

Initial Orbit

De Wiki

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By default values

It is not reasonable to give a by default orbit! So, when using **PSIMU** for the first time, the initial orbit will be displayed with an error status. For example, it will just be necessary to give a positive value for the semi-major axis.

The screenshot shows the 'Initial Orbit' configuration window. At the top left, there is a red 'Orbit' label with a close icon and an asterisk. To its right is a 'Pivot' button. Further right is a 'TLE Convert' button. Below these, there is a 'Deactivate conversions' checkbox. The 'Date:' field contains '01/01/2000 00h00m00s' and has a 'UTC +/-' button to its right. The 'Frame:' dropdown is set to 'GCRF'. The 'Type:' dropdown is set to 'Keplerian'. Below these is the 'Keplerian Parameters' section, also with a red close icon and asterisk. It contains several input fields: 'a:' (0.0 km), 'e:' (0.0), 'i:' (0.0 deg), 'Ω:' (0.0 deg), 'ω:' (0.0 deg), 'Anomaly:' (0.0 deg) with a 'true' label, and 'μ:' (398600.4418 km^3/s^2) with a 'Select' button to its left. Each input field has a unit label to its right.

Date

The date is given with the following entry area:

A close-up of the 'Date:' entry field. It shows the text '01/01/2010 00h00m00s' and a 'UTC +/-' button to its right.

Several date formats are available via a mouse right click.

Date: 01/01/2010 00h00m00s UTC +/-

Frame: ISO-8601

Type: jj ~1950

Apsis Altitude Param

hp: 200.0 km

ha: 300.0 km

Calendar

ISO-8601

jj ~1950

jj ~2000

jj sec ~1950

jj sec ~2000

Moreover the user can select a time scale ... for which the conversion will be done ...

UTC +/-

UTC

TAI

TT

GPS

GST

... and also have the possibility to use a date offset utility (very useful when you want to add duration to a previous date) by clicking on the +/- button:

Relative Date

Date offset: 0j03h45m15s

Ok Cancel

Conversions and “pivot” notion

The widget used to entry initial orbit parameters proposes a lot of different frames an type of parameters but also allows executing conversions. It is very interesting for example if you want to see quickly at which altitude is your perigee when you initially get Cartesian parameters!

Frame: GCRF

Type: Cartesian

Cartesian Parameters *

x: 3295.70380176292 km

y: 5683.65017359001 km

z: 439.631391348975 km

Vx: -6.74200496491514 km/s

Vy: 3.90930999706841 km/s

Vz: 0.439250454593903 km/s

μ : Select 398600.4415 km³/s²

Frame: GCRF

Type: Apsis Altitude

Apsis Altitude Parameters *

hp: 200.0 km

ha: 300.0 km

i: 5.0 deg

Ω : 10.0 deg

ω : 20.0 deg

Anomaly: true 30.0 deg

μ : Select 398600.4415 km³/s²

req: Select 6378.1363 km

Unfortunately, a feedback of many years of such use shows that you will definitively get numerical uncertainties and when you will have to return to the first entry, you will not recover exactly the same values. The “pivot” is a very important notion that allows answering to this problematic. The basic idea is to store the initial entry as a reference (the “pivot”). So every time the user will ask for a conversion, it will be checked if the format is equal (or not) to the reference. If it is the case, no

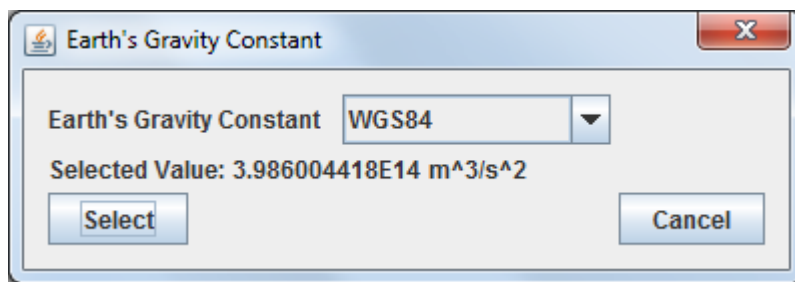
conversion will be done, the reference will be retrieved. The “pivot” is then defined by:

- The frame
- The kind of parameters
- The kind of anomaly (if relevant)

At every moment, the user may change the “pivot” definition by clicking on the dedicated button. On the other side, if the user modifies an entry (as the eccentricity when Keplerian parameters), the “pivot” will be automatically modified (as we will be on a new orbit). On the same idea, if the user modifies the “ μ ” value (or equatorial radius or flatness), the orbit will also be modified. Nevertheless, a conversion will be done as it could be useful to see the influence of such constants. Moreover, it is always possible to disconnect this conversion possibility: indeed, it is a basic case when the user started to enter orbital parameters before choosing the right frame!

Constants

Some constants are necessary depending on the kind of parameters. Nominally, only Cartesian parameters do not need it but it has been decided to show “ μ ” value anytime. On the contrary, equatorial radius and/or flatness will be displayed only when needed (as for reentry parameters). These constants are modifiable via the **GUI** but a list of predefined values (present in [[PATRIUS](#)] library) is accessible via a select button that will display a pop-up window as below ...



Copy/Paste

Thanks to [GENIUS](#) and [GENOPUS](#) functionalities, it is possible to do a **Copy/Paste/Import/Export** on orbit data. To do it, you have just to click with the right button above the "Orbit" label (in blue (or red if values are uncorrect!)).

Orbit

De:

Conversions ☐

Type:

Apsis Altitude Parameters

hp:	<input type="text" value="300.0"/>	km
ha:	<input type="text" value="300.0"/>	km
i:	<input type="text" value="51.6"/>	deg
Ω :	<input type="text" value="0.0"/>	deg
ω :	<input type="text" value="0.0"/>	deg
Anomaly:	<input checked="" type="checkbox"/> true	<input type="text" value="0.0"/> deg
μ :	<input type="button" value="Select"/>	<input type="text" value="398600.4415"/> km^3/s^2
req:	<input type="button" value="Select"/>	<input type="text" value="6378.1363"/> km

Then, you can copy your orbit data on any other tool that uses the [GENOPUS](#) widget [GPOrbit](#). You may also paste (or export) the data in a file. With the previous example, you will get:

```
<?xml version="1.0" encoding="UTF-8"?>
<fr.cnes.genopus.orbits.GPOrbit>
  <Orbit name="Orbit">
    <AbsoluteDate name="Date">
      <String name="date">01/01/2000 00h00m00s</String>
      <String name="scale">UTC</String>
    </AbsoluteDate>
    <Frame name="Frame">
      <String name="name">GCRF</String>
    </Frame>
    <String name="typeOfParameters">Apsis Altitude</String>
    <ApsisAltitudeParameters name="Apsis_Altitude_Parameters">
      <Real name="hp" unit="km">3.0E2</Real>
      <Real name="ha" unit="km">3.0E2</Real>
      <Real name="i" unit="deg">5.16E1</Real>
      <Real name="raan" unit="deg">0.0E0</Real>
      <Real name="pa" unit="deg">0.0E0</Real>
      <String name="typeOfAnomaly">true</String>
      <Real name="anomaly" unit="deg">0.0E0</Real>
      <Real name="mu" unit="km^3/s^2">3.986004415E5</Real>
      <Real name="req" unit="km">6.3781363E3</Real>
    </ApsisAltitudeParameters>
  </Orbit>
</fr.cnes.genopus.orbits.GPOrbit>
```

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