

American TLE experts



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The technique for TLE recalculation

This task is solved by the “TLE_rec.exe” software. You can order it [here](#).

As the initial data, the TLE sets are applied, which are prepared by the user and written into the “TLE_ini.txt” file. The fragment of this file is given below.

```
1 25509U 98061B   98297.49237138   .00002433 -76938-5   00000+0 0   11
2 25509 028.4795 037.7286 0015392 321.7814 037.7919 16.34311544   05
1 25509U 98061B   98297.62368702   .00000531  00000-0 10000-3 0   22
2 25509 031.4542 034.5533 0364397 250.7872 105.2982 14.23437438   15
1 25509U 98061B   98297.76392310   +.00000546 +00000-0 +10000-3 0 00036
2 25509 031.4430 033.7710 0370167 252.0548 104.0418 14.23717857000035
.....
.....
1 25509U 98061B   98318.17003753   +.00000679 +00000-0 +13313-3 0 00829
2 25509 031.4456 279.2199 0368832 069.1138 294.8570 14.23756123002947
```

The number of TLE sets in a file is not limited. The file must contain the TLE sets only.

Recalculation is based on the SGP4 model of motion, which is included in the software as a module. Addressing to this module at the current time instant allows us to obtain all components of the 6-dimensional state vector (RV) in the Geocentric Equatorial Coordinate (true-equator, mean-equinox) System with reference to the TLE time. The TLE time is recalculated into the Modified Julian Date counted from 00h 00m 00s of January 01, 1958. The example of results is given in table 1 (the “RVoutput.dat” file). Generally, the position of a satellite is close to the ascending node at the beginning of any revolution. The calculation results contain also the number of a current revolution (N). Numbering of revolutions is started from the first TLE set.

In addition to the output data in the (RV) form, the osculating orbital elements (i , Ω , $e \cdot \cos \omega$, $e \cdot \sin \omega$, a) at the ascending node, as well as the draconic period (Tdr) and the period change per one revolution (ΔT) are also calculated. These data are written into the “ELoutput.dat” file. The example of the content of this file is presented in table 2.

Table 1. Content of the "RVoutput.dat" file

Explanations are given in italics.

<i>N</i>	<i>Timeя</i>	<i>x km</i>	<i>y km</i>	<i>z km</i>	<i>Vx km/sec</i>	<i>Vy km/sec</i>	<i>Vz km/sec</i>
1	14906.62368702	5986.2215802	4122.4204042	-0.0000559	-3.3549686245	5.3165083642	3.8448732695
3	14906.76390312	6037.3122452	4037.2216058	-0.0000313	-3.2798624480	5.3693351768	3.8462580155
15	14907.60531786	6320.0125806	3510.2228226	-0.0000271	-2.8330922481	5.6507548702	3.8640375916
57	14910.55035390	6943.5021478	1540.5833006	-0.0000705	-1.1345536399	6.3234830892	3.9280302995
95	14913.21503895	7013.6515233	-299.6368187	0.0000262	0.4903616383	6.4883714451	3.9796657689
100	14913.56566276	6988.8422056	-539.5535276	0.0000262	0.7043367761	6.4780245951	3.9855911550
109	14914.19678914	6924.9134764	-967.9090250	0.0000257	1.0874595181	6.4406857696	3.9954998792
123	14915.17855008	6777.0716088	-1622.9906284	0.0000258	1.6753461396	6.3352285355	4.0090031643
138	14916.23044718	6555.2031199	-2304.8388531	-0.0002145	2.2887623493	6.1596795607	4.0205712159
.....							
.....							

Table 2. Content of the "ELoutput.dat" file

Explanations are given in italics.

<i>N</i>	<i>Time</i>	<i>Tdr day</i>	<i>i radian</i>	Ω <i>radian</i>	<i>e-cos ω</i>	<i>e-sin ω</i>	ΔT <i>min</i>	<i>a km</i>
1	14906.62368702	0.07013144	0.54926408	0.60306886	-0.0109381	-0.0338733	-0.00000528	7197.9874
3	14906.76390312	0.07011770	0.54906864	0.58941710	-0.0103518	-0.0346792	-0.00000542	7197.0458
15	14907.60531786	0.07011881	0.54907213	0.50699026	-0.0057863	-0.0358533	0.00000127	7197.0611
57	14910.55035390	0.07012219	0.54914371	0.21833720	0.0105467	-0.0351938	-0.00000185	7197.0838
95	14913.21503895	0.07012498	0.54915070	6.24048937	0.0238036	-0.0285977	-0.00000584	7197.1153
100	14913.56566276	0.07012527	0.54915419	6.20613605	0.0253201	-0.0273411	-0.00000679	7197.1172
109	14914.19678914	0.07012576	0.54915420	6.14431303	0.0278654	-0.0248992	-0.00000768	7197.1213
123	14915.17855008	0.07012644	0.54915944	6.04812966	0.0313250	-0.0206546	-0.00000773	7197.1284
138	14916.23044718	0.07012702	0.54915769	5.94508191	0.0342984	-0.0155800	-0.00000734	7197.1344
.....								
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