). GSMAP utilizes a direct access binary files to store digital data. The feature attributes (up to 12 major-minor pairs) stored in the DLG-3 file must be converted to GSMAP codes. DLGGSM will perform the conversion of the attribute codes. The user can select either Cartesian (UTM X-Y) coordinates or Geodetic coordinates for the output GSMAP data base.

The program uses a two step process: convert the lines into a GSMAP data base and then, if area records are present and the user wants to process them, use the area definitions from the DLG-3 file and the lines from the GSMAP data base (created in step 1) to create a second GSMAP data base that contains area boundaries. The user can decline to create the area data base, but if it is latter deemed desirable, the entire process must be repeated. The program will attempt to perserve as much of the attribute information contained in the DLG-3 file as possible.

PROGRAM OPERATION

The program is executed from the DOS prompt by typing DLGGSM followed by a carriage return. In the following text user responses are underlined to differentiate the questions and the example answer. The answers shown are examples of processing the DLG-3 test file (BAGGS.DLG) contained on the release disk. All responses are followed by a carriage return. The GSMAP data base names used are arbitary and were chosen to indicate the contents of the new data base, i.e. BAGGSL contains the lines and BAGGSP, the polygons.

C>DLGGSM

A brief disclaimer screen will appear for a second and then the screen will clear and request the DOS filename of the DLG-3 (Optional) file.

ENTER DLG FILENAME: BAGGS.DLG

The program will then clear the screen and request the name of the GSMAP data base that is to be created.

ENTER OUTPUT GSMAP DATA BASE NAME FOR LINES: BAGGSL

The program will then ask whether you want to store geodetic coordinates (latitude-longitude) or cartesian coordinates (UTM X-Y) in the output data base.

GEODETIC OR CARTESIAN?(G/C): G

The program will then request a title for the GSMAP data base. The title helps identify the contents of the data base.

3

ENTER TITLE: <u>LINEWORK</u>

The program DLGGSM reads in the UTM X-Y values and converts each point to latitude-longitude values if geodetic coordinates were requested. The program reads up to 12 major-minor pairs of attributes for each line from the DLG-3 file and assigns GSMAP codes (starting with 1) to unique combinations of major-minor pairs. As a new unique combination is encountered the GSMAP code is incremented by 1. A maximum of 99 unique combinations of up to 12 major-minor pairs can be handled. Unattributed lines are assigned a GSMAP code of 1000. Use GSMAP to modify the 1000 codes during subsequent processing. If the number of unique sets of major-minor pairs exceeds 99, the program assigns a code of 1000 and writes into the table file the entry number, the 1000 code and the major-minor pairs. During execution the program will display on the bottom of the screen the output entry number, code, parameter 1 and parameter 2 as written to the output GSMAP data base. Upon reaching the end of the input file the program will clear the screen and provide the following message:

FILE BAGGSL.TAB CONTAINS INFORMATION REGARDING
THE DLG-3 (OPTIONAL) FILE AND A TABLE SHOWING THE GSMAP CODES
ASSIGNED TO EACH UNIQUE SET OF MAJOR-MINOR
ATTRIBUTE COMBINATIONS. USE THE DOS PRINT COMMAND
TO OBTAIN A HARD COPY LISTING.

Hit any key to continue.

The file BAGGSL.TAB can be printed to the line printer or typed to the screen after you have exited DLGGSM and returned to the DOS prompt. The table will contain some header information cited in the DLG-3 (Optional) data file. Refer to the appropriate reference cited for an explanation of the various fields from the DLG-3 (Optional) data file.

If area definition records are present in the DLG-3 file, the screen will clear and the program will ask if the user wishes to process the area records.

AREA RECORDS ARE PRESENT IN THE DLG-3 (Optional) FILE
DO YOU WANT TO PROCESS THEM AT THIS TIME(Y/N): <u>Y</u>

If the answer is Y, the program will request the output GSMAP data base name. If the answer is N, the program will return to the DOS operating system.

ENTER OUTPUT GSMAP DATA BASE NAME FOR AREAS : BAGGSP

The program will then request a title for the output GSMAP data base for areas.

ENTER TITLE: <u>POLYGONS</u>

4

The program reads in the lines numbers that comprise an area boundary from the DLG and retrieves the coordinates for each line from the GSMAP data base created in step 1. The coordinates are arranged in sequence to form the boundary. The program reads the major-minor pairs of attributes for the area and assigns a GSMAP code (starting with 401) to each unique combinations of up to 12 major-minor pairs. The coordinates of the boundary and the GSMAP code assigned is written to the output GSMAP data base. This process is repeated until all areas defined in the DLG-3 file are processed. As a new unique combination is encountered the GSMAP code is incremented by 1. A maximum of 99 unique combinations of up to 12 major-minor pairs can be handled. Unattributed areas are assigned a GSMAP code of 1000 that will have to be modified by the user during subsequent processing. If the number of unique sets of major-minor pairs exceeds 99, the program assigns a code of 1000 and writes into the table file the entry number, a 1000 code and the major-minor pairs so that the code can be changed later in GSMAP. The coordinates of the boundary and the code are written to the output GSMAP data base. During the execution the program will display on the bottom of the screen the output entry number, code, parameter 1 and parameter 2 written to the output GSMAP data base. Upon reaching the end of the DLG-3 (Optional) input file the program will clear the screen and provide the following message:

FILE BAGGSP.TAB CONTAINS INFORMATION REGARDING
THE DLG-3 (OPTIONAL) FILE AND A TABLE SHOWING THE GSMAP CODES
ASSIGNED TO EACH UNIQUE SET OF MAJOR-MINOR
ATTRIBUTE COMBINATIONS. USE THE DOS PRINT COMMAND
TO OBTAIN A HARD COPY LISTING.

Hit any key to continue.

The file BAGGSP.TAB can be printed to the line printer or typed to the screen after you have exited DLGGSM and returned to the DOS prompt. The table will contain some header information cited in the DLG-3 (Optional) data file. Refer to the appropriate reference cited for an explanation of the various fields from the DLG-3 (Optional) data file. The program then returns the user to the DOS operating system.

REFERENCES

Selner, Gary I. and Taylor, Richard B., 1989, GSDRAW and GSMAP System Version 6.0: Graphic Programs and Utility Programs for the IBM PC and Compatible Microcomputers to assist Compilation and Publication of Geologic Maps and Illustrations: U.S. Geological Survey Open-File Report 89-373A, 53 p., Program Disks 89-373B, 5 disks.

USGS, 1985, USGeoData Digital Line Graphs from 1:100,000-Scale Maps, Data Users Guide 2, U.S.Geological Survey, Reston Virginia.

USGS, 1986, USGeoData Digital Line Graphs from 1:24,000-Scale Maps, Data Users Guide 1, U.S.Geological Survey, Reston Virginia.