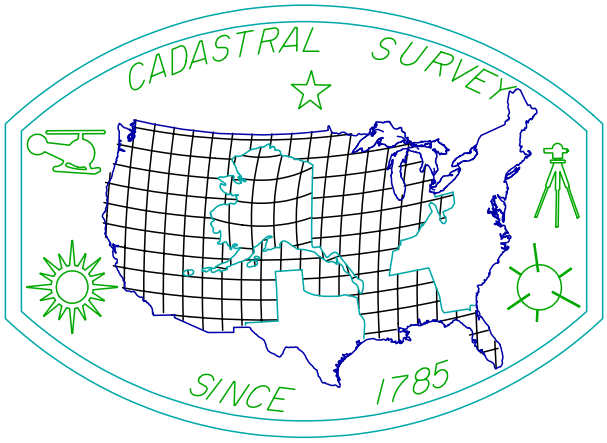
COLORADO



GEOGRAPHIC COORDINATE DATA BASE

Users Manual

Bureau of Land Management
Colorado State Office
Lakewood, Colorado

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GLOSSARY OF ABBREVIATED TERMS

BLM	Bureau of Land Management
GCDB	Geographic Coordinate Data Base
GIS	Geographic Information System
GMM	GCDB Measurement Management
HES	Homestead Entry Survey
NAD	North American Datum
CDOT	Colorado Department of Transportation
NGS	National Geodetic Survey
PCCS	PLSS Coordinate Computation System
PID	Point Identifier
PLSS	Public Land Survey System
SID	Source Identification
USC & GS	U.S. Coast and Geodetic Survey
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator

INTRODUCTION

This User's Guide has been compiled in order to give the novice user an introduction to the Geographic Coordinate Data Base (GCDB). The guide manual will familiarize the user with the corner identification used in the output files created by the Public Land Survey System Coordinate Computational System (PCCS) software, and by GCDB Measurement Management (GMM) software, and their functionality.

The GCDB has been developed in order to render the most dependable coordinates available for the U.S. Public Land Survey System (PLSS) corners. The Colorado State BLM Office has the responsibility of producing the GCDB for the State of Colorado. For an up-to-date listing of currently available townships, see the Public Notice posted in the Public Room of the state BLM office. The BLM`s record data contained in the GCDB has been collected with a 98% level of accuracy.

To satisfy the need for more accurate and more complete set of coordinates of the PLSS corners, a system of computer programs, PCCS and GMM have been developed to:

1. Compute the geographic coordinates of PLSS corners using official cadastral survey record data.

2. Provide an estimate of the approximate relative position coordinate dependability.

BLM began the GCDB project using PCCS software and changed to GMM software which is currently being used and will continue to be used in the future to obtain the coordinate values. This software is available for PC's. (486 micro-processor is needed to run the programs.)

At this time, the geographic coordinates are computed using the adjustment of North American Datum 1927 (NAD27).

The data obtained from these computer programs provides the theoretical position of the PLSS corners. The information is used primarily for a Geographic Information System (GIS) type environment to give the relationship of the townships to a point on the earth's surface.

The geographic positions should never be used to replace lost or missing PLSS corners. Refer to the Manual of Surveying Instructions, 1973 for official survey procedures.

PLSS Corner Identification

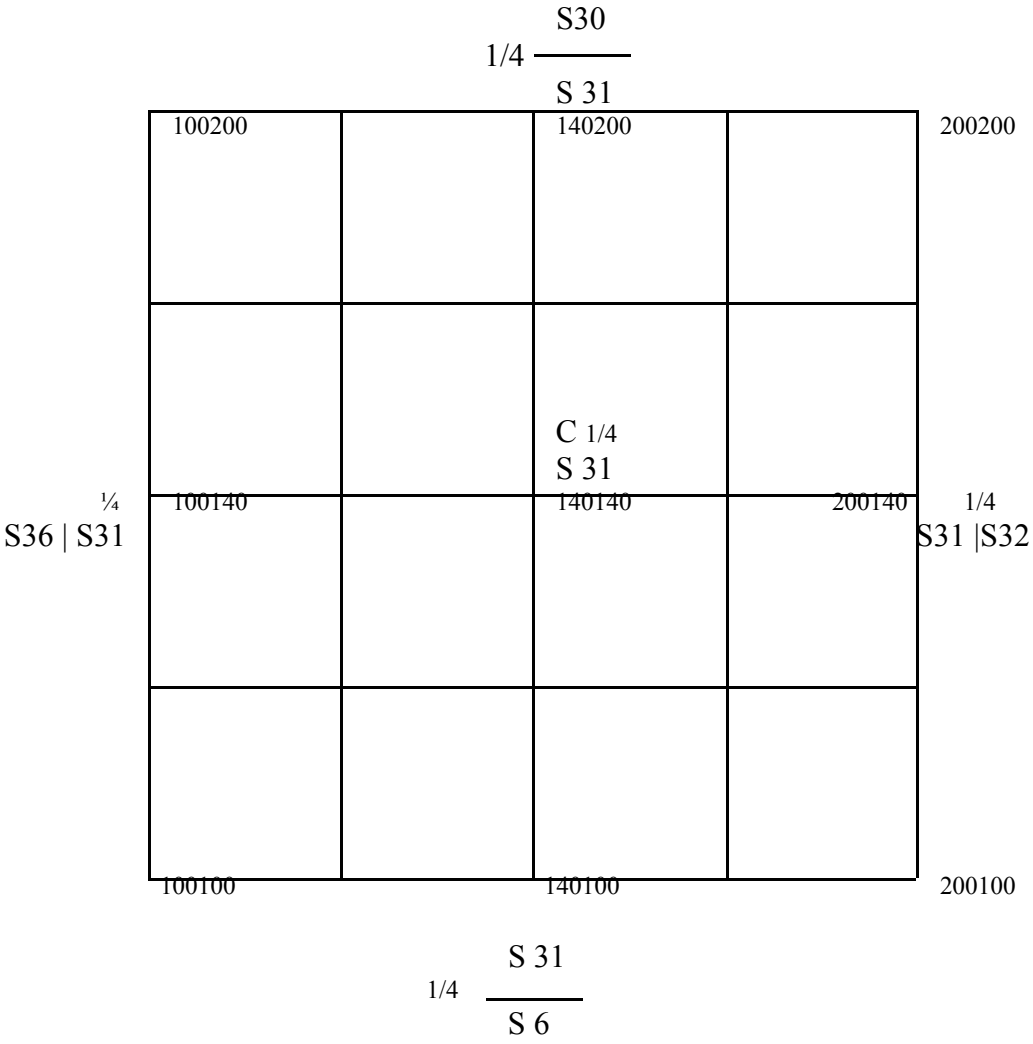
GMM utilizes a six digit, fixed length, numerically logical point identification code for all PLSS corners.

100700	200700	300700	400700	500700	600700	700700
Sec. 6	5	4	3	2	Sec. 1	
100600	200600	300600	400600	500600	600600	700600
7	8	9	10	11	12	
100500	200500	300500	400500	500500	600500	700500
18	17	16	15	14	13	
100400	200400	300400	400400	500400	600400	700400
19	20	21	22	23	24	
100300	200300	300300	400300	500300	600300	700300
30	29	28	27	26	25	
100200	200200	300200	400200	500200	600200	700200
Sec. 31	32	33	34	35	Sec. 36	
100100	200100	300100	400100	500100	600100	700100

The user will note that a grid of seven North-South and seven East-West lines, have been constructed. The Prefixes of the North-South lines begin with the number 100, on the western-most line, beginning with section 31, and increase in 100 unit increments as the lines proceed Easterly, to the eastern-most line, which is identified by the Prefix of 700, on the east boundary of section 36. The seven East-West lines begin with a Suffix of 100, at the southern-most line in the township, beginning with sections 31-36, and increase in 100 unit increments, to the northern-most line, which is identified by the Suffix of 700, in sections 1-6.

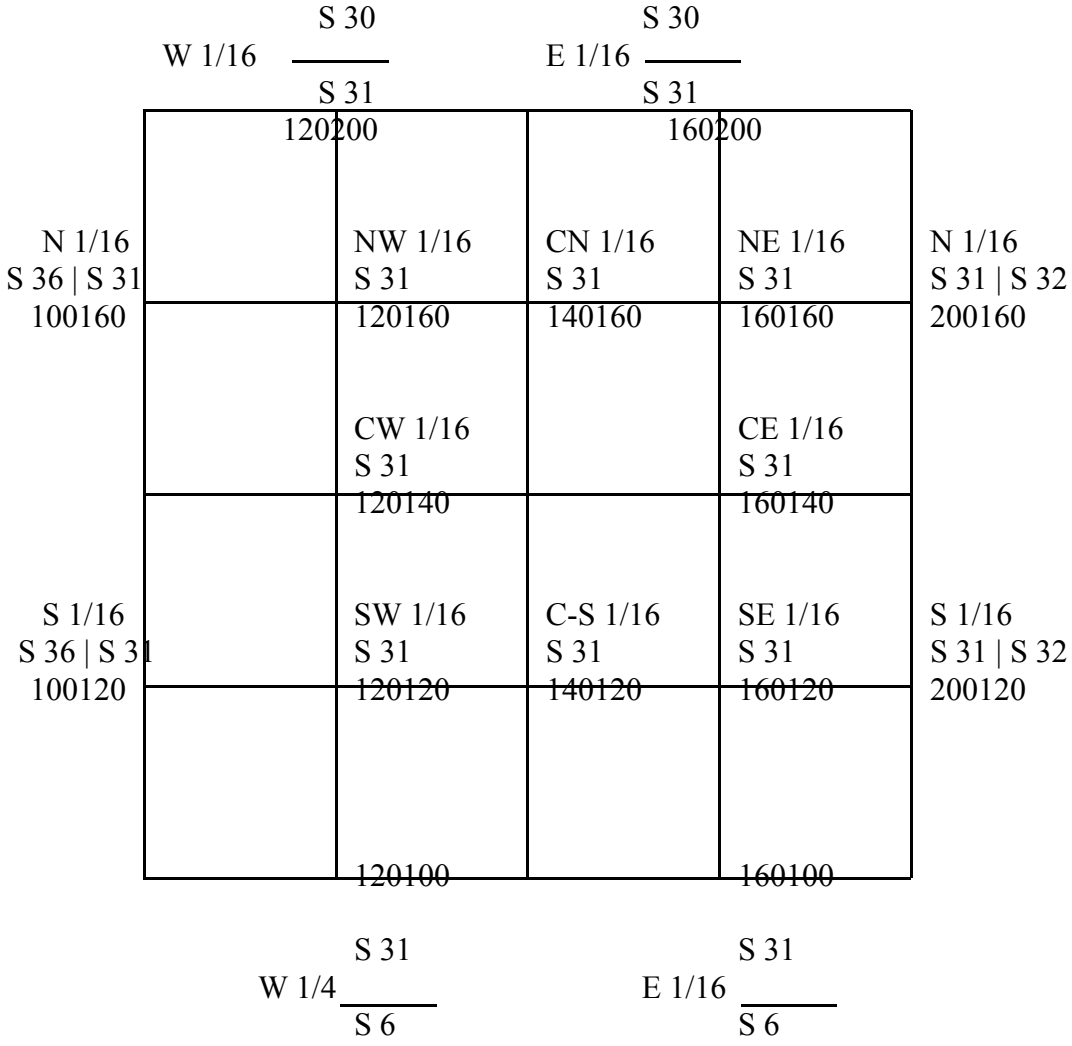
One-Quarter Section Corner Identification

The previous set of point IDs can be utilized to define the four corners of specific sections within a township, but a further dissection is necessary if PLSS corners are to be identified which were created in the subdivision of sections. The following diagram illustrates the point ID scheme used to identify 1/4 section corners created in the subdivision of a standard section. Section 31 will be used to demonstrate this strategy:



The User will notice that the four 1/4 section corners of section 31, are located at midpoint between respective section corners, and that the 1/4 section corners that fall on the East-West lines are identified with the Prefix 140yyy, while the North-South lines have 1/4 section corners are identified by a Suffix of xxx140.

The following diagram illustrates the point ID scheme used to further Identify 1 /16 section corners created in the subdivision of a standard section. Section 31 will be used to demonstrate this strategy:



This next division identifies 1/16 section corners, which are located at midpoint between respective 1/4 section corners. Notice that the south 1/16 section corner, on the west boundary of section 31 is identified with the Prefix of 120yyy. A standard section will identify eight exterior 1/16 section corners, and eight interior 1/16 section corners as illustrated. Further subdivision of sections is possible which identifies subdivisional corners subdivided below 1/16 section corners, using this same strategy for point identification.

Non-Rectangular Surveys in GCDB

The previous section dealt with standard rectangular point IDs, but GCDB also identifies PLSS corners which fall outside the rectangular survey system. **Non-Rectangular surveys,** as the term is used in GCDB, includes meanders, small holding claims, grant boundaries, reservation boundaries, mineral surveys, homestead entry surveys, tracts, etc. These non-rectangular surveys have been broken dawn into four categories:

1. Boundaries with Mileposts
2. Meanders
3. Tracts
4. Mineral Surveys, Homestead Entry Surveys (HES) , etc.

The following list identifies (Prefix) point IDs used to describe these non-rectangular surveys:

1. 711-799 - Boundaries with Mileposts
2. 800-836 - Meanders
3. 837-899 - Tracts
4. 900-999 - Mineral Surveys, Homestead Entry Surveys, etc.

GMM SECTION

The following list describes the files which are created by the GMM process using the method of Least Squares Analysis and a weighing process based on the year of the survey. Also a brief description of the contents thereof:

T??SR??W. ___, (i.e., T06SR96W.RAW)

.RAW Contains point ID's, distance, bearing, and source ID, used to compute coordinates from one point to another within a township.

This file is identical with the RxxN/SyyE in PCCS.

.CON Control available, Cadastral Surveys (BLM), National Geodetic Survey (NGS, formerly U.S. Coast and Geodetic Survey (USC & GS) , U.S. Geological Survey (USGS) Digitized corners from USGS 7½' quadrangle maps)

This file is identical with the CxxNSyyE in PCCS.

.PGC File containing latitude, longitude, reliability and state mean elevation. (6000 ft.)

This file is identical with the XxxN/SyyE in PCCS.

.UTM Final coordinates expressed in Universal Transverse Mercator (UTM) format. (Zone 13 is used for the whole state).
This file is identical with the UxxSRyyE in PCCS.

.DXF AutoCAD file, used for graphics and hard copies using AutoCAD software.

* Control:

Control points are allowed to move as much as 1½ times the values that they are expected to adjust.

.001 GPS These control point values do not move in the Least Square Analysis.

3 Doppler

10 Convention

40 Digitized control points from 7½' min. USGS quads.

100 Road intersections

.Raw-FILE

The RawFile contains distance, bearing, and source ID, used to compute coordinates from one point to another within a township.

SAMPLE Rawfile

```
  TWP 6S    RNG 96W   PM 06          CO                   DATE 91/06/11
999999
100100   100103    8.100  1     2100.0 22272
100103   100120    7.130  1     2100.0 22272
100120   100123   12.870  1     2100.0 22272
100123   100140    7.130  1     2100.0 22272
100140   100143   12.620  1     2100.0 22272 <------Source Identifier
100143   100160    7.380  1     2100.0
100160   100200   20.000  1     2100.0 <------Bearing (DDMMSS.S)
100200   100240   40.000  1
100240   100300   40.000  1 <------Quadrant (1=NE 2=SE 3=SW 4=NW)
100300   100307   11.420
100307   100340   28.580
100340   100347    6.150 <------Distance in chains
100347   100400
100400   100407 <------TO Point Identifier
100407
100440   <------FROM Point Identifier
```

**Example of data entry line 100100:

"From the cor. of Tps. 43 and 44 N., Rs. 56 W. (100100), N. 0°21' W., 8.10 chs. dist. to the cor. of Tps.43 and 44 N., R. 57 W. (100103)

The Source Identifier is a number assigned to a plat of survey.

.LX-File

L-file The t-File has PID's, latitude, longitude, mean state elevation, reliability (average and MAXIMUM) and UTM coordinates.

SAMPLE L-FILE

```
TWP ??N    RNG ??E   PM 06            COLORADO       DATE 92/02/28

100100 391718.9492 1192029.4353    6000.00 105  243   1 0 2  298054.33 4351208.51
100120 391732.0948 1192029.5571    6000.00 108  376   1 0 3  298061.90 4351613.88
100140 391745.2401 1192029.6792    6000.00 108  376   1 0 3  298069.47 4352019.24
100160 391758.3856 1192029.8010    6000.00 108  376   1 0 3  298077.05 4352424.61
100200 391811.5310 1192029.9230    6000.00  40   40   1 0 3  298084.63 4352829.98
100220 391824.4878 1192029.9934    6000.00 108  376   1 0 3  298093.29 4353229.50
100240 391837.4445 1192030.0640    6000.00 108  376   1 0 3  298101.94 4353629.02
100260 391850.4013 1192030.1345    6000.00 108  376   1 0 3  298110.61 4354028.54
100300 391903.3580 1192030.2050    6000.00  40   40   1 0 3  298119.27 4354428.06
100320 391916.4178 1192030.3637    6000.00 108  376   1 0 3  298125.90 4354830.81
100340 391929.4775 1192030.5225    6000.00 108  376   1 0 3  ↑____UTM COORDINATES
100360 391942.5373 1192030.6812    6000.00 108  376   1 0 3
100400 391955.5970 1192030.8400    6000.00  40   40   1 0 3
100420 392008.6386 1192030.7719    6000.00 108  376   1 0 3
100440 392021.6803 1192030.7038    6000.00 108  376   ↑____PEN CODES FOR GRAPHICS
100460 392034.7219 1192030.6356    6000.00 108  376
100500 392047.7636 1192030.5675    6000.00 108  376
100520 392100.8052 1192030.4994    6000.00 108  376
100540 392113.8468 1192030.4313    6000.00   ↑___↑_______ RELIABILITIES
100560 392126.8884 1192030.3631    6000.00               average and maximum
100600 392139.9300 1192030.2950    6000.00
100620 392152.9847 1192030.1274     ↑_____ PROJECT MEAN ELEVATION
100640     ↑_____LATITUDE AND LONGITUDE
100660
     ↑____POINT IDENTIFIER
```

* Reliability is indicated by two values. The first value is the average distance in feet and the second value is the maximum distance in <u>feet</u> a point adjusted for a particular survey.

Control points in PCCS do not adjust and will have the same average and maximum reliability as shown below.

1	1	GPS
3	3	Doppler
10	10	Conventional control
30	30	Computed from tri-stations through ties
40	40	Digitized control points from 71/2 min. USGS quads.
100	100	Digitized control points (Road Intersections

.PGC - File

```
 TWP 060S  RNG 0960  PM 06          CONTROL POINTS        DATE 05/12/94
ORIGIN    393100.0000 1080700.0000 7000.000   0    0  2000.0000 5000.0000
100100    392823.2423 1080931.5117 7000.000  15    8  1819.9166 4759.6475
100103    392828.5239 1080931.5103 7000.000  15    9  1819.9221 4767.7470
100120    392833.1730 1080931.5091 7000.000  15    9  1819.9268 4774.8766
100123    392841.5647 1080931.5055 7000.000  15   10  1819.9372 4787.7457
100140    392846.2139 1080931.5043 7000.000  15   10  1819.9418 4794.8753
100143    392854.4426 1080931.5008 7000.000  15   10      ↑_______Tangent plane
100160    392859.2547 1080931.4996 7000.000  15   10                coordinates
100200    392912.2951 1080931.4907 7000.000       ↑_______Reliabilities
100300    393004.4386 1080931.5352 7000.000
100307    393011.8845 1080931.5393       ↑_______ Project Elevation
100340    393030.5167 1080931.5651
100347            ↑         ↑
100400        Latitude    Longitude
  ↑
Point identifier
```