ISIS Planetary Geodesy Software

(formerly RAND/USGS Planetary Geodesy (RUPG) Software)

Randlsq Program A Priori Input File Format

File: ISIS-PG-FMT502.doc, .pdf, or .asc

Version: 2006.08.10

==========

Description: Primary input of a priori information, such as approximate positions for the body pole position and rotation rate, control point positions (and optionally their uncertainties), and camera position and orientation.

File input:

Groups 1, 2a, and 2b.

THESE RECORDS ARE NOT USED FOR LUNAR SOLUTIONS.

Group 3 - Control point locations ("npoi" records, note 2):

Phi	1-24	D24.16	Latitude of control point (degrees).
Lamda	35-48	D24.16	Longitude of control point (degrees). If iew=0, then east longitude. If iew=1, then west longitude.
Radius	49-72	D24.16	Radius of control point (km).
Pointid	73-79	A7	Point identification (unitless).
Siglat	80-103	D24.16	Uncertainty in latitude (degrees). If zero or less, not used. Note 6.
Siglon	104-127	D24.16	Uncertainty in longitude at the equator (degrees). If zero or less, not used. Note 6.
Sigrad	128-151	D24.16	Uncertainty in radius (km). If zero or less, not used. Note 6.

Sample (from Clementine lunar solution, zout.dat):

```
=> 0.2167900000000000D+02  0.2978699999999998D+02  0.1735230000000000D+04Clerke<=
```

Group 4 - Camera orientation and position (4 x "npic" records, note 3):

Record 4-1:

JulianDate	1-24	D24.16	Julian date when picture was taken (days).

Imageid	25-36	A12	Image identification. Usually flight data sequence (FSC) or similar image number (unitless).
-	65-79	A15	"JULIAN_DATE&FDS".

Record 4-2:

s(i,1)	1-24	D24.16	X component of spacecraft position vector in J2000.0 coordinates (km).
s(i,2)	25-48	D24.16	Y component of spacecraft position vector in J2000.0 coordinates (km).
s(i,3)	49-72	D24.16	Z component of spacecraft position vector in J2000.0 coordinates (km).
-	74-79	A6	"SXSYSZ".

Record 4-3:

c(i,1)	1-24	D24.16	J2000.0 right ascension of optical axis of picture (degrees).
c(i,2)	25-48	D24.16	J2000.0 declination of optical axis of picture (degrees).
c(i,3)	49-72	D24.16	Twist angle of picture (degrees).
-	74-79	A6	"C1C2C3".

Record 4-4 (only used with runstring option "USEPLAN=YES") (note 4):

pa(i,1)	1-24	D24.16	Right ascension of target body north pole, e.g. alpha, at time "JulianDate" (degrees).
pa(i,2)	25-48	D24.16	Declination of target body north pole, e.g. delta, at time "JulianDate" (degrees).
pa(i,3)	49-72	D24.16	Rotation angle of target body, e.g. omega, at time "JulianDate" (degrees).
-	74-79	A6	"PLANET".

Sample (from Clementine lunar solution, zout.dat):

```
=> 0.2449424473991000D+07    10010085                              JULIAN_DATE&FDS<=
=>-0.5683284820000000D+02  0.1024576564900000D+04 -0.2289259262200000D+04 SXSYSZ<=
=>-0.8708766833846568D+02  0.6533837435742034D+02 -0.9010629153707471D+02 C1C2C3<=
=> 0.2731998259000000D+03  0.6567969309999999D+02  0.1746108997000000D+03 PLANET<=
```

Notes:

1. Currently read from *randlsq* program unit 12.

2. "npoi" is the number of control points. See the "Solution Parameterization" file (format "ISIS-PG-FMT531.doc") for input of this.
3. "npic" is the number of images. See the "Solution Parameterization" file (format "ISIS-PG-FMT531.doc") for input of this.
4. "PLANET" angles (records such as no. 4-4 above) and the use of the runstring option "PLANET=YES" should be used for the Moon and eventually other objects where the closed formulae in *randlsq* (subroutine *iau2000.F*) are not sufficiently accurate to represent the rotation of the body in question.
5. Lines beginning with a "#" will eventually be treated as comments.
6. Earlier versions of *randlsq* for non-lunar solutions used 5 character control point names, but all solutions now use 7 character names.
7. The input of uncertainties for control points was added to the operational version of *randlsq* after 2005 November 17. These uncertainties are used to weight the given parameters by addition to the diagonal elements of the normal matrix. Latitude and longitude uncertainties here are converted to radians. Latitude weights are then one over the latitude uncertainty squared. Longitude weights are one over (the longitude uncertainty divided by the absolute value of the cosine of the latitude) squared. Radius weights are one over the radius uncertainty squared. Note that in experimental and briefly operational (2005 October) versions before this date, the uncertainties were (incorrectly) not squared. So the entered uncertainties were actually treated as entered variances. Also note that if uncertainty values are specified here, they are used to weight the parameters, overriding the use of "RAND style" weights as set using the gweight or sweight values in the Parameter Input File. (And as a current bug, these changed weights are not yet reflected in the output of the RAND style weights at the top of the residual output file, under the heading "WEIGHTS".)

==========

Reference: Model, program, and format generally follow that specified in:

Colvin, Tim R. (1992). "Photogrammetric Algorithms and Software for Spacecraft Optical Imaging Systems," _ A RAND NOTE _, N-3330-JPL.

Note that the original format indicates the use of 5 character control point names.

==========

Document History:

Begun 2006.08.10 by B. Archinal, based on RUPG-FMT5012.doc.

Modifications:

==========

(End of document.)