

ECKERT4

10xxxxxx.1

LEGAL RESTRICTIONS:

This Reusable Software Component (RSC) contains data with Unlimited Government Rights.

DESCRIPTION:

ECKERT4 is a C language code component that provides conversions between Geodetic coordinates (latitude and longitude) and Eckert IV projection coordinates (easting and northing).

CERTIFICATION LEVEL:

This RSC has been certified at level 4. A level 4 component satisfies the criteria for reliability, testing, and documentation for the Army Reuse Center (ARC). The component comes with test materials and a Reuse Manual that aids in integrating the component into a software system.

LEVEL OF TESTING/ACCEPTANCE:

Unit and integration testing have been performed for the functions contained in this component.

PURPOSE/INTENDED USE:

The purpose of ECKERT4 is to provide a reusable component that supports the following coordinate conversions:

- Geodetic coordinates (latitude and longitude in radians) to Eckert IV projection coordinates (easting and northing in meters), and
- Eckert IV projection coordinates (easting and northing in meters) to Geodetic coordinates (latitude and longitude in radians).

A particular ellipsoid is specified in terms of the following parameters:

- Semi-Major Axis (a): Radius (in meters) at the equator, and

- Semi-Minor Axis (b): Radius (in meters) at a pole.

A particular variation of the Eckert IV projection is specified in terms of the following parameters:

- Central Meridian – Longitude (in radians) at the horizontal center of the projection,
- False Easting – A coordinate value (in meters) assigned to the central meridian of the projection to avoid the inconvenience of using negative coordinates, and
- False Northing – A coordinate value (in meters) assigned to the origin latitude of the projection to avoid the inconvenience of using negative coordinates.

HARDWARE/ENVIRONMENT CONSTRAINTS:

There are no hardware or environment constraints. There are no limitations.

FUNCTIONS:

`Set_Eckert4_Parameters` – This function sets the ellipsoid parameters and Eckert IV projection parameters for the particular variation of the Eckert IV projection that is to be used in subsequent coordinate conversion operations.

`Get_Eckert4_Parameters` – This function returns the current values of the ellipsoid parameters and Eckert IV projection parameters.

`Convert_Geodetic_To_Eckert4` – This function converts the specified geodetic coordinates (latitude and longitude in radians) to Eckert IV projection coordinates (easting and northing in meters) using the current ellipsoid parameters and Eckert IV projection parameters.

`Convert_Eckert4_To_Geodetic` – This function converts the specified Eckert IV projection coordinates (easting and northing in meters) to geodetic coordinates (latitude and longitude in radians) using the current ellipsoid parameters and Eckert IV projection parameters.

EXAMPLE APPLICATIONS:

The following example illustrates how ECKERT4 can be used to convert Geodetic coordinates to Eckert IV projection coordinates and back again:

Function Call:

```
status = Set_Eckert4_Parameters (a, b, Central_Meridian, False_Easting, False_Northing)
```

Inputs:

a	6371007.0 (Radius of sphere with same surface area as WGS84 Ellipsoid)
b	6371007.0 (Radius of sphere with same surface area as WGS84 Ellipsoid)
Central_Meridian	0.0
False_Easting	0.0
False_Northing	0.0

Outputs:

None

Function Call:

```
status = Convert_Geodetic_To_Eckert4 (Latitude, Longitude, Easting, Northing)
```

Inputs:

Latitude:	-35.0
Longitude:	75.0

Outputs:

Easting:	-1825358.29
Northing:	-4433611.04

Function Call:

```
status = Convert_Eckert4_To_Geodetic (Easting, Northing, Latitude, Longitude)
```

Inputs:

Easting:	-1825358.29
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Northings:	-4433611.04
Outputs:	
Latitude:	-35.0
Longitude:	75.0