



### Legend:

"	arcseconds
Cy	Julian century
a	semi-major axis
e	eccentricity
i	inclination
Omega	longitude of the ascending node
~omega	longitude of perihelion
L	mean longitude

## Mean Anomaly

*Anomaly* is a term for an angle. The *Mean Anomaly* is the angle which describes the position of the satellite in its orbit, relative to perigee. At perigee, the Mean Anomaly is zero, it increases to 180 degrees at apogee, then back to perigee at 360 degrees.

Since the orbit is often not a circle, the measurement of the angle is difficult, so the angle is expressed in terms of a fractional orbit (one orbit = 360 **degrees**). This is the reason for the *mean* adjective. For circular orbits, the Mean Anomaly is just the angle between perigee and the current satellite position.

A special form of the Mean Anomaly is used by AMSAT controllers - instead of 360 degrees, the orbit fraction is expressed as a number in the range 0-255. This is often referred to as "MA" and is available in the [Orbit group](#) of the [Info Window](#).

<http://home.att.net/~srschmitt/planetorbits.html>

**Planetary Mean Orbits (J2000)**  
(epoch = J2000 = 2000 January 1.5)  
([see the table of rates below](#))

Planet (mean)	a AU	e	i deg	Omega deg	~omega deg	L deg
Mercury	0.38709893	0.20563069	7.00487	48.33167	77.45645	252.25084
Venus	0.72333199	0.00677323	3.39471	76.68069	131.53298	181.97973
Earth	1.00000011	0.01671022	0.00005	-11.26064	102.94719	100.46435
Mars	1.52366231	0.09341233	1.85061	49.57854	336.04084	355.45332
Jupiter	5.20336301	0.04839266	1.30530	100.55615	14.75385	34.40438
Saturn	9.53707032	0.05415060	2.48446	113.71504	92.43194	49.94432
Uranus	19.19126393	0.04716771	0.76986	74.22988	170.96424	313.23218
Neptune	30.06896348	0.00858587	1.76917	131.72169	44.97135	304.88003
Pluto	39.48168677	0.24880766	17.14175	110.30347	224.06676	238.92881

**Planetary Orbital Element Centennial Rates**  
([for the mean elements given above](#))

Planet (rate)	a AU/Cy	e /Cy	i "/Cy	Omega "/Cy	~omega "/Cy	L "/Cy
Mercury	0.00000066	0.00002527	-23.51	-446.30	573.57	538101628.29
Venus	0.00000092	-0.00004938	-2.86	-996.89	-108.80	210664136.06
Earth	-0.00000005	-0.00003804	-46.94	-18228.25	1198.28	129597740.63
Mars	-0.00007221	0.00011902	-25.47	-1020.19	1560.78	68905103.78
Jupiter	0.00060737	-0.00012880	-4.15	1217.17	839.93	10925078.35
Saturn	-0.00301530	-0.00036762	6.11	-1591.05	-1948.89	4401052.95
Uranus	0.00152025	-0.00019150	-2.09	-1681.40	1312.56	1542547.79
Neptune	-0.00125196	0.0000251	-3.64	-151.25	-844.43	786449.21
Pluto	-0.00076912	0.00006465	11.07	-37.33	-132.25	522747.90