General Cartographic Transformation Package Interface (GCTP)

GENERAL OVERVIEW

1. What has Changed and Why?

GCTP has been converted to C from the latest (March, 1993) FORTRAN version of GCTP as required by an EDC project.

Initialization routines for each projection were separated into forward and inverse initialization routines. Thus, forward and inverse routines can now be initialized separately. For example, if a transformation is between the same projection with slightly different parameters, say Albers with different Central Meridians, the FORTRAN version forces an initialization step each time. In the new version, forward and inverse routines are initialized separately. The re-init is not necessary, resulting in a significant run-time savings.

The initialization of the Universal Transverse Mercator (UTM) has been changed so that if a positive zone is specified and the input latitude is negative the zone stays positive. If the user assigns a nonzero zone value, the sign will not change with the latitude. This eliminates the changing of a zone's sign without the user's knowledge.

The FORTRAN logical unit numbers for informational and error messages have been replaced by file names. All messages are routed through a separate report routine which can be easily modified to control the format of the reports and the output device for reports so that the GCTP may be tailored more closely to the calling application package.

The FORTRAN logical unit numbers for the State Plane Parameter Files have been removed. These files can still be accessed by using the appropriate file names.

2. Methods to access transformation routines.

There are two ways to access the projection conversion routines included with this package. The first and most common method is to pass the necessary projection information into the subroutine GCTP. The second method is to initialize the projections as needed and to pass the coordinates directly to the conversion routines.

Method I. The first method is the more general of the two methods. For this method, the programmer need only pass the coordinates to the subroutine GCTP. The proper flags are checked to determine if initialization is required. The coordinates are converted to the proper units. Finally, the proper transformation routines are used and the transformed coordinates are returned. This method has the disadvantage of being slower then method

two, but is nearly identical to the FORTRAN calling sequence.

Method II. The second method is the more complicated of the two. For this method, the programmer is responsible for converting the input coordinates to meters or radians, and calling the initialization and transformation routines. This method has the advantage of being faster and may be considered when only one or two projections are used by a given application. For example, to transform geographic coordinates to Transverse Mercator, the user would:

1. Initialize the Transverse Mercator projection with FOR_INIT.
2. Convert the input coordinates to radians.
3. Transform coordinates to TM by calling TMFOR.
4. Convert returned coordinates to desired units.
5. Loop to step 2.

A similar method would be used to transform from Transverse Mercator to geographic coordinates except call INV_INIT in step 1, convert to meters in step 2, and call TMINV in step 3.