

# GEOCENTRIC

10xxxxxx.1

## LEGAL RESTRICTIONS:

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

## DESCRIPTION:

GEOCENTRIC is a C language code component that provides conversions between Geodetic coordinates (latitude, longitude in radians and height in meters) and Geocentric coordinates (X, Y, Z in meters).

## 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 GEOCENTRIC is to provide a reusable component which supports the following coordinate conversions:

- Geodetic coordinates (latitude, longitude in radians and height in meters) to Geocentric coordinates (X, Y, Z in meters),
- Geocentric coordinates (X, Y, Z in meters) to Geodetic coordinates (latitude, longitude in radians and height in meters).

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

- Semi-Major Axis (a) – Radius (in meters) at the equator.
- Semi-Minor Axis (b) – Radius (in meters) at a pole.

#### HARDWARE/ENVIRONMENT CONSTRAINTS:

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

#### FUNCTIONS:

`Set_Geocentric_Parameters` – This function sets the ellipsoid parameters that are to be used in subsequent coordinate conversion operations.

`Get_Geocentric_Parameters` – This function returns the current values of the ellipsoid parameters.

`Convert_Geodetic_To_Geocentric` – This function converts the specified Geodetic coordinates (latitude, longitude in radians and height in meters) to Geocentric coordinates (X, Y, Z in meters) using the current ellipsoid parameters.

`Convert_Geocentric_To_Geodetic` – This function converts the specified Geocentric coordinates (X, Y, Z in meters) to Geodetic coordinates (latitude, longitude in radians and height in meters) using the current ellipsoid parameters.

#### EXAMPLE APPLICATIONS:

The following example illustrates how GEOCENTRIC can be used to convert Geodetic coordinates to Geocentric coordinates and back again:

##### Function Call:

```
status = Set_Geocentric_Parameters (a, b)
```

##### Inputs:

a	6378137.0
b	6356752.3142

##### Outputs:

none

Function Call:

```
status = Convert_Geodetic_To_Geocentric (Latitude, Longitude, Height, X, Y, Z)
```

Inputs:

Latitude: 45.0

Longitude: -75.0

Height: 700

Outputs:

X: 1169366.666323

Y: -4364135.811395

Z: 4487843.383565

Function Call:

```
status = Convert_Geocentric_To_Geodetic (X, Y, Z, Latitude, Longitude, Height)
```

Inputs:

X: 1169366.666323

Y: -4364135.811395

Z: 4487843.383565

Outputs:

Latitude: 45.0

Longitude: -75.0

Height: 700.004645