

UNITED STATES DEPARTMENT OF THE INTERIOR

GEOLOGICAL SURVEY

DLGSCOD: a program to determine and list 1:100,000-scale standard
DLG distribution format codes,

DLGOCOD: a program to determine and list 1:100,000-scale optional
DLG distribution format codes,

DLGSGSM: a program to extract 1:100,000-scale standard DLG
distribution format data and write the data to a GSMAP database,

and

DLGOGSM: a program to extract 1:100,000-scale optional DLG
distribution format data and write the data to a GSMAP database.

Programs for IBM PC-compatible microcomputers

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INTRODUCTION

The Digital Line Graph (DLG) data are valuable as background information for displaying earth-science information. The program DLGSCOD determines and lists 1:100,000-scale standard DLG distribution format (hereafter abbreviated to standard format DLG) codes. The program DLGOCOD determines and lists 1:100,000-scale optional DLG distribution (hereafter abbreviated to optional format DLG) format codes. The program DLGSGSM extracts standard DLG format data and writes the data to a GSMAP database. The program DLGOGSM extracts optional DLG format data writes the data to a GSMAP database (Selner and Taylor, 1992). Programs are also available to examine and convert 1:2,000,000-scale DLG data to GSMAP data bases (Selner and Hoffman, 1991).

The standard DLG format uses a coordinate system internal to each file to minimize storage requirements, while the optional DLG format uses meters in the Universal Transverse Mercator (UTM) coordinate system.

GSMAP is a practical "graphics program" designed for the earth sciences to enable digital compilation of maps and drawings. GSMAP utilizes an IBM-PC compatible microcomputer, a digitizer and a plotter. GSMAP can operate on either geodetic (latitude, longitude) coordinates or on Cartesian (X,Y) coordinates.

DIGITAL LINE GRAPH FILES

The 1:100,000-scale DLG data are available to the public as a series of magnetic tapes. The DLG files can be purchased individually or as a set covering a category, such as hydrography or transportation, or as a set covering a geographic region. The data are sold to the public for a reproduction cost.

Standard format DLG data files use an internal coordinate system unique to each 1:100,000-scale quadrangle. Such a system minimizes storage requirements. Optional format DLG data files use the UTM coordinate system, expressed in meters. The programs DLGSGSM and DLGOGSM convert the appropriate coordinate systems to a GSMAP coordinate system.

The standard format DLG data are organized by category and by 1:100,000-scale quadrangle. A publication (U. S. Geological Survey, 1990) contains a complete description of the record structure for standard and optional DLG formats and lists the major-minor DLG codes. This publication and DLG magnetic tapes are available from U.S. Geological Survey Earth Science Information Centers (ESIC's). The ESIC main office can be reached at 1-800-USA-MAPS.

Five categories are included in the current 1:100,000-scale DLG data. Not all categories are available for each 1:100,000-scale quadrangle. The five categories are listed in the following table:

Category	Type of Information
Hydrography	Flowing and standing water, and wetlands.
Transportation	Roads, trails, railroads, pipelines, transmission lines, and miscellaneous transportation.
Hypsography	Topographic relief information and spot elevations.
Boundaries	Political boundaries such as States, counties, and cities; administrative boundaries such as National and State Forests and National Wilderness Areas.
Public Land Survey System	Rectangular system of land surveys administered by the U. S. Bureau of Land Management. Such data are collected only for those lands within the States that were formed from the public domain. These data are for cartographic reference only and are not intended to be used as a legal basis for determining land boundaries.

SYSTEM REQUIREMENTS

An IBM-PC (tm) compatible microcomputer running PC-DOS or MS-DOS 2.0 or later, or a compatible operating system, with at least 512KB installed RAM, and a hard disk are required to use the programs described here. Also, a 9-track tape drive is required for reading the DLG tapes. The U.S. Geological Survey is planning to publish 1:100,000-scale DLG data on CD-ROM's. As of this open-file report, 1:100,000-scale DLG data for the state of Florida have been published on a CD-ROM. This publication is available from ESIC offices.

CONTENTS OF THE RELEASE DISK

File	Explanation
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DLGSCOD.EXE	Program to determine and list standard DLG distribution format codes
DLGOCOD.EXE	Program to determine and list optional DLG distribution format DLG codes
DLGSGSM.EXE	Standard distribution format 1:100,000-scale DLG to GSMAP conversion program
DLGOGSM.EXE	Optional distribution format 1:100,000-scale DLG to GSMAP conversion program
WATER.CTL	Example control file for selecting water and wetlands data
WATER.COD	Example major-minor code file for specifying water and wetland codes

PAONIA_1.BND Example boundary file in decimal degrees format
 PAONIA_2.BND Example boundary file in degrees, minutes, and
 seconds format
 MS1HYS01.ASC 1:100,000-scale hydrography DLG file for the
 Paonia, Colorado quadrangle. This file is bounded
 by 39,00,00,N and 108,00,00,W at the NW corner,
 38,52,30,N and 108,00,00,W at the SW corner,
 38,52,30,N and 107,52,30,W at the SE corner, and
 39,00,00,N and 107,52,30,W at the NE corner.
 MS1HYS02.ASC 1:100,000-scale hydrography DLG file for the
 Paonia, Colorado quadrangle. This file is bounded
 by 39,00,00,N and 107,52,30,W at the NW corner,
 38,52,30,N and 107,52,30,W at the SW corner,
 38,52,30,N and 107,45,00,W at the SE corner, and
 39,00,00,N and 107,45,00,W at the NE corner.
 MS1HYS03.ASC 1:100,000-scale hydrography DLG file for the
 Paonia, Colorado quadrangle. This file is bounded
 by 39,00,00,N and 107,45,00,W at the NW corner,
 38,52,30,N and 107,45,00,W at the SW corner,
 38,52,30,N and 107,37,30,W at the SE corner, and
 39,00,00,N and 107,37,30,W at the NE corner.
 PAONIA.PLT GSMAP plot control file to be used for the
 tutorial.
 PAONIA.PRJ GSMAP projection file to be used for the tutorial.

INSTALLATION

All files on the accompanying floppy diskette should be copied to a directory on your hard disk that is contained in the default path list. For simplicity, working .COD and .CTL files may be placed in the directory in which the conversions will take place.

DLGSCOD AND DLGOCOD DESCRIPTIONS

The DLGSCOD program examines the contents of a standard DLG distribution format 1:100,000-scale DLG file and writes an ASCII file containing the unique DLG attribute codes in that file. The DLGOCOD program performs the same operation for optional DLG distribution format 1:100,000-scale DLG files.

DLGSCOD AND DLGOCOD OPERATIONS

The programs DLGSCOD and DLGOCOD are started by typing either DLGSCOD or DLGOCOD and then pressing the Enter key.

After displaying an introductory screen, the program will display the following prompt:

ENTER NAME OF DLG INPUT FILE(Q TO EXIT):

Type the name of the DLG file to be processed. After DLG file name is entered, the program will display the next prompt:

ENTER NAME OF ASCII OUTPUT FILE FOR ATTRIBUTE CODES:

Enter a file name as requested. After the file name is entered, the program will process the data, create the requested ASCII file, display information about that file, and finally display the first prompt again.

Examine the contents of the ASCII file(s) to determine the unique attribute codes in the DLG file(s).

A typical ASCII output file looks like this:

```
50,    200
50,    412
50,    414
```

Use the appropriate table(s) in the appendix in this report or Appendix D of the 1:100,000-scale Data Users Guide (see **REFERENCES**) to interpret the ASCII output files. In the example above, the DLG code 50, 200 indicates a shoreline. The DLG code 50, 412 indicates a stream. The DLG code 50, 414 indicates a ditch or a canal.

DLGSGSM AND DLGOGSM DESCRIPTIONS

The DLGSGSM and DLGOGSM program enables the user to select all or portions of the data from one or more standard or optional distribution format DLG files and to generate GSMAP data bases with the lines attributed by GSMAP codes. You must stipulate the instructions for the programs in control files (see below). The programs operate in a pseudo-batch method where you stipulate the selection criteria and the DLG files to be processed, and then leave the process to operate unattended until the conversion is completed.

The programs display the contents of the control file parameters and the contents of the attribute file and the boundary file on the screen as they are read in. Next, the user is requested to press the Enter key to continue the process. After all of the parameters are set, the program will display at the bottom of the screen the name of the DLG file currently being processed and a counter showing the number of records written to the GSMAP output data base.

DLGSGSM AND DLGOGSM OPERATION

The programs are started by typing either DLGSGSM or DLGOGSM and then pressing the Enter key. After displaying an introductory screen, the program will then display the following prompt:

ENTER THE NAME OF THE CONTROL FILE:

Type the filename for the control file and then press the Enter key.

An alternative way to start the program running is to type the name of the program followed by one or more spaces and the DOS filename of the control file:

DLGSGSM WATER.CTL

This second method lends itself to practical batch processing.

DLGSGSM AND DLGOGSM CONTROL FILE DESCRIPTIONS

The control file is an ASCII file that can be created with any editor or word processing program capable of creating an ASCII file.

Record 1. The GSMAP data base name. The name must be one to eight characters long and contain no special characters or blanks. Do not append a file extension to the name.

Example:

WATER

Record 2. The GSMAP map title. The name can be from one to 16 characters long and must not contain special characters.

Example:

RIVERS AND LAKES

Record 3. The geographic northwest corner for the GSMAP data base. Latitude degrees, minutes, seconds, N or S, and longitude degrees, minutes, seconds, W or E.

Example:

39,00,0,N,108,0,0,W

Record 4. The southwest corner in the same format as record 3.

Example:

38,30,0,N,108,0,0,W

Record 5. The southeast corner in the same format as record 3.

Example:

38,30,0,N,107,0,0,W

Record 6. The northeast corner in the same format as record 3.

Example:

39,0,0,N,107,0,0,W

Record 7. Y or N indicates if a geographic-boundary trim file is to be used. If record 8 is a N, then omit records 8 and 9.

Example:

Y

Record 8. If record 7 contains a Y, then record 8 must be the name of an ASCII file that contains the coordinates of a polygonal geographic-boundary. This boundary will be used to the data. Data inside the boundary will be written to the GSMAP data base.

Example:

PAONIA_2.BND

A description and an example of a boundary trim file follows later in this paper.

Record 9. If Record 7 contains a Y, then Record 9 must indicate if the geographic coordinates of the boundary file are in decimal degrees (DD) or degrees,minutes,seconds (DMS).

Example:

DMS

Record 10. Y or N specifies whether data are to be selected by major-minor DLG pairs listed in major-minor code file. Major-minor code files are described later in this paper.

Example:

Y

Record 11. If Record 10 contains a Y, then Record 11 must be the name of an ASCII file that provides a table of major-minor pairs and the GSMAP code to be assigned to that pair. If Record 10 contains a N, then Record 11 must be the GSMAP code to assign to all the line work. We highly recommend using a major-minor code file. GSMAP accepts line codes from 1 through 99 (Selner and Taylor, 1992).

Example:

WATER.COD

Record 12, 13, 14,... These records contain the full pathname of each DLG file that is to be processed, one file per line.

Examples:

MS1HYS01.ASC
MS1HYS02.ASC
MS1HYS03.ASC

Following is the entire control file given above. The comments to the right are not part of the file.

WATER	Name of the GSMAP data base
RIVERS AND LAKES	Title of the GSMAP data base
39,00,0,N,108,0,0,W	Latitude and longitude of the NW corner
38,30,0,N,108,0,0,W	Latitude and longitude of the SW corner
38,30,0,N,107,0,0,W	Latitude and longitude of the SE corner
39,00,0,N,107,0,0,W	Latitude and longitude of the NE corner
Y	Y means use a boundary trim file
PAONIA_2.BND	The name of the boundary trim file
DMS	The format of the boundary trim file
Y	Y means use a major-minor code file
WATER.COD	The name of the major-minor code file
MS1HYS01.ASC	The name of the first DLG file
MS1HYS02.ASC	The name of the second DLG file
MS1HYS03.ASC	etcetera

MAJOR-MINOR CODE FILE DESCRIPTION

This file consists of a series of records that contain a DLG major code, a DLG minor code, a GSMAP code and an optional comment field enclosed in quotation marks. If you do not want to use the optional comment feature, be sure to omit the third comma. DLG major-minor codes are listed in a table below and in Appendix D of the Data Users Guide (U.S. Geological Survey, 1990). Create the required major-minor code file(s) using a text editor or a word processing program that can write ASCII files. This can be done by editing the output files created by DLGSCOD or DLGOCOD. Major-minor code files are required for selecting the desired line features. The maximum number of records in such files is 250.

Listed below is an example of a major-minor code file:

50,200,50,"Shoreline"
50,300,51,"Spring"
50,412,52,"Stream"
50,414,53,"Ditch or canal"
50,415,54,"Aqueduct"
50,610,55,"Intermittent"

In the example above, 50 is the DLG major code. The DLG minor codes are 200, 300, 412, 414, 415, and 604. The GSMAP line codes are 50, 51, 52, 53, 54, and 55. The DLG major code will become parameter 1 in the GSMAP database, and the DLG minor code will become parameter 2 in the GSMAP database.

Be careful when creating major-minor code files. Avoid assigning the same GSMAP attribute code to different DLG features. For example, assigning the GSMAP attribute code 50 to both a stream and a road could make editing the output GSMAP data base difficult.

BOUNDARY TRIM FILE DESCRIPTION

A boundary file consists of the geographic coordinates of a series of points that form a closed polygon. Boundary trim files are used to select a geographically-bound area from a larger data set. The format is either in decimal degrees (DD) or degrees, minutes, seconds (DMS), depending on what was stipulated on Record 9 of the control file. If the decimal degree format is used, west longitudes are negative, and south latitudes are negative. Remember to repeat the first point; that is, the polygon must have first and last point equal. The maximum number of points in the polygon is 250.

Example for DD format:

```
39.000,-108.000
38.875,-108.000
38.875,-107.875
38.917,-107.875
38.917,-107.620
39.000,-107.620
39.000,-108.000
```

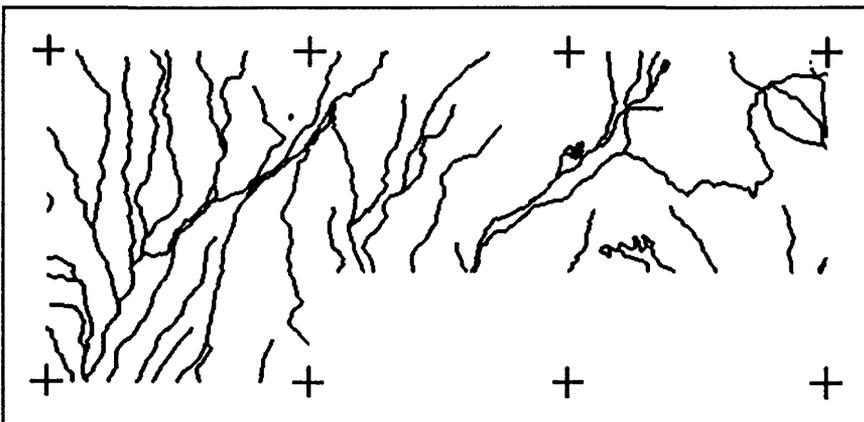
Example for DMS format:

```
39,00,00,N,108,00,00,W
38,52,30,N,108,00,00,W
38,52,30,N,107,52,30,W
38,55,00,N,107,52,30,W
38,55,00,N,107,37,30,W
39,00,00,N,107,37,30,W
39,00,00,N,108,00,00,W
```

TUTORIAL

Your task is to convert the files MS1HYS01.ASC, MS1HYS02.ASC, and MS1HYS03.ASC on the distribution disk into a GSMAP data base. These files are described in the section **CONTENTS OF THE RELEASE DISK** above. Use the following procedure:

1. Use the program DLGSCOD to determine and list the DLG code pairs in each of the three DLG files. The program should find that all the major codes are 50, and that the minor codes are 200, 300, 412, 414, 415, and 610. Use the summary table of DLG attribute codes listed in the appendix to determine what these major-minor code pairs represent.
2. Create a major-minor code file using the output from step 1. You may wish to use the major-minor code file, WATER.COD, included on the distribution disk.
3. Create a control file to manage the DLGSGSM program. You may wish to use the control file, WATER.CTL, included on the distribution disk.
4. Create a boundary trim file to select a geographically-bound area from DLG files included on the distribution disk. You may wish to use one of the boundary files, PAONIA_1.BND or PAONIA_2.BND, included on the distribution disk. Be sure to specify in the control file the format of the boundary file you use.
5. Run the program DLGSGSM to convert the DLG files into a GSMAP data base. If you use the files WATER.COD, WATER.CTL, and PAONIA_2.BND, PAONIA.PLT, and PAONIA.PRJ on the distribution disk, your GSMAP data base should look like this when using GSMAP or GSMEDIT to display the data base on the monitor:



Note that, for reference, tick marks at 7½ minute intervals have been added. Only the portion of the Paonia quadrangle that is covered by the DLG files included on the distribution is shown. The blank area in the lower two-thirds of the map is outside the polygonal area defined by the boundary trim file PAONIA_2.BND.

APPENDIX -- SUMMARY TABLE OF DLG ATTRIBUTE CODES

The following table lists major and minor DLG code pairs by category, along with descriptions of the code pairs. The first number is the major code and the second number is the minor code. Use the output from DLGSCOD or DLGOCOD to determine the features present in the DLG files you are using. A * denotes a code pair no longer being used to encode features, but may appear in older files.

Hypsography -- lines

- 020 0200 Contour (index or intermediate)
- 0201 Carrying contour
- 0202 Supplementary contour
- 0203 Continuation contour
- 0204 Amended contour
- 0205 Bathymetric contour
- *0206 Depth curve
- 0207 Watershed divides
- 0208 Closure line

Hypsography -- lines (degenerate lines)

- 020 0300 Spot elevation, less than third order
- 020 0301 Spot elevation, less than third order, not at ground level

Hypsography -- multiple element types

- 020 0600 Decimal fractions of feet
- 0609 or meters
- 0610 Approximate
- 0611 Depression
- 0612 Glacier or snow field
- 0613 Underwater
- 0614 Best estimate of contour elevation value

Hydrography -- nodes

- 050 0001 Upper origin of stream
- 0002 Upper origin of stream at water body
- 0003 Sink, channel no longer evident
- 0004 Stream entering water body
- 0005 Stream exiting water body

Hydrography -- areas

- 050 0100 Alkali flat
- 0101 Reservoir
- 0102 Covered reservoir
- 0103 Glacier or permanent snowfield
- 0104 Salt evaporator
- 0105 Inundation area
- 0106 Fish hatchery or farm
- 0107 Industrial water impoundment
- 0108 Area to be submerged
- 0109 Sewage disposal pond or filtration beds
- 0110 Tailings pond
- 0111 Marsh, wetland, swamp, bog
- 0112 Mangrove area
- 0113 Rice field
- 0114 Cranberry bog
- 0115 Flats (tidal, mud, sand, gravel)
- 0116 Bays, estuaries, gulfs, oceans, seas
- 0117 Shoal
- 0118 Soda evaporator
- 0119 Duck Pond
- 0120 Void area

Hydrography -- lines

- 050 0200 Shoreline
- 0201 Handmade shoreline
- 0202 Closure line
- 0203 Indefinite shoreline
- 0204 Apparent limit
- 0205 Outline of a Carolina bay
- 0206 Danger curve
- 0207 Apparent shoreline

Hydrography -- points

- 050 0300 Spring
- 0301 Non-flowing well
- 0302 Flowing well
- 0303 Riser
- 0304 Geyser
- 0305 Windmill
- 0306 Cistern

Hydrography -- multiple element types

- 050 0400 Rapids
- 0401 Falls
- 0402 Gravel pit or quarry filled with water
- 0403 Gaging station
- 0404 Pumping station

0405 Water intake
 0406 Dam or weir
 0407 Canal lock or sluice gate
 0408 Spillway
 0409 Gate (flood, tidal, head, check)
 0410 Rock
 0411 Crevasse
 0412 Stream
 0413 Braided stream
 0414 Ditch or canal
 0415 Aqueduct
 0416 Flume
 0417 Penstock
 0418 Siphon
 0419 Channel in water area
 0420 Wash or ephemeral drain
 0421 Lake or pond
 0422 Coral reef
 0423 Sand in open water
 0424 Spoil area
 0425 Fish ladders
 0426 Holiday area
 0601 Underground types
 0602 Overpassing
 0603 Elevated
 0604 Tunnel
 0605 Right bank
 0606 Left bank
 0607 Under construction
 0608 Salt
 0609 Unsurveyed
 0610 Intermittent
 0611 Abandoned or discontinued
 0612 Submerged or sunken
 *0613 Wooded
 0614 Dry
 0615 Mineral or hot (sulphur, alkali, etc.)
 0616 Navigable, transportation
 0617 Underpassing
 0618 Earthen construction
 0619 Interpolated elevation
 0621 Decimal fractions of feet or meters

Boundaries -- nodes

090 0001 Monumented point on a boundary

Boundaries -- areas

090 0100 Civil township, district, precinct, or barrio
 0101 Incorporated city, village, town, borough, or hamlet

0103 National Park, Monument, Lakeshore, Seashore,
 Parkway, Battlefield, or Recreation Area
 0104 National Forest or Grassland
 0105 National Wildlife Refuge, Game Preserve, or Fish
 Hatchery
 0106 National Scenic Waterway, Riverway, Wild and
 Scenic River, or Wilderness Area
 0107 Indian Reservation
 0108 Military Reservation
 0110 Federal prison
 0111 Miscellaneous Federal reservation
 0129 Miscellaneous State reservation
 0130 State Park, Recreation Area, Arboretum, or Lake
 0131 State Wildlife Refuge, Game Preserve, or Fish
 Hatchery
 0132 State Forest or Grassland
 0133 State prison
 0134 County Game Preserve
 0150 Large park (city, county, or private)
 0151 Small park (city, county, or private)
 0197 Canada
 0198 Mexico
 0199 Open water

Boundaries -- lines

090 0201 Indefinite (or approximate) boundary
 0202 Disputed boundary
 0203 Historical line
 0204 Boundary closure line

Boundaries -- points (degenerate lines)

090 0301 Reference monuments for boundary points

Boundaries -- multiple element types

091 00-- State FIPS code
 092 0--- County or county equivalent FIPS code
 095 ---- Monument number
 096 XXYY Alphabetic portion of any monument number.
 Substitute numeric equivalent of alphabetic for
 XX and for YY as follows: 00=blank, 01=A, 02=B,
 03=C, 04=D, 05=E, 06=F, 07=G, 08=H, 09=I, 10=J,
 11=K, 12=L, 13=M, 14=N, 15=O, 16=P, 17=Q, 18=R,
 19=S, 20=T, 21=U, 22=V, 23=W, 24=X, 25=Y, 26=Z.
 098 0000 Best estimate of classification or position
 099 00-- Coincident feature

Transportation, roads and trails -- nodes

170 0001 Bridge abutment
 0002 Tunnel portal

0004 Gate
0005 Cul-de-sac
0006 Dead end
0007 Drawbridge

Transportation, roads and trails -- areas

170 0100 Void area

Transportation, roads and trails -- lines

170 0201 Primary route, class 1, symbol undivided
0202 Primary route, class 1, symbol divided by
centerline
0203 Primary route, class 1, divided, lanes separated
0204 Primary route, class 1, one way, other than
divided highway
0205 Secondary route, class 2, symbol undivided
0206 Secondary route, class 2, symbol divided by
centerline
0207 Secondary route, class 2, symbol divided, lanes
separated
0208 Secondary route, class 2, one way, other than
divided highway
0209 Road or street, class 3
0210 Road or street, class 4
0211 Trail, class 5, other than four-wheel-drive
vehicle
0212 Trail, class 5, four-wheel-drive vehicle
0213 Footbridge
0214 Ferry crossing
0215 Perimeter of parking area
0216 Arbitrary extension of line (join or closure)
0217 Road or street, class 3, symbol and trails,
divided by centerline
0218 Road or street, class 3, divided, lanes separated
0221 Road in street, class 3, one way
0222 Road in transition

Transportation, roads and trails -- multiple element types

170 0401 Traffic circle
0402 Cloverleaf or interchange
0403 Toll gate, toll plaza or perimeter of toll plaza
0404 Weigh station
0405 Nonstandard section of road
0601 In tunnel
0602 Overpassing, on bridge
0603 Under construction, classification known
0604 Under construction, classification unknown
0605 Labeled "old railroad grade"
0606 Submerged or in ford
0607 Underpassing

- 0608 Limited access
- 0609 Toll road
- 0610 Privately operated or controlled public access
- 0611 Proposed
- 0612 Double-decked
- 0613 In service facility or rest area 0614 Elevated
- 0615 Bypass route
- 0616 Alternate route
- 0617 Business route
- 0618 On drawbridge
- 0619 Spur
- 0620 Loop
- 0621 Connector
- 0622 Truck route
- 0650 Road width 46-55 feet, 0.025 inches at 1:24,000
- 0651 Road width 56-65 feet, 0.030 inches at 1:24,000
- 0652 Road width 66-75 feet, 0.035 inches at 1:24,000
- 0653 Road width 76-85 feet, 0.040 inches at 1:24,000
- 0654 Road width 86-95 feet, 0.045 inches at 1:24,000
- 0655 Road width 96-105 feet, 0.050 inches at 1:24,000
- 0656 Road width 106-115 feet, 0.055 inches at 1:24,000
- 0657 Road width 116-125 feet, 0.060 inches at 1:24,000
- 0658 Road width 126-135 feet, 0.065 inches at 1:24,000
- 0659 Road width 136-145 feet, 0.070 inches at 1:24,000

- 171 ---- Number of lanes
- 172 ---- Interstate route number
- 173 ---- U.S. route number
- 174 ---- State route number
- 175 ---- Reservation, park, or military route number
- 176 ---- County route

- 177 XXYY Alphabetic portion of any route number.
 Substitute numeric equivalent of alphabetic for
 XX and for YY as follows: 00=blank, 01=A, 02=B,
 03=C, 04=D, 05=E, 06=F, 07=G, 08=H, 09=I, 10=J,
 11=K, 12=L, 13=M, 14=N, 15=O, 16=P, 17=Q, 18=R,
 19=S, 20=T, 21=U, 22=V, 23=W, 24=X, 25=Y, 26=Z.

- 178 0000 Best estimate of position or classification
- 179 00-- Coincident feature

Transportation, railroads -- nodes

- 180 0001 Bridge abutment
- 0002 Tunnel portal
- 0007 Drawbridge

Transportation, railroads -- areas

- 180 0100 Void area

Transportation, railroads -- lines

- 180 0201 Railroad
- 0202 Railroad in street or road
- 0204 Carline
- 0205 Cog railroad, incline railway, logging tram
- 0207 Ferry crossing
- 0208 Railroad siding
- 0209 Perimeter or limit of yard
- 0210 Arbitrary line extension
- 0211 Closure line

Transportation, railroads -- multiple element types

- 180 0400 Railroad station, perimeter of station
- 0401 Turntable
- 0402 Roundhouse
- 0601 In tunnel
- 0602 Overpassing, on bridge
- 0603 Abandoned
- 0604 Dismantled
- 0605 Underpassing
- 0606 Narrow gauge
- 0607 In snowshed or under structure
- 0608 Under construction
- 0609 Elevated
- 0610 Rapid transit
- 0611 On drawbridge
- 0612 Private
- 0613 U.S. Government
- 0614 Juxtaposition

- 181 ---- Number of tracks
- 188 0000 Best estimate of position or classification
- 189 00-- Coincident feature

Transportation, pipelines, transmission lines, miscellaneous transportation features -- nodes

- 190 0001 End of transmission line at power station, substation, or hydroelectric plant
- 0002 End of pipeline at oil or gas field
- 0003 End of pipeline at refinery, depot, or tank farm

Transportation, pipelines, transmission lines, miscellaneous transportation features -- areas

- 190 0100 Void area

Transportation, pipelines, transmission lines, miscellaneous transportation features -- lines

- 190 0201 Pipeline

- 0202 Power transmission line
- 0203 Telephone or telegraph line
- 0204 Aerial tramway, monorail, ski lift
- 0205 Arbitrary line extension
- 0206 Closure line

Transportation, pipelines, transmission lines, miscellaneous transportation features -- points (degenerate lines)

190 0300 Seaplane anchorage

Transportation, pipelines, transmission lines, miscellaneous transportation features -- multiple element types

- 190 0400 Power station
- 0401 Substation
- 0402 Hydroelectric Plant
- 0403 Landing strip, airport, perimeter of airport
- 0404 Heliport, perimeter of heliport
- 0405 Launch complex, perimeter of launch complex
- 0406 Pumping station (other than water)
- 0407 Seaplane ramp or landing area
- 0408 Measuring station
- 0600 Underground
- 0601 Under construction
- 0602 Abandoned
- 0603 Above ground
- 0604 Labeled "closed"
- 0605 Unimproved, loose surface
- 0606 Submerged
- 0607 Nuclear

193 0--- Angle of clockwise rotation (nearest whole degree)

198 0000 Best estimate of position or classification

199 00-- Coincident feature

U.S. Public Land Survey System -- nodes

- 300 0001 U.S. Public Land Survey System section corner
- 0002 Point on section line (no corner)
- 0003 Closing corner
- 0004 Meander corner
- 0005 Auxiliary meander corner
- 0006 Special meander corner
- 0007 Witness corner
- 0008 Witness point
- 0009 Angle point
- 0010 Location monument (includes amended monument and mineral monument)
- 0011 Reference mark
- 0012 Quarter-section corner
- 0013 Tract corner
- 0014 Land grant corner

0015 Arbitrary section corner

- 300 0040 Corner identified in field
- 0041 Corner with horizontal coordinates
- 0042 Corner with elevation value

U.S. Public Land Survey System -- areas

Select one parameter code from each of the following A, B, C, and D lists and/or consult list E.

A. Origin of Survey

- 306 00-- Insert two-digit code from Appendix K, U. S. Geological Survey, 1990.

B. Township number(s)

- 30- ---- Insert 2 for north of the baseline or 3 for south of the baseline in first space. In the second space, insert a 0 for full township, 2 for 1/4 township, 4 for 1/2 township, or 6 for 3/4 township. Insert township number in the last three spaces, right justified.

C. Range number(s)

- 30- ---- Insert 4 for east of the principal meridian or 5 for west of the principal meridian in the first space. In the second space, insert a 0 for a full range, 2 for 1/4 range, 4 for 1/2 range, 6 for 3/4 range, 8 for duplicate to the north or east of the original township, or 9 for triplicate to the north or east of the original township. Insert range number in last three spaces, right justified.

D. Section number

- 301 ---- In the first space, insert 0 for numeric section identifier, 1 for numeric portion of alphanumeric identifier, or 2 for alphabetic part of alphanumeric identifier. In the last three spaces, insert section number or numeric representation of alphabetic character (01-26), right justified.

E. Land grant identifier

- 307 ---- In the first space, insert the appropriate number:
 - 0 for numeric grant identifier
 - 1 for numeric portion of alphanumeric identifier

- 2 for alphabetic portion of alphanumeric identifier
- 3 for alphabetic identifier
- 4 for identifier of named grant in Arizona
- 5 for identifier of named grant in California
- 6 for identifier of named grant in Colorado
- 7 for identifier of named grant in New Mexico
- 8 for identifier of named grant in other States

In the last three spaces after 0-3 above, insert the grant number or numeric representation of the alphabetic character (01-26), right-justified. In the last three spaces after 4-7 above, insert the three-digit code of the named grant as designated in Appendix L.

F. Excluded areas

- 300 0100 Indian lands
 - 0101 Homestead entries
 - 0102 Donation land claims
 - 0103 Land grants; civil colonies
 - 0104 Private extension of public land survey
 - 0105 Area of public and private survey overlap
 - 0106 Overlapping land grants
 - 0107 Military reservation
 - 0198 Water
 - 0199 Unsurveyed area

U.S. Public Land Survey System -- lines

- 300 0201 Approximate position (within 200 feet)
- 0202 Protracted position
- 0203 Arbitrary closure line
- 0204 Base line
- 0205 Claim line, grant line

U.S. Public Land Survey System -- points (degenerate lines)

- 300 0300 Location monument
 - 0301 Isolated found section corner
 - 0302 Witness corner (off surveyed line)

U.S. Public Land Survey System -- multiple element types

- 308 0000 Best estimate of classification and/or position
- 309 00-- Coincident feature or symbol

REFERENCES

- Selner, Gary I. and Hoffman, J. D., 1991, E2MCOD: a program to determine and list Digital Line Graph line attributes from a CD-ROM titled 1:2,000,000-Scale Digital Line Graph and E2MGSM: a program to retrieve Digital Line Graph data from a CD-ROM titled 1:2,000,000-Scale Digital Line Graph and convert those data to a GSMAP data base: U. S. Geological Survey Open-File Report 91-345, 12 p., 1 disk.
- Selner, Gary I. and Taylor, Richard B., 1992, GSMAP, GSMEDIT, GSMUTIL, GSPOST, GSDIG, and other programs, version 8, for the IBM PC and Compatible Microcomputers to assist workers in the earth sciences: U.S. Geological Survey Open-File Report 92-217, 217 p., 1 disk.
- U. S. Geological Survey, Digital Line Graphs From 1:100,000-Scale Maps, National Mapping Program Technical Instructions, Data Users Guide 2, 107 p.