NCAT Library User Guide

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1. Introduction

NGS Coordinate Conversion and Transformation Tool (NCAT) allows users to easily convert between different coordinate systems and/or transform between different reference frames and/or datums, in a single step. NCAT consists of web pages and a java library, referred to as the NCAT library that is used for all conversions and transformations. This document provides instructions on how to use the NCAT library as a command line tool or as a library jar.

2. Building NCAT library from source code

The package contains a pre-built jar that can be used for command line access or as a library jar.
You may optionally build it from the source code. An Ant tool is recommended to build a library jar from the source code.
Run ant using the following command:
ant -f buildjar.xml

The command generates jtransform_thin.jar under the "dist" directory
Navigate to dist directory to use the NCAT command line version

3. Running NCAT from the Command Line

No internet connectivity is needed to run NCAT from the command line. A java runtime is needed to use the command line option. You may run NCAT with or without transformation. Nadcon and/or Vertcon grids are needed for transformation. Grids are available for download from https://geodesy.noaa.gov/NCAT/

Navigate to the directory where the library jar is located and run the command choosing a format that best meets your specific needs (see formats and examples below). Results are generated in JSON format which may be directed to a text file. Commands may be embedded in a script or program as needed.

3.1 Reference Frames (historically called "horizontal datum") Supported for Transformation:

The following are the valid reference frames for use as input or output. Transformation takes place only when input and output frames are different. If no transformation is possible, results are returned as N/A.

Region	Reference Frame
StGeorge	SG1897,SG1952,NAD83(1986)
StPaul	SP1897, SP1952,NAD83(1986)
StLawrence	SL1952,NAD83(1986)
Alaska	NAD27,NAD83(1986),NAD83(1992),NAD83(NSRS2007),NAD83(2011)

Conus	USSD,NAD27,NAD83(1986),NAD83(HARN),NAD83(FBN),NAD83(NSRS2007),NAD83(2011)
Hawaii	OHD,NAD83(1986),NAD83(1993),NAD83(PA11)
PRVI	PR40,NAD83(1986),NAD83(1993),NAD83(1997),NAD83(2002),NAD83(NSRS2007),NAD83(2011)
AS	AS62,NAD83(1993),NAD83(2002),NAD83(PA11)
GuamCNMI	GU63,NAD83(1993),NAD83(2002),NAD83(MA11)

3.2 Geopotential Datums (historically called "vertical datum") Supported for Transformation

The following are the valid geopotential datums for use as input or output. Transformation takes place only when input and output datums are different. If no transformation is possible, results are returned as N/A

Region	**Datum**
Conus	NGVD29,NAVD88
Alaska	NGVD29,NAVD88
Guam	GUVD63,GUVD04
CNMI	LT,NMVD03
VI	LT,VIVD09
PR	LT,PRVD02
AS	LT,ASVD02

3.3 Format of latitude and longitude

Latitude and longitude may be entered in decimal degrees, Degrees-Minutes-Seconds (DMS), or mixed mode.
If a DMS format is used:

Prefix the value with a hemisphere designator (N or S for latitudes and E or W for longitudes), and use
DDMMSS.ssssss format for latitudes,
DDDMMSS.ssssss format for longitudes
Decimal seconds are optional, up to 6 decimals may be used.

For decimal degrees, negative west longitude convention is used.

3.4 Heights

Where applicable, if no ellipsoid height is used, ellipsoid height input should be set to N/A.
If no orthometric height is used, orthometric height input should be set to N/A.

3.5 Keywords

A description of keywords used in formats is as follows.

Keyword	**Description**
<lat>	Latitude in decimal degrees or DMS
<lon>	Longitude in decimal degrees or DMS
<h>	Ellipsoid height in meters; For SPC conversion, ellipsoid height must be in the same units as northing and easting.
<H>	Orthometric height in meters
<inDatum>	Input reference frame or N/A
<outDatum>	Output reference frame or N/A
<inVertDatum>	Input geopotential datum or N/A
<outVertDatum>	Output geopotential datum or N/A
<spcZone>	A 4-digit SPC zone

<utmZone>	A 2-digit UTM zone*
<destZone	An optional 4-digit SPC zone or a 2-digit UTM zone used to convert SPC or UTM coordinate from one zone to the other
<northing>	Northing
<easting>	Easting
<units>	Units of northing and easting (m,usft,or ift) **
<hemi>	Hemisphere for UTM conversion (N or S) ***
<usng>	USNG at 1-meter resolution
<x>	X-coordinate in meters
<y>	Y-coordinate in meters
<z>	Z-coordinate in meters
<radius>	Equatorial radius in meters
<invf>	Inverse of flattening
<grids dir>	Directory of Nadcon5 or Vertcon3 grids (unzipped directory)
llh	lat-lon-ellipsoid height is being used for input, case sensitive
llH	lat-lon-orthometric height is being used for input, case sensitive
spch	SPC-ellipsoid coordinate is being used for input, case sensitive
spcH	SPC-orthometric coordinate is being used for input, case sensitive
utmh	UTM-ellipsoid height coordinate is being used for input, case sensitive
utmH	UTM-orthometric height coordinate is being used for input, case sensitive
usngh	USNG-ellipsoid height coordinate is being used for input, case sensitive
usngH	USNG-orthometric height coordinate is being used for input, case sensitive
xyz	XYZ coordinate is being used for input, case sensitive
-Dparms	A keyword used on the command line to provide input data
-Dgpath	A keyword used to specify the path of grids directory

*For UTM conversion, the utmZone is a required field. For other conversions, the UTM zone is automatically determined when the keyword "auto" used. You may optionally override this by specifying your own 2-digit UTM zone.
**Needed only for SPC conversions
***Needed only for UTM conversions

3.6 Conversion without Transformation

When reference frames and/or geopotential datums chosen for input and output are the same, no transformation takes place. No grids are needed for this option.

3.6.1 Command Line Formats and Examples

The following examples show use cases supported by the NCAT library, the corresponding commands, and the output generated.

Format#1 (lat-long-ellipsoid height conversion):
java -Dparms=llh,<lat>,<lon>,<h>,<inDatum>,<outDatum><spcZone><utmZone> -jar jtransform_thin.jar

Example:
java -Dparms=llh,40.0,-80.0,100.0,NAD83(1986),NAD83(1986),3702,auto -jar jtransform_thin.jar

{

"ID":"1620244053635",
"nadconVersion":"5.0",
"vertconVersion":"3.0",
"srcDatum":"NAD83(1986)",
"destDatum":"NAD83(1986)",
"srcVertDatum":"N/A",
"destVertDatum":"N/A",
"srcLat":"40.0000000000",
"srcLatDms":"N400000.00000",
"destLat":"40.0000000000",
"destLatDms":"N400000.00000",
"sigLat":"0.000000",
"srcLon":"-80.0000000000",
"srcLonDms":"W0800000.00000",
"destLon":"-80.0000000000",
"destLonDms":"W0800000.00000",
"sigLon":"0.000000",
"srcEht":"100.000",
"destEht":"100.000",
"sigEht":"0.000",
"srcOrthoht":"N/A",
"destOrthoht":"N/A",
"sigOrthoht":"N/A",
"spcZone":"PA S-3702",
"spcNorthing_m":"76,470.584",
"spcEasting_m":"407,886.482",
"spcNorthing_usft":"250,887.243",
"spcEasting_usft":"1,338,207.567",
"spcNorthing_ift":"250,887.744",
"spcEasting_ift":"1,338,210.244",
"spcConvergence":"-01 27 35.22",
"spcScaleFactor":"0.99999024",
"spcCombinedFactor":"0.99997455",
"utmZone":"UTM Zone 17",
"utmNorthing":"4,428,236.065",
"utmEasting":"585,360.462",
"utmConvergence":"00 38 34.17",
"utmScaleFactor":"0.99968970",
"utmCombinedFactor":"0.99967402",
"x":"849,623.061",
"y":"-4,818,451.818",
"z":"4,078,049.851",
"usng":"17TNE8536028236"
}

Format#1a (lat-long-ellipsoid height conversion for an international coordinate)
java -Dparms=llh,<lat>,<lon>,<h>,<radius>,<invf>,<utmZone> -jar jtransform_thin.jar

Example:
java -Dparms=llh,-33.8688,151.2093,100.0,6378160.0,298.25,auto -jar jtransform_thin.jar

{
"ID":"1620244154085",

"nadconVersion":"5.0",
"vertconVersion":"3.0",
"srcDatum":"N/A",
"destDatum":"N/A",
"srcVertDatum":"N/A",
"destVertDatum":"N/A",
"srcLat":"-33.8688000000",
"srcLatDms":"S335207.68000",
"destLat":"N/A",
"destLatDms":"N/A",
"sigLat":"N/A",
"srcLon":"151.2093000000",
"srcLonDms":"E1511233.48000",
"destLon":"N/A",
"destLonDms":"N/A",
"sigLon":"N/A",
"srcEht":"100.000",
"destEht":"N/A",
"sigEht":"N/A",
"srcOrthoht":"N/A",
"destOrthoht":"N/A",
"sigOrthoht":"N/A",
"spcZone":"N/A",
"spcNorthing_m":"N/A",
"spcEasting_m":"N/A",
"spcNorthing_usft":"N/A",
"spcEasting_usft":"N/A",
"spcNorthing_ift":"N/A",
"spcEasting_ift":"N/A",
"spcConvergence":"N/A",
"spcScaleFactor":"N/A",
"spcCombinedFactor":"N/A",
"utmZone":"UTM Zone 56",
"utmNorthing":"6,250,935.338",
"utmEasting":"334,368.032",
"utmConvergence":"-00 59 53.42",
"utmScaleFactor":"0.99993820",
"utmCombinedFactor":"0.99992250",
"x":"-4,646,140.911",
"y":"2,553,255.603",
"z":"-3,534,440.375",
"usng":"56HLH3436850935"
}

Format#1b (lat-long-orthometric height conversion)
java -Dparms=llH,<lat>,<lon>,<H>,<inDatum>,<outDatum><spcZone><utmZone> <inVertDatum> <outVertDatum -jar jtransform_thin.jar

Example:
java -Dparms=llH,40.0,-80.0,100.0,NAD83(2011),NAD83(2011),3702,auto,NAVD88,NAVD88 -jar jtransform_thin.jar

{

"ID":"1620244238699",
"nadconVersion":"5.0",
"vertconVersion":"3.0",
"srcDatum":"NAD83(2011)",
"destDatum":"NAD83(2011)",
"srcVertDatum":"NAVD88",
"destVertDatum":"NAVD88",
"srcLat":"40.0000000000",
"srcLatDms":"N400000.00000",
"destLat":"40.0000000000",
"destLatDms":"N400000.00000",
"sigLat":"0.000000",
"srcLon":"-80.0000000000",
"srcLonDms":"W0800000.00000",
"destLon":"-80.0000000000",
"destLonDms":"W0800000.00000",
"sigLon":"0.000000",
"srcEht":"N/A",
"destEht":"N/A",
"sigEht":"N/A",
"srcOrthoht":"100.000",
"destOrthoht":"100.000",
"sigOrthoht":"0.000",
"spcZone":"PA S-3702",
"spcNorthing_m":"76,470.584",
"spcEasting_m":"407,886.482",
"spcNorthing_usft":"250,887.243",
"spcEasting_usft":"1,338,207.567",
"spcNorthing_ift":"250,887.744",
"spcEasting_ift":"1,338,210.244",
"spcConvergence":"-01 27 35.22",
"spcScaleFactor":"0.99999024",
"spcCombinedFactor":"N/A",
"utmZone":"UTM Zone 17",
"utmNorthing":"4,428,236.065",
"utmEasting":"585,360.462",
"utmConvergence":"00 38 34.17",
"utmScaleFactor":"0.99968970",
"utmCombinedFactor":"N/A",
"x":"N/A",
"y":"N/A",
"z":"N/A",
"usng":"17TNE8536028236"
}

Format#2 (SPC-ellipsoid height conversion):
java -Dparms=spch,<spcZone>,<northing>,<easting>,<units>,<inDatum> <outDatum><utmZone><h> -jar jtransform_thin.jar

Example:
java -Dparms=spch,2402,173099.419,503626.812,m,NAD83(2011),NAD83(2011),auto,100.0 -jar jtransform_thin.jar

{
"ID":"1620244321184",
"nadconVersion":"5.0",
"vertconVersion":"3.0",
"srcDatum":"NAD83(2011)",
"destDatum":"NAD83(2011)",
"srcVertDatum":"N/A",
"destVertDatum":"N/A",
"srcLat":"37.3933000033",
"srcLatDms":"N372335.88001",
"destLat":"37.3933000033",
"destLatDms":"N372335.88001",
"sigLat":"0.000000",
"srcLon":"-92.4590399988",
"srcLonDms":"W0922732.54400",
"destLon":"-92.4590399988",
"destLonDms":"W0922732.54400",
"sigLon":"0.000000",
"srcEht":"100.000",
"destEht":"100.000",
"sigEht":"0.000",
"srcOrthoht":"N/A",
"destOrthoht":"N/A",
"sigOrthoht":"N/A",
"spcZone":"MO C-2402",
"spcNorthing_m":"173,099.419",
"spcEasting_m":"503,626.812",
"spcNorthing_usft":"567,910.344",
"spcEasting_usft":"1,652,315.632",
"spcNorthing_ift":"567,911.480",
"spcEasting_ift":"1,652,318.937",
"spcConvergence":"00 01 29.55",
"spcScaleFactor":"0.99993350",
"spcCombinedFactor":"0.99991781",
"utmZone":"UTM Zone 15",
"utmNorthing":"4,138,641.146",
"utmEasting":"547,883.638",
"utmConvergence":"00 19 42.68",
"utmScaleFactor":"0.99962824",
"utmCombinedFactor":"0.99961255",
"x":"-217,687.296",
"y":"-5,069,012.421",
"z":"3,852,223.064",
"usng":"15SWB4788338641"
}

Format#2a (SPC-ellipsoid height conversion; convert SPC from one zone to the other):
java -Dparms=spch,<spcZone>,<northing>,<easting>,<units>,<inDatum>
<outDatum><utmZone><h><destZone> -jar jtransform_thin.jar

Example:
java -Dparms=spch,2402,173099.419,503626.812,m,NAD83(2011),NAD83(2011),auto,100.0,2401 -jar jtransform_thin.jar

{
"ID":"1620244393473",
"nadconVersion":"5.0",
"vertconVersion":"3.0",
"srcDatum":"NAD83(2011)",
"destDatum":"NAD83(2011)",
"srcVertDatum":"N/A",
"destVertDatum":"N/A",
"srcLat":"37.3933000033",
"srcLatDms":"N372335.88001",
"destLat":"37.3933000033",
"destLatDms":"N372335.88001",
"sigLat":"0.000000",
"srcLon":"-92.4590399988",
"srcLonDms":"W0922732.54400",
"destLon":"-92.4590399988",
"destLonDms":"W0922732.54400",
"sigLon":"0.000000",
"srcEht":"100.000",
"destEht":"100.000",
"sigEht":"0.000",
"srcOrthoht":"N/A",
"destOrthoht":"N/A",
"sigOrthoht":"N/A",
"spcZone":"MO E-2401",
"spcNorthing_m":"174,900.027",
"spcEasting_m":"76,527.436",
"spcNorthing_usft":"573,817.840",
"spcEasting_usft":"251,073.762",
"spcNorthing_ift":"573,818.987",
"spcEasting_ift":"251,074.264",
"spcConvergence":"-01 11 23.96",
"spcScaleFactor":"1.00030390",
"spcCombinedFactor":"1.00028820",
"utmZone":"UTM Zone 15",
"utmNorthing":"4,138,641.146",
"utmEasting":"547,883.638",
"utmConvergence":"00 19 42.68",
"utmScaleFactor":"0.99962824",
"utmCombinedFactor":"0.99961255",
"x":"-217,687.296",
"y":"-5,069,012.421",
"z":"3,852,223.064",
"usng":"15SWB4788338641"
}

Format#2b (SPC-orthometric height conversion):
java -Dparms=spcH,<spcZone>,<northing>,<easting>,<units>,<inDatum>
<outDatum><utmZone><H><inVertDatum> <outVertDatum> -jar jtransform_thin.jar

Example:
java -

Dparms=spcH,2402,173099.419,503626.812,m,NAD83(2011),NAD83(2011),auto,100.0,NAVD88,NAVD88 -jar jtransform_thin.jar

{
"ID":"1620244451227",
"nadconVersion":"5.0",
"vertconVersion":"3.0",
"srcDatum":"NAD83(2011)",
"destDatum":"NAD83(2011)",
"srcVertDatum":"NAVD88",
"destVertDatum":"NAVD88",
"srcLat":"37.3933000033",
"srcLatDms":"N372335.88001",
"destLat":"37.3933000033",
"destLatDms":"N372335.88001",
"sigLat":"0.000000",
"srcLon":"-92.4590399988",
"srcLonDms":"W0922732.54400",
"destLon":"-92.4590399988",
"destLonDms":"W0922732.54400",
"sigLon":"0.000000",
"srcEht":"N/A",
"destEht":"N/A",
"sigEht":"N/A",
"srcOrthoht":"100.000",
"destOrthoht":"100.000",
"sigOrthoht":"0.000",
"spcZone":"MO C-2402",
"spcNorthing_m":"173,099.419",
"spcEasting_m":"503,626.812",
"spcNorthing_usft":"567,910.344",
"spcEasting_usft":"1,652,315.632",
"spcNorthing_ift":"567,911.480",
"spcEasting_ift":"1,652,318.937",
"spcConvergence":"00 01 29.55",
"spcScaleFactor":"0.99993350",
"spcCombinedFactor":"N/A",
"utmZone":"UTM Zone 15",
"utmNorthing":"4,138,641.146",
"utmEasting":"547,883.638",
"utmConvergence":"00 19 42.68",
"utmScaleFactor":"0.99962824",
"utmCombinedFactor":"N/A",
"x":"N/A",
"y":"N/A",
"z":"N/A",
"usng":"15SWB4788338641"
}

Format#2c (SPC-orthometric height conversion; convert SPC from one zone to the other):
java -Dparms=spcH,<spcZone>,<northing>,<easting>,<units>,<inDatum>
<outDatum><utmZone><H><inVertDatum> <outVertDatum><destZone> -jar jtransform_thin.jar

Example:

java -
Dparms=spcH,2402,173099.419,503626.812,m,NAD83(2011),NAD83(2011),auto,100.0,NAVD88,NAVD88,240
1 -jar jtransform_thin.jar
{
"ID":"1620244522935",
"nadconVersion":"5.0",
"vertconVersion":"3.0",
"srcDatum":"NAD83(2011)",
"destDatum":"NAD83(2011)",
"srcVertDatum":"NAVD88",
"destVertDatum":"NAVD88",
"srcLat":"37.3933000033",
"srcLatDms":"N372335.88001",
"destLat":"37.3933000033",
"destLatDms":"N372335.88001",
"sigLat":"0.000000",
"srcLon":"-92.4590399988",
"srcLonDms":"W0922732.54400",
"destLon":"-92.4590399988",
"destLonDms":"W0922732.54400",
"sigLon":"0.000000",
"srcEht":"N/A",
"destEht":"N/A",
"sigEht":"N/A",
"srcOrthoht":"100.000",
"destOrthoht":"100.000",
"sigOrthoht":"0.000",
"spcZone":"MO E-2401",
"spcNorthing_m":"174,900.027",
"spcEasting_m":"76,527.436",
"spcNorthing_usft":"573,817.840",
"spcEasting_usft":"251,073.762",
"spcNorthing_ift":"573,818.987",
"spcEasting_ift":"251,074.264",
"spcConvergence":"-01 11 23.96",
"spcScaleFactor":"1.00030390",
"spcCombinedFactor":"N/A",
"utmZone":"UTM Zone 15",
"utmNorthing":"4,138,641.146",
"utmEasting":"547,883.638",
"utmConvergence":"00 19 42.68",
"utmScaleFactor":"0.99962824",
"utmCombinedFactor":"N/A",
"x":"N/A",
"y":"N/A",
"z":"N/A",
"usng":"15SWB4788338641"
}

Format#3 (UTM-ellipsoid height conversion)
java -Dparms=utmh,<utmZone>,<northing>,<easting>,<hemi>,<inDatum>,<outDatum>,<spcZone><h> -jar jtransform_thin.jar

Example
java -Dparms=utmh,15,4138641.144,547883.655,N,NAD83(2011),NAD83(2011),2402,100.0 -jar jtransform_thin.jar
{
"ID":"1620244580019",
"nadconVersion":"5.0",
"vertconVersion":"3.0",
"srcDatum":"NAD83(2011)",
"destDatum":"NAD83(2011)",
"srcVertDatum":"N/A",
"destVertDatum":"N/A",
"srcLat":"37.3932999809",
"srcLatDms":"N372335.87993",
"destLat":"37.3932999809",
"destLatDms":"N372335.87993",
"sigLat":"0.000000",
"srcLon":"-92.4590398075",
"srcLonDms":"W0922732.54331",
"destLon":"-92.4590398075",
"destLonDms":"W0922732.54331",
"sigLon":"0.000000",
"srcEht":"100.000",
"destEht":"100.000",
"sigEht":"0.000",
"srcOrthoht":"N/A",
"destOrthoht":"N/A",
"sigOrthoht":"N/A",
"spcZone":"MO C-2402",
"spcNorthing_m":"173,099.417",
"spcEasting_m":"503,626.829",
"spcNorthing_usft":"567,910.336",
"spcEasting_usft":"1,652,315.688",
"spcNorthing_ift":"567,911.472",
"spcEasting_ift":"1,652,318.993",
"spcConvergence":"00 01 29.55",
"spcScaleFactor":"0.99993350",
"spcCombinedFactor":"0.99991781",
"utmZone":"UTM Zone 15",
"utmNorthing":"4,138,641.144",
"utmEasting":"547,883.655",
"utmConvergence":"00 19 42.68",
"utmScaleFactor":"0.99962824",
"utmCombinedFactor":"0.99961255",
"x":"-217,687.279",
"y":"-5,069,012.424",
"z":"3,852,223.062",
"usng":"15SWB4788338641"
}

Format#3a (UTM-ellipsoid height conversion convert UTM from one zone to the other):
java -
Dparms=utmh,<utmZone>,<northing>,<easting>,<hemi>,<inDatum>,<outDatum>,<spcZone><h><destZone> -jar jtransform_thin.jar

Example
java -Dparms=utmh,15,4138641.144,547883.655,N,NAD83(2011),NAD83(2011),2402,100.0,14 -jar jtransform_thin.jar

{
"ID":"1620244640546",
"nadconVersion":"5.0",
"vertconVersion":"3.0",
"srcDatum":"NAD83(2011)",
"destDatum":"NAD83(2011)",
"srcVertDatum":"N/A",
"destVertDatum":"N/A",
"srcLat":"37.3932999809",
"srcLatDms":"N372335.87993",
"destLat":"37.3932999809",
"destLatDms":"N372335.87993",
"sigLat":"0.000000",
"srcLon":"-92.4590398075",
"srcLonDms":"W0922732.54331",
"destLon":"-92.4590398075",
"destLonDms":"W0922732.54331",
"sigLon":"0.000000",
"srcEht":"100.000",
"destEht":"100.000",
"sigEht":"0.000",
"srcOrthoht":"N/A",
"destOrthoht":"N/A",
"sigOrthoht":"N/A",
"spcZone":"MO C-2402",
"spcNorthing_m":"173,099.417",
"spcEasting_m":"503,626.829",
"spcNorthing_usft":"567,910.336",
"spcEasting_usft":"1,652,315.688",
"spcNorthing_ift":"567,911.472",
"spcEasting_ift":"1,652,318.993",
"spcConvergence":"00 01 29.55",
"spcScaleFactor":"0.99993350",
"spcCombinedFactor":"0.99991781",
"utmZone":"UTM Zone 14",
"utmNorthing":"4,158,634.993",
"utmEasting":"1,079,309.292",
"utmConvergence":"03 58 59.77",
"utmScaleFactor":"1.00373652",
"utmCombinedFactor":"1.00372077",
"x":"-217,687.279",
"y":"-5,069,012.424",
"z":"3,852,223.062",
"usng":"14SKG7930958634"
}

Format#3b (UTM-orthometric height conversion)
java -

Dparms=utmH,<utmZone>,<northing>,<easting>,<hemi>,<inDatum>,<outDatum>,<spcZone><H><inVertDatum><outVertDatum> -jar jtransform_thin.jar

Example
java -Dparms=utmH,15,4138641.144,547883.655,N,NAD83(2011),NAD83(2011),2402,100.0,NAVD88,NAVD88 -jar jtransform_thin.jar

{
"ID":"1620244731576",
"nadconVersion":"5.0",
"vertconVersion":"3.0",
"srcDatum":"NAD83(2011)",
"destDatum":"NAD83(2011)",
"srcVertDatum":"NAVD88",
"destVertDatum":"NAVD88",
"srcLat":"37.3932999809",
"srcLatDms":"N372335.87993",
"destLat":"37.3932999809",
"destLatDms":"N372335.87993",
"sigLat":"0.000000",
"srcLon":"-92.4590398075",
"srcLonDms":"W0922732.54331",
"destLon":"-92.4590398075",
"destLonDms":"W0922732.54331",
"sigLon":"0.000000",
"srcEht":"N/A",
"destEht":"N/A",
"sigEht":"N/A",
"srcOrthoht":"100.000",
"destOrthoht":"100.000",
"sigOrthoht":"0.000",
"spcZone":"MO C-2402",
"spcNorthing_m":"173,099.417",
"spcEasting_m":"503,626.829",
"spcNorthing_usft":"567,910.336",
"spcEasting_usft":"1,652,315.688",
"spcNorthing_ift":"567,911.472",
"spcEasting_ift":"1,652,318.993",
"spcConvergence":"00 01 29.55",
"spcScaleFactor":"0.99993350",
"spcCombinedFactor":"N/A",
"utmZone":"UTM Zone 15",
"utmNorthing":"4,138,641.144",
"utmEasting":"547,883.655",
"utmConvergence":"00 19 42.68",
"utmScaleFactor":"0.99962824",
"utmCombinedFactor":"N/A",
"x":"N/A",
"y":"N/A",
"z":"N/A",
"usng":"15SWB4788338641"
}

Format#3c (UTM-orthometric height conversion; convert UTM from one zone to the other):
java -
Dparms=utmH,<utmZone>,<northing>,<easting>,<hemi>,<inDatum>,<outDatum>,<spcZone><H><inVertDatum><outVertDatum><destZone> -jar jtransform_thin.jar

Example
java -
Dparms=utmH,15,4138641.144,547883.655,N,NAD83(2011),NAD83(2011),2402,100.0,NAVD88,NAVD88,14 -
jar jtransform_thin.jar

{
"ID":"1620244779544",
"nadconVersion":"5.0",
"vertconVersion":"3.0",
"srcDatum":"NAD83(2011)",
"destDatum":"NAD83(2011)",
"srcVertDatum":"NAVD88",
"destVertDatum":"NAVD88",
"srcLat":"37.3932999809",
"srcLatDms":"N372335.87993",
"destLat":"37.3932999809",
"destLatDms":"N372335.87993",
"sigLat":"0.000000",
"srcLon":"-92.4590398075",
"srcLonDms":"W0922732.54331",
"destLon":"-92.4590398075",
"destLonDms":"W0922732.54331",
"sigLon":"0.000000",
"srcEht":"N/A",
"destEht":"N/A",
"sigEht":"N/A",
"srcOrthoht":"100.000",
"destOrthoht":"100.000",
"sigOrthoht":"0.000",
"spcZone":"MO C-2402",
"spcNorthing_m":"173,099.417",
"spcEasting_m":"503,626.829",
"spcNorthing_usft":"567,910.336",
"spcEasting_usft":"1,652,315.688",
"spcNorthing_ift":"567,911.472",
"spcEasting_ift":"1,652,318.993",
"spcConvergence":"00 01 29.55",
"spcScaleFactor":"0.99993350",
"spcCombinedFactor":"N/A",
"utmZone":"UTM Zone 14",
"utmNorthing":"4,158,634.993",
"utmEasting":"1,079,309.292",
"utmConvergence":"03 58 59.77",
"utmScaleFactor":"1.00373652",
"utmCombinedFactor":"N/A",
"x":"N/A",
"y":"N/A",

"z":"N/A",
"usng":"14SKG7930958634"
}

Format#3d (UTM-ellipsoid height conversion for international coordinates)
java -Dparms=utmh,<utmZone>,<northing>,<easting>,<hemi>,<radius> <invf><eht> -jar jtransform_thin.jar

Example
java -Dparms=utmh,56,6250935.338,334368.032,S,6378160.0,298.25,100.0 -jar jtransform_thin.jar

{
"ID":"1620244843283",
"nadconVersion":"5.0",
"vertconVersion":"3.0",
"srcDatum":"N/A",
"destDatum":"N/A",
"srcVertDatum":"N/A",
"destVertDatum":"N/A",
"srcLat":"-33.8687999971",
"srcLatDms":"S335207.67999",
"destLat":"N/A",
"destLatDms":"N/A",
"sigLat":"N/A",
"srcLon":"151.2092999979",
"srcLonDms":"E1511233.47999",
"destLon":"N/A",
"destLonDms":"N/A",
"sigLon":"N/A",
"srcEht":"100.000",
"destEht":"N/A",
"sigEht":"N/A",
"srcOrthoht":"N/A",
"destOrthoht":"N/A",
"sigOrthoht":"N/A",
"spcZone":"N/A",
"spcNorthing_m":"N/A",
"spcEasting_m":"N/A",
"spcNorthing_usft":"N/A",
"spcEasting_usft":"N/A",
"spcNorthing_ift":"N/A",
"spcEasting_ift":"N/A",
"spcConvergence":"N/A",
"spcScaleFactor":"N/A",
"spcCombinedFactor":"N/A",
"utmZone":"UTM Zone 56",
"utmNorthing":"6,250,935.338",
"utmEasting":"334,368.032",
"utmConvergence":"-00 59 53.42",
"utmScaleFactor":"0.99993820",
"utmCombinedFactor":"0.99992250",
"x":"-4,646,140.911",
"y":"2,553,255.603",

"z":"-3,534,440.375",
"usng":"56HLH3436850935"
}
Format#4 (USNG-ellipsoid height conversion)
java -Dparms=usngh,<usng>,<inDatum>,<outDatum>,<spcZone><h> -jar jtransform_thin.jar

Example
java -Dparms=usngh,15SWB4788338641,nad83(2011),nad83(2011),2402,100.0 -jar jtransform_thin.jar

{
"ID":"1620244902643",
"nadconVersion":"5.0",
"vertconVersion":"3.0",
"srcDatum":"NAD83(2011)",
"destDatum":"NAD83(2011)",
"srcVertDatum":"N/A",
"destVertDatum":"N/A",
"srcLat":"37.3932987168",
"srcLatDms":"N372335.87538",
"destLat":"37.3932987168",
"destLatDms":"N372335.87538",
"sigLat":"0.000000",
"srcLon":"-92.4590472163",
"srcLonDms":"W0922732.56998",
"destLon":"-92.4590472163",
"destLonDms":"W0922732.56998",
"sigLon":"0.000000",
"srcEht":"100.000",
"destEht":"100.000",
"sigEht":"0.000",
"srcOrthoht":"N/A",
"destOrthoht":"N/A",
"sigOrthoht":"N/A",
"spcZone":"MO C-2402",
"spcNorthing_m":"173,099.276",
"spcEasting_m":"503,626.173",
"spcNorthing_usft":"567,909.875",
"spcEasting_usft":"1,652,313.536",
"spcNorthing_ift":"567,911.010",
"spcEasting_ift":"1,652,316.840",
"spcConvergence":"00 01 29.53",
"spcScaleFactor":"0.99993350",
"spcCombinedFactor":"0.99991781",
"utmZone":"UTM Zone 15",
"utmNorthing":"4,138,641.000",
"utmEasting":"547,883.000",
"utmConvergence":"00 19 42.66",
"utmScaleFactor":"0.99962824",
"utmCombinedFactor":"0.99961255",
"x":"-217,687.938",
"y":"-5,069,012.481",
"z":"3,852,222.950",

"usng":"15SWB4788238641"
}

Format#4a (USNG-orthometric height conversion)
java -Dparms=usngH,<usng>,<inDatum>,<outDatum>,<spcZone><H><inVertDatum><outVertDatum> -jar jtransform_thin.jar

Example:
java -Dparms=usngH,15SWB4788338641,nad83(2011),nad83(2011),2402,100.0,NAVD88,NAVD88 -jar jtransform_thin.jar

{
"ID":"1620244944933",
"nadconVersion":"5.0",
"vertconVersion":"3.0",
"srcDatum":"NAD83(2011)",
"destDatum":"NAD83(2011)",
"srcVertDatum":"NAVD88",
"destVertDatum":"NAVD88",
"srcLat":"37.3932987168",
"srcLatDms":"N372335.87538",
"destLat":"37.3932987168",
"destLatDms":"N372335.87538",
"sigLat":"0.000000",
"srcLon":"-92.4590472163",
"srcLonDms":"W0922732.56998",
"destLon":"-92.4590472163",
"destLonDms":"W0922732.56998",
"sigLon":"0.000000",
"srcEht":"N/A",
"destEht":"N/A",
"sigEht":"N/A",
"srcOrthoht":"100.000",
"destOrthoht":"100.000",
"sigOrthoht":"0.000",
"spcZone":"MO C-2402",
"spcNorthing_m":"173,099.276",
"spcEasting_m":"503,626.173",
"spcNorthing_usft":"567,909.875",
"spcEasting_usft":"1,652,313.536",
"spcNorthing_ift":"567,911.010",
"spcEasting_ift":"1,652,316.840",
"spcConvergence":"00 01 29.53",
"spcScaleFactor":"0.99993350",
"spcCombinedFactor":"N/A",
"utmZone":"UTM Zone 15",
"utmNorthing":"4,138,641.000",
"utmEasting":"547,883.000",
"utmConvergence":"00 19 42.66",
"utmScaleFactor":"0.99962824",
"utmCombinedFactor":"N/A",
"x":"N/A",

"y":"N/A",
"z":"N/A",
"usng":"15SWB4788238641"
}

Command format#4b (USNG-ellipsoid height for an international coordinate)
java -Dparms=usngh,<usng>,<radius>,<invf><h> -jar jtransform_thin.jar

Example:
java -Dparms=usngh,56HLH3436850935,6378160.0,298.25,100.0 -jar jtransform_thin.jar

{
"ID":"1620244985884",
"nadconVersion":"5.0",
"vertconVersion":"3.0",
"srcDatum":"N/A",
"destDatum":"N/A",
"srcVertDatum":"N/A",
"destVertDatum":"N/A",
"srcLat":"-33.8688030390",
"srcLatDms":"S335207.69094",
"destLat":"N/A",
"destLatDms":"N/A",
"sigLat":"N/A",
"srcLon":"151.2092995885",
"srcLonDms":"E1511233.47852",
"destLon":"N/A",
"destLonDms":"N/A",
"sigLon":"N/A",
"srcEht":"100.000",
"destEht":"N/A",
"sigEht":"N/A",
"srcOrthoht":"N/A",
"destOrthoht":"N/A",
"sigOrthoht":"N/A",
"spcZone":"N/A",
"spcNorthing_m":"N/A",
"spcEasting_m":"N/A",
"spcNorthing_usft":"N/A",
"spcEasting_usft":"N/A",
"spcNorthing_ift":"N/A",
"spcEasting_ift":"N/A",
"spcConvergence":"N/A",
"spcScaleFactor":"N/A",
"spcCombinedFactor":"N/A",
"utmZone":"UTM Zone 56",
"utmNorthing":"6,250,935.000",
"utmEasting":"334,368.000",
"utmConvergence":"-00 59 53.42",
"utmScaleFactor":"0.99993820",
"utmCombinedFactor":"0.99992250",
"x":"-4,646,140.728",

"y":"2,553,255.545",
"z":"-3,534,440.655",
"usng":"56HLH3436850934"
}

Format#5 (XYZ conversion)
java -Dparms=xyz,<x>,<y>,<z>,<inDatum>,<outDatum>,<spcZone>,<utmZone>

Example:
java -Dparms=xyz,-217683.881,-5068933.259,3852162.058,NAD83(2011),NAD83(2011),2402,auto -jar jtransform_thin.jar

{
"ID":"1620245026898",
"nadconVersion":"5.0",
"vertconVersion":"3.0",
"srcDatum":"NAD83(2011)",
"destDatum":"NAD83(2011)",
"srcVertDatum":"N/A",
"destVertDatum":"N/A",
"srcLat":"37.3932968550",
"srcLatDms":"N372335.86868",
"destLat":"37.3932968550",
"destLatDms":"N372335.86868",
"sigLat":"0.000000",
"srcLon":"-92.4590398225",
"srcLonDms":"W0922732.54336",
"destLon":"-92.4590398225",
"destLonDms":"W0922732.54336",
"sigLon":"0.000000",
"srcEht":"0.001",
"destEht":"0.001",
"sigEht":"0.000",
"srcOrthoht":"N/A",
"destOrthoht":"N/A",
"sigOrthoht":"N/A",
"spcZone":"MO C-2402",
"spcNorthing_m":"173,099.070",
"spcEasting_m":"503,626.828",
"spcNorthing_usft":"567,909.198",
"spcEasting_usft":"1,652,315.684",
"spcNorthing_ift":"567,910.333",
"spcEasting_ift":"1,652,318.989",
"spcConvergence":"00 01 29.55",
"spcScaleFactor":"0.99993350",
"spcCombinedFactor":"0.99993350",
"utmZone":"UTM Zone 15",
"utmNorthing":"4,138,640.797",
"utmEasting":"547,883.656",
"utmConvergence":"00 19 42.68",
"utmScaleFactor":"0.99962824",
"utmCombinedFactor":"0.99962824",
"x":"-217,683.881",

"y":"-5,068,933.259",
"z":"3,852,162.058",
"usng":"15SWB4788338640"
}

Command format#5a (XYZ conversion for an international coordinate)
java -Dparms=xyz,<x>,<y>,<z>,<radius>,<invf>,><utmZone>

Example:
java -Dparms=xyz,-4646068.143,2553215.614,-3534384.646,6378160.0,298.25,auto -jar jtransform_thin.jar

{
"ID":"1620245066380",
"nadconVersion":"5.0",
"vertconVersion":"3.0",
"srcDatum":"N/A",
"destDatum":"N/A",
"srcVertDatum":"N/A",
"destVertDatum":"N/A",
"srcLat":"-33.8687999979",
"srcLatDms":"S335207.67999",
"destLat":"N/A",
"destLatDms":"N/A",
"sigLat":"N/A",
"srcLon":"151.2092999955",
"srcLonDms":"E1511233.47998",
"destLon":"N/A",
"destLonDms":"N/A",
"sigLon":"N/A",
"srcEht":"0.000",
"destEht":"N/A",
"sigEht":"N/A",
"srcOrthoht":"N/A",
"destOrthoht":"N/A",
"sigOrthoht":"N/A",
"spcZone":"N/A",
"spcNorthing_m":"N/A",
"spcEasting_m":"N/A",
"spcNorthing_usft":"N/A",
"spcEasting_usft":"N/A",
"spcNorthing_ift":"N/A",
"spcEasting_ift":"N/A",
"spcConvergence":"N/A",
"spcScaleFactor":"N/A",
"spcCombinedFactor":"N/A",
"utmZone":"UTM Zone 56",
"utmNorthing":"6,250,935.338",
"utmEasting":"334,368.032",
"utmConvergence":"-00 59 53.42",
"utmScaleFactor":"0.99993820",
"utmCombinedFactor":"0.99993820",
"x":"-4,646,068.143",
"y":"2,553,215.614",

"z":"-3,534,384.646",
"usng":"56HLH3436850935"
}

3.7 Conversion with Datum Transformation

Transformation grids are needed for this option. See above for a list of reference frames or geopotential datums available for a region of interest.

Download Nadcon5 and/or Vertcon3 grids from https://geodesy.noaa.gov/NCAT/, if not done already.

Unzip downloaded grids to a directory of choice. Please note that both Nadcon5 and Vertcon3 grids must be together in one directory with no subdirectories separating them.

Add "-Dgpath=<grids dir>" to a command of interest given above.

Assuming the grids are unzipped to "/grids" directory, the following examples perform transformations for both reference frame and geopotential datum and return the coordinate set in output reference frame and output geopotential datum. As before, the command must be run from a directory where the library jar is located.

java -Dgpath=/grids -Dparms=llH,40.0,-80.0,100.0,NAD83(2011),NAD83(NSRS2007),3702,auto,NGVD29,NAVD88 -jar jtransform_thin.jar

{
"ID":"1620245253259",
"nadconVersion":"5.0",
"vertconVersion":"3.0",
"srcDatum":"NAD83(2011)",
"destDatum":"NAD83(NSRS2007)",
"srcVertDatum":"NGVD29",
"destVertDatum":"NAVD88",
"srcLat":"40.0000000000",
"srcLatDms":"N400000.00000",
"destLat":"40.0000000387",
"destLatDms":"N400000.00014",
"sigLat":"0.000002",
"srcLon":"-80.0000000000",
"srcLonDms":"W0800000.00000",
"destLon":"-80.0000002064",
"destLonDms":"W0800000.00074",
"sigLon":"0.000008",
"srcEht":"N/A",
"destEht":"N/A",
"sigEht":"N/A",
"srcOrthoht":"100.000",
"destOrthoht":"99.848",
"sigOrthoht":"0.005",
"spcZone":"PA S-3702",
"spcNorthing_m":"76,470.589",
"spcEasting_m":"407,886.465",

"spcNorthing_usft":"250,887.258",
"spcEasting_usft":"1,338,207.510",
"spcNorthing_ift":"250,887.760",
"spcEasting_ift":"1,338,210.186",
"spcConvergence":"-01 27 35.23",
"spcScaleFactor":"0.99999024",
"spcCombinedFactor":"N/A",
"utmZone":"UTM Zone 17",
"utmNorthing":"4,428,236.069",
"utmEasting":"585,360.444",
"utmConvergence":"00 38 34.17",
"utmScaleFactor":"0.99968970",
"utmCombinedFactor":"N/A",
"x":"N/A",
"y":"N/A",
"z":"N/A",
"usng":"17TNE8536028236"
}

java -Dgpath=/grids -
Dparms=spcH,2402,173099.419,503626.812,m,NAD83(2011),NAD83(NSRS2007),auto,100.0,NGVD29,NAVD8
8 -jar jtransform_thin.jar

{
"ID":"1620245294040",
"nadconVersion":"5.0",
"vertconVersion":"3.0",
"srcDatum":"NAD83(2011)",
"destDatum":"NAD83(NSRS2007)",
"srcVertDatum":"NGVD29",
"destVertDatum":"NAVD88",
"srcLat":"37.3933000033",
"srcLatDms":"N372335.88001",
"destLat":"37.3933000245",
"destLatDms":"N372335.88009",
"sigLat":"0.000002",
"srcLon":"-92.4590399988",
"srcLonDms":"W0922732.54400",
"destLon":"-92.4590401909",
"destLonDms":"W0922732.54469",
"sigLon":"0.000003",
"srcEht":"N/A",
"destEht":"N/A",
"sigEht":"N/A",
"srcOrthoht":"100.000",
"destOrthoht":"100.127",
"sigOrthoht":"0.001",
"spcZone":"MO C-2402",
"spcNorthing_m":"173,099.421",
"spcEasting_m":"503,626.795",
"spcNorthing_usft":"567,910.352",
"spcEasting_usft":"1,652,315.577",
"spcNorthing_ift":"567,911.487",

"spcEasting_ift":"1,652,318.881",
"spcConvergence":"00 01 29.55",
"spcScaleFactor":"0.99993350",
"spcCombinedFactor":"N/A",
"utmZone":"UTM Zone 15",
"utmNorthing":"4,138,641.149",
"utmEasting":"547,883.621",
"utmConvergence":"00 19 42.68",
"utmScaleFactor":"0.99962824",
"utmCombinedFactor":"N/A",
"x":"N/A",
"y":"N/A",
"z":"N/A",
"usng":"15SWB4788338641"
}

java -Dgapth=/grids -
Dparms=utmH,15,4138641.144,547883.655,N,NAD83(2011),NAD83(NSRS2007),2402,100.0,NGVD29,NAVD8
8,14 -jar jtransform_thin.jar

{
"ID":"1620245331406",
"nadconVersion":"5.0",
"vertconVersion":"3.0",
"srcDatum":"NAD83(2011)",
"destDatum":"NAD83(NSRS2007)",
"srcVertDatum":"NGVD29",
"destVertDatum":"NAVD88",
"srcLat":"37.3932999809",
"srcLatDms":"N372335.87993",
"destLat":"37.3933000021",
"destLatDms":"N372335.88001",
"sigLat":"0.000002",
"srcLon":"-92.4590398075",
"srcLonDms":"W0922732.54331",
"destLon":"-92.4590399996",
"destLonDms":"W0922732.54400",
"sigLon":"0.000003",
"srcEht":"N/A",
"destEht":"N/A",
"sigEht":"N/A",
"srcOrthoht":"100.000",
"destOrthoht":"100.127",
"sigOrthoht":"0.001",
"spcZone":"MO C-2402",
"spcNorthing_m":"173,099.419",
"spcEasting_m":"503,626.812",
"spcNorthing_usft":"567,910.343",
"spcEasting_usft":"1,652,315.632",
"spcNorthing_ift":"567,911.479",
"spcEasting_ift":"1,652,318.937",
"spcConvergence":"00 01 29.55",
"spcScaleFactor":"0.99993350",

"spcCombinedFactor":"N/A",
"utmZone":"UTM Zone 14",
"utmNorthing":"4,158,634.994",
"utmEasting":"1,079,309.275",
"utmConvergence":"03 58 59.77",
"utmScaleFactor":"1.00373652",
"utmCombinedFactor":"N/A",
"x":"N/A",
"y":"N/A",
"z":"N/A",
"usng":"14SKG7930958634"
}

java -Dgapth=/grids -
Dparms=usngH,15SWB4788338641,nad83(2011),nad83(NSRS2007),2402,100.0,NGVD29,NAVD88 -jar
jtransform_thin.jar

{
"ID":"1620245367277",
"nadconVersion":"5.0",
"vertconVersion":"3.0",
"srcDatum":"NAD83(2011)",
"destDatum":"NAD83(NSRS2007)",
"srcVertDatum":"NGVD29",
"destVertDatum":"NAVD88",
"srcLat":"37.3932987168",
"srcLatDms":"N372335.87538",
"destLat":"37.3932987380",
"destLatDms":"N372335.87546",
"sigLat":"0.000002",
"srcLon":"-92.4590472163",
"srcLonDms":"W0922732.56998",
"destLon":"-92.4590474084",
"destLonDms":"W0922732.57067",
"sigLon":"0.000003",
"srcEht":"N/A",
"destEht":"N/A",
"sigEht":"N/A",
"srcOrthoht":"100.000",
"destOrthoht":"100.127",
"sigOrthoht":"0.001",
"spcZone":"MO C-2402",
"spcNorthing_m":"173,099.278",
"spcEasting_m":"503,626.156",
"spcNorthing_usft":"567,909.882",
"spcEasting_usft":"1,652,313.480",
"spcNorthing_ift":"567,911.018",
"spcEasting_ift":"1,652,316.785",
"spcConvergence":"00 01 29.53",
"spcScaleFactor":"0.99993350",
"spcCombinedFactor":"N/A",
"utmZone":"UTM Zone 15",
"utmNorthing":"4,138,641.002",

"utmEasting":"547,882.983",
"utmConvergence":"00 19 42.66",
"utmScaleFactor":"0.99962824",
"utmCombinedFactor":"N/A",
"x":"N/A",
"y":"N/A",
"z":"N/A",
"usng":"15SWB4788238641"
}

java -Dparms=xyz,-217683.881,-5068933.259,3852162.058,NAD83(2011),NAD83(NSRS2007),2402,auto -jar jtransform_thin.jar

{
"ID":"1620245397252",
"nadconVersion":"5.0",
"vertconVersion":"3.0",
"srcDatum":"NAD83(2011)",
"destDatum":"NAD83(NSRS2007)",
"srcVertDatum":"N/A",
"destVertDatum":"N/A",
"srcLat":"37.3932968550",
"srcLatDms":"N372335.86868",
"destLat":"37.3932968762",
"destLatDms":"N372335.86875",
"sigLat":"0.000002",
"srcLon":"-92.4590398225",
"srcLonDms":"W0922732.54336",
"destLon":"-92.4590400146",
"destLonDms":"W0922732.54405",
"sigLon":"0.000003",
"srcEht":"0.001",
"destEht":"0.023",
"sigEht":"0.001",
"srcOrthoht":"N/A",
"destOrthoht":"N/A",
"sigOrthoht":"N/A",
"spcZone":"MO C-2402",
"spcNorthing_m":"173,099.072",
"spcEasting_m":"503,626.811",
"spcNorthing_usft":"567,909.205",
"spcEasting_usft":"1,652,315.628",
"spcNorthing_ift":"567,910.341",
"spcEasting_ift":"1,652,318.933",
"spcConvergence":"00 01 29.55",
"spcScaleFactor":"0.99993350",
"spcCombinedFactor":"0.99993350",
"utmZone":"UTM Zone 15",
"utmNorthing":"4,138,640.799",
"utmEasting":"547,883.639",
"utmConvergence":"00 19 42.68",
"utmScaleFactor":"0.99962824",
"utmCombinedFactor":"0.99962824",

"x":"-217,683.899",
"y":"-5,068,933.275",
"z":"3,852,162.073",
"usng":"15SWB4788338640"
}

3.8 Description of Output Parameters

ID=A timestamp associated with an API response
nadconVersion=Version of Nadcon transformation
vertconVersion=Version of Vertcon transformation
srcDatum=Input reference frame, a reference frame to be transformed from
destDatum=Output reference frame, a reference frame to be transformed to
srcVertDatum=Input geopotential datum, a geopotential datum to be transformed from
destVertDatum=output geopotential datum, a geopotential datum to be transformed to
srcLat=Input latitude, in decimal degrees, positive north of the equator
srcLatDms=Input latitude in Degrees-Minutes-Seconds with a 'N'orth or 'S'outh hemisphere prefix
destLat=Output latitude, in decimal degrees, positive north of the equator
destLatDms=Output latitude in Degrees-Minutes-Seconds with a 'N'orth or 'S'outh hemisphere prefix
deltaLat=Estimated latitude transformation shift in meters
sigLat=Latitude transformation error estimate in arcseconds
sigLat_m=Latitude transformation error estimate in meters
srcLon=Input longitude in decimal degrees; negative west of the prime meridian
srcLonDms=Input longitude in Degrees-Minutes-Seconds with an 'E'ast or 'W'est hemisphere prefix
destLon=Output longitude in decimal degrees; negative west of the prime meridian
destLonDms=Output longitude in Degrees-Minutes-Seconds with an 'E'ast or 'W'est hemisphere prefix
deltaLon=Estimated longitude transformation shift in meters
sigLon=Longitude transformation error estimate in arcseconds
sigLon_m=Longitude transformation error estimate in meters
srcEht=Input height, in meters, above the geometric reference frame ellipsoid;set to N/A, if not defined
destEht=Output height, in meters, above the geometric reference frame ellipsoid;set to N/A, if not defined or transformed
sigEht=Ellipsoid height transformation error estimate in meters;set to N/A, if not defined or transformed
srcOrthoht=Input orthometric height in Meters;set to N/A, if not defined
destOrthoht=Ouput orthometric height in Meters;set to N/A, if not defined or transformed
sigOrthoht=Orthometric height transformation error in meters
spcZone=Name of a State Plane Coordinate zone
spcNorthing_m=North coordinate of State Plane in meters
spcEasting_m=East coordinate of State Plane in meters
spcNorthing_usft=North coordinate of State Plane in USFT
spcEasting_usft=East coordinate of State Plane in USFT
spcNorthing_ift=North coordinate of State Plane in IFT
spcEasting_ift=East coordinate of State Plane in IFT
spcConvergence=Angular difference between grid north and geodetic north, in Degrees-Minutes-Seconds
spcScaleFactor=The ratio of the length of a linear increment on the grid to the length of the corresponding increment on the ellipsoid at a given point
spcCombinedFactor=A product of scale factor and elevation factor that varies by latitude and ellipsoid height
utmZone=Name of a Universal Transverse Mercator(UTM)zone
utmNorthing=North coordinate of UTM in meters
utmEasting=East coordinate of UTM in meters
utmConvergence=Angular difference between grid north and geodetic north, in Degrees-Minutes-Seconds
utmScaleFactor=The ratio of the length of a linear increment on the grid to the length of the corresponding increment on the ellipsoid at a given point

utmCombinedFactor=A product of UTM scale factor and elevation factor that varies by latitude and ellipsoid height
x=Cartesian X-coordinate in meters
y=Cartesian Y-coordinate in meters
z=Cartesian Z-coordinate in meters
usng=United States National Grid representation of an UTM coordinate

4. Using NCAT Library in a java program

The class *CLDriver* located in the package gov.noaa.ngs.transform.test provides sample conversions and transformations. Additionally, the *docs* folder in the package has a companion *javadoc* which may be used for custom output formats, conversions and/or transformations. Just import jtransform_thin.jar into your source code and customize it for your specific needs.

5. Sample use cases and input/output files

A set of sample input and output files are provided in the package for validation to ensure that all conversions and transformations are working as expected.
Here are the steps to follow for validation

1. Navigate to the dist directory where the library jar is located.

2. To validate conversions, run the following command:
java -cp jtransform_thin.jar gov.noaa.ngs.transform.test.TestDriver

The command should generate the following output:

Performing conversions against testdata.....
All Tests Passed. Actual results match expected results

3. To validate nadcon5 transformations, run the following command. Please note that the test data contains a few invalid use cases. Grids are assumed to be in /grids directory.
java -cp jtransform_thin.jar gov.noaa.ngs.nadcon5.test.TestDriver

After a few error messages pertaining to invalid use cases, the command should generate the following output:

All Nadcon Tests Passed. Actual results match expected results

4. To validate vertcon3 transformations run the following command. Grids are assumed to be in /grids directory.

java -cp jtransform_thin.jar gov.noaa.ngs.vertcon.test.TestDriver

The command should generate the following output:

Running tests for PR
All Tests Passed
Running tests for AS
All Tests Passed
Running tests for VI

```
All Tests Passed
Running tests for ALASKA
All Tests Passed
Running tests for CONUS
All Tests Passed
Running tests for CNMI
All Tests Passed
Running tests for GUAM
All Tests Passed
```