PBO GPS Station Position Time Series Naming Convention and Format Description
Version 1.0.1

This document describes the naming convention and internal format for PBO GPS time series files, version 1.0.1.

1 Background

PBO has two GPS Analysis Centers (ACs) that process raw GPS data and produce position solutions for all stations in the PBO and PBO Nucleus networks as well as selected other stations One AC is operated by the Geodesy Laboratory at Central Washington University and the other by the Berkeley Seismological Laboratory at the University of California, Berkeley. These ACs produce GPS station position solutions on a daily basis using rapid orbit products ("rapid" solutions), as well as with about 14 days latency using the final orbit products ("final" solutions). The ACs send both the rapid and final solutions to the PBO Analysis Center Coordinator (ACC) at MIT. The rapid and final products are available separately from the PBO GPS Archives with latencies of about 24 hours and 14 days, respectively.

The ACC first rotates each of the individual AC products into a single common reference frame. The ACC then combines these intermediate rotated products to produce a single best-estimate PBO combined solution for station position and velocity. The intermediate and final combined products are also available from the PBO GPS Archives with latencies of about 24 hours and 14 days (rapid and final).

For further details of the GPS processing and products, please see the PBO GPS Processing Plan and the Preliminary Design Review document for PBO data management, both of which are available on the PBO web site.

2 File Name Convention

Each of the time series products created by the GPS Analysis Center Coordinator is identified with a unique file name, with the structure

`<STATION>.<AC_ID>.<PROD_ID>.pos`

where

- `<STATION>`
  4-character PBO Dot Number or 16-character PBO station name
- `<AC_ID>`
  A string that identifies the PBO Analysis Center from whose work the time series is derived. Values are one of `CWU` (Central Washington University), `BSL` (Berkeley Seismological Laboratory), or `PBO` (Combined solution from MIT).
- `<PROD_ID>`
  A string that identifies the product type. Values are
  `rapid_frame`: Rapid product from a given AC, rotated into a common reference frame.

`final_frame`: Final product from a given AC, rotated into a common reference frame.
`rerun_frame`: Rerun product from a given AC, rotated into a common reference frame.

For example, the time series for station P041 derived from final solutions generated by Central Washington University, and in the standard PBO reference frame, would be named `P041.CWU.final_loose.pos`. The time series for station P511 derived from the final combined solution produced by MIT would be named `P511.PBO.final_frame.pos`.

3 PBO GPS Station Position Time Series Format

PBO GPS station position time series are made available in ASCII format. The file begins with a set of header lines as given in Table 1.

Table 1: PBO GPS Station Position Time Series Header Format

Line	Entry	Definition
1	PBO Station Position Time Series	
2	Format Version: 1.0.1	
3	`4-character ID: SSSS`	4-character PBO Dot Number
4	`Station name: CCCCCCCCCCCCCCC`	16-character station name
5	`First epoch: YYYYMMDD HHMMSS`	Date and time of first data point in the file, in UTC
6	`Last epoch:  YYYYMMDD HHMMSS`	Date and time of last data point in the file, in UTC
7	`Release date: YYYYMMDD HHMMSS`	Date and time at which the time series file was released, in UTC
8	`XYZ reference position: X Y Z`	Reference position of the station, in ITRF standard Cartesian coordinates with units of meters.
9	`NEU reference position: N E U`	Reference position of the station with respect to the WGS-84 standard ellipsoid. N is latitude in decimal degrees, with North positive. E is longitude in decimal degrees, with East positive. U is elevation with respect to the WGS-84 ellipsoid, in meters.

Following the header are a series of lines giving position information as a function of time. Each line gives the position estimate at a particular epoch. These lines have the structure

```
YYYYMMDD HHMMSS JJJJJJ X Y Z xx yy zz xy xz yz  N E U Ndel Edel Udel nn ee uu ne nu eu <quality>
```

The entries are described in Table 2 below. Note that all times and dates given are in UTC.

Table 2: PBO GPS Station Position Time Series Format

Entry	Definition
YYYY	4-digit year for the given position epoch
MM	2-digit month of year for the given position epoch
DD	2-digit day of month for the given position epoch
HH	2-digit hour for the given position epoch
MM	2-digit minute for the given position epoch
SS	2-digit second for the given position epoch
JJJJJ	Modified Julian day for the given position epoch
X Y Z	ITRF Cartesian coordinates, meters
xx	Standard deviation of the X position, meters
yy	Standard deviation of the Y position, meters
zz	Standard deviation of the Z position, meters
xy	Correlation of the X and Y position
xz	Correlation of the X and Z position
yz	Correlation of the Y and Z position
N	North latitude, decimal degrees, relative to WGS-84 ellipsoid
E	East longitude, decimal degrees, relative to WGS-84 ellipsoid
U	Elevation, meters, relative to WGS-84 ellipsoid
Ndel	Change in North component relative to NEU reference position, meters. If the station moves northward, Ndel is positive.
Edel	Change in East component relative to NEU reference position, meters. If the station moves eastward, Ndel is positive.
Udel	Change in vertical component relative to NEU reference position, meters. If the station moves upward, Ndel is positive.
nn	Standard deviation of Ndel, meters
ee	Standard deviation of Edel, meters
uu	Standard deviation of Udel, meters
ne	Correlation of Ndel and Edel
nu	Correlation of Ndel and Udel
eu	Correlation of Edel and Udel
<quality>	'final' or 'rapid', corresponding to products generated from final or rapid orbit products

See the PBO web page for a reference for the Modified Julian date.

An example file derived from the Berkeley final solution rotated into the common PBO reference frame would be named `P041.BSL.final_frame.pos` and have the following internal structure

```
PBO Station Position Time Series
Format Version: 1.0.1
4-character ID: P041
Station name: Marshall_CO2004
First epoch: 20040120 000000
Last epoch:  20050930 000000
Release date: 20051001 000000
XYZ reference position: -2382952.20260893 -3688233.91924966 4610508.43527586
NEU reference position: 39.949481 -105.193900 1809.6159

20040120 000000 53024.0 -2382952.20260893 -3688233.91924966 4610508.43527586...
    0.01234 0.05678 0.09012 0.03456 0.07890 0.01234 ...
    39.949481 -105.193900 1809.6159 0.00000 0.00000 0.00000 0.01234 0.05678...
    0.09012 0.03456 0.07890 0.01234 final
20040121 000000 53025.0 -2382952.20260942 -3688233.91924927 4610508.43530291...
    0.01234 0.05678 0.09012 0.03456 0.07890 0.01234 ...
    39.949481 -105.193900 1809.6159 0.00000 0.00000 0.00000 0.01234 0.05678...
    0.09012 0.03456 0.07890 0.01234 final
```

and so on, where ... indicates that a single line has been broken for clarity.