



## **Computing Datum Offset values for Eos Tools Pro**

Eos Tools Pro (iOS starting with version 1.64.7 and Android version 1.46.25 and up) offers an Offset feature that can be used for datum shifts. Note that the new position computed will populate the Core Location (iOS) and Location Service (Android) and will also be passed on to 3<sup>rd</sup> party data collection app. Therefore, care must be taken not to duplicate the datum shift. For example, if using Collector for ArcGIS, it is preferable to use the built-in on-the-fly (OTF) datum transformation of Collector instead of this feature. If your app does not support OTF datum transformations, then this tool is for you.

The principle for computing datum offset values is simple: Destination/target datum coordinates **minus** Origin/current datum coordinates and you enter these values in the Offset menu of Eos Tools Pro.

**Destination – Origin = Offset** 

## Example for the United States: from NAD83 2011 to WGS84 (G1674)

This transformation is typical when using the Arrow receiving corrections from an RTK network (most likely referenced to Nad83 2011) and the maps used are in Web Mercator (WGS84 G1674 or G1762; 5mm difference between these two)

a) Get a coordinate from Google Map for the area in which you are working. Let's say

Latitude: 38° 20' 15.000" Longitude: -80° 50' 20.000" Height: 0.000 meters

We'll call this point Origin and we'll assume it is in Nad83 2011.

b) Next we need to compute the Destination coordinates in WGS85 G1674. For this, we go to the NGS NOAA web site for the HTDP (Horizontal Time-Dependent Positioning) online tools to transform positions between reference frames:

https://www.ngs.noaa.gov/cgi-bin/HTDP/htdp.prl?f1=4&f2=1



- We first select the "Reference Frame for the Input Values" to be Nad83 2011 and the "Reference Frame for the Output Values" to be WGS84 (G1674)

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Horizontal Time-Depen	dent Positioning	
TRANSFORMING POSITIONS BETWEEN RE	FERENCE FRAMES	
Specify the reference frame for the input values:	NAD_83/2011/CORS96/2007)(North America plate fixed)  AD_83/PA11/PACP00)(Pacific tectonic plate fixed) MXD_83/M411/MARP001(Minata tectonic plate fixed) WXS_84(Granal) = WXS_84(transt)(NAD_83/2011) will be used) WXS_84(Grans) (JTKF91 will be used)  *	
Specify the reference frame for the output values	INDS_percercarge_content         1 min be used)           VMOS_B4(6150)ITRF24 will be used)	
Dates may be entered either in the month-day-year for For the month-day-year format, the month is a number Valid examples are: $s_{+,1}$ 1996 for May 4, 1998 5 4 1998 for May 4, 1998	mat or in the decimal-year format. between 1 and 12 and a four-character year is required. The month, day, and year may be separated by spaces or by commas.	
For the decimal-year format, enter yyyy.xxx where yyy Valid examples are: 2010.0 for January 1, 2010 1979.359 for May 12, 1979 1991.35 for May 8, 1991	y denotes the year and xxx denotes the fraction of the year.	
The decimal point is required but the precision of the fr The fractional year is obtained by subtractiong one from Thus, the fractional year corresponds to UTC midnight HTDP models are not valid for dates before the 1906 @ month-day-year @ decimal year	actional year is optional. n the day-of-year and then dividing the result by 365 (or 366 if it is a leap year). at the beginning of the day. San Francisco earthquake.	
Specify the reference date of the input position(	s):	

- Next, select "decimal year" for the dates and enter "input position" date/epoch 2010.0 (for Nad83 2011) and output epoch 2005.0 (for WGS84 G1674).

- Select the "type of coordinates" to be Latitude, Longitude, Height and enter the values as specified (space between the numbers and no "-" sign for longitude)

- Click on "Use te velocity predicted by this program" and click on "Submit"

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Thus, the fractional year corresponds to UTC midnight at the beginning of the day. HTDP models are not valid for dates before the 1906 San Francisco earthquake. © month-day-year * decimal year	
Specify the reference date of the input position(s): 2010.0	
Specify the reference date of the output position(s): 2005.0	
Input the site's position either in terms of latitude, longitude, and ellipsioidal height or in terms of geocentric Cartesian coordinates -X,Y,Z- but not both. For la west), use the form degrees, minutes, and seconds and use either commas or spaces to separate the individual values. The field for seconds must include a de negative degrees, minutes, and seconds. Vald examples for latitude are: 37, 34, 35, 67	atitude (positive north) and longitude (positive ecimal point. To denote negative values, use
-37 -34 -35.67 denotes a point in the southern hemisphere.	
Values for ellipsoidal height or for X, Y, and Z must be specified in meters and must be entered with a decimal point (but without commas).	
Select the type of coordinates to be entered:	
Longitude or Y: 80 50 20.000	
Height or Z: 0.000	
Station Name (optional): Origin	
Select how the required velocity (relative to the input frame) is to be entered:	
Section of the velocity predicted by this program (ignore the input boxes below)	
<ul> <li>Specify the velocity in terms of notal-east-up components (use the input boxes below)</li> <li>Specify the velocity in terms of fields YYZ components (use the input boxes below)</li> </ul>	
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The target of the second	
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The destination coordinate in WGS84 (G1674) is then:

Latitude: 38° 20' 15.02816" Longitude: -80° 50' 20.01805" Height: -1.273 meters

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HTDP Output	
HIDP (VERSION v3.2.5 ) OUIPUT	
TRANSFORMING POSITIONS FROM NAD_69(2011/COR596/2007)         (EPOCH = 01-01-2010 (2010.0000))           TO WGS_64 (G1674)         (EPOCH = 01-01-2005 (2005.0000))	
Origin LATITUDE 38 20 15,00000 N 38 20 15,02816 N -0.50 mm/yr north	
LONGITUDE 80 50 20.00000 W 80 50 20.01805 W 1.97 mm/yr east	
ELLIP. HT. 0.000 -1.273 m -0.92 mm/yr up	
Y -4945382.765 -4945382.338 m 0.72 mm/yr	
Z 3934896.634 3934896.525 m -0.97 mm/yr	
S COS HOME PACE	

c) We now convert these coordinates to degrees decimal (with a minimum of 8 decimal digits):

(((Seconds/60) + minutes)/60) + Degrees

Example for Latitude: (((15.000/60)+20)/60)+38 = 38.33750000

The two sets of coordinates are now:

Origin -	Lat: 38.33750000	
	Lon: -80.83888889	
	Height: 0.000	
Destination -	Lat: 38.33750782	
	Lon: -80.83889390	
	Height: -1.273	

d) And we compute the shift with (Destination – Origin) with at least 8 decimal digits. This gives us the following values:

## **Offset = Destination – Origin**

ΔLat: 0.00000782 (degrees) ΔLon: -0.00000501 (degrees) \*(-80.83889390 – (-80.83888889)) ΔHeight: -1.273 (meters)



(Since the shifts are small we could have simply computed the difference for the seconds only and then divide by 3600 to get decimal degrees).

- e) The last step is to enter these values in Eos Tools Pro.
- For the iOS version, go to Config menu and enter the offset values, then hit "Save". Turn the "Offset Mode" tab to the ON position to activate.

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	Offset			_
	Offset Mode	0		
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and the second s	Latitude (+/- 2.0 deg)	0.00000782		
	Longitude (+/- 2.0 deg)	-0.00000501		×.
	Altitude (+/- 100.0 m)	-1.273		- 1
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1. 2.2	"Note: Labitude and Longitude offsets in degree	s decimal Altitude offset in meters.		
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- For Android, go to the Settings menu and turn on the Offset tab to enter the values, then click on "OK".

