

Lunar Gateway Orbital Parameters				Gravitational Parameters			
Periapsis	3000	km	also perilune or pericynthion	Moon	4904.86959	km3/s2	
Apoapsis	70000	km	also apolune or apocynthion	Earth	398600.4419	km3/s2	
inclination	90	deg	1.57 rad	Sun	132712440019	km3/s2	
longitude of the ascending node	15	deg	0.26 rad				
argument of periapsis	25	deg	0.44 rad				
true anomaly	180	deg	3.14 rad	Notes:			
semi-major axis	36500	km		1	This algorithm will blow up if the orbit is too close to equatorial (inclination = 0) or too circular (periapse = apoapse)		
semiparameter	5,753.42	km		2	Conversion from lunar to earth coordinates presumes a zero argument of periapse and longitude of ascending node. This changes with time, would need to incorporate lunar ephemeris for accurate data for a given date		
eccentricity	0.92			3			
Lunar Gateway position wrt its orbital plane							
X	-70,000.00	km					
Y	0.00	km					
Z	0.00	km	always zero				
Vx	0.00	km/s					
Vy	0.08	km/s					
Vz	0.00	km/s	always zero				
Lunar Gateway position wrt inertial center of moon							
Rotation Matrix							
	0.88		-0.41		0.26		
	0.23		0.11		-0.97		
	0.42		0.91		0.00		
X	-61,279.83	km					
Y	-16,419.88	km					
Z	-29,583.28	km		70,000.00	check		
Vx	-0.03	km/s					
Vy	0.01	km/s					
Vz	0.07	km/s		0.08	check		
Moon Orbital Parameters							
Earth obliquity to ecliptic plane	23.4	deg	also called tilt				
Moon orbital inclination	5.15	deg					
Moon obliquity to ecliptic plane	1.543	deg	also called tilt				
conversion angle	30.093	deg	0.53 rad				
Lunar Apogee	405400	km					
Lunar Perigee	363229	km					
True Anomaly	0	deg	0.00 rad				
semi-major axis	384314.5	km					
semiparameter	383,157.64	km					
eccentricity	0.05						
Moon position wrt its orbital plane							
X	363,229.00	km					
Y	0.00	km					
Z	0.00	km	always zero				
Vx	0.00	km/s					
Vy	-1.08	km/s					
Vz	0.00	km/s	always zero				
Moon position wrt inertial center of Earth							
Conversion Matrix							
	1		0		0		
	0	0.8652126852		-0.5014050352			
	0		0	0.8652126852			
X	363,229.00	km					
Y	0.00	km					
Z	0.00	km		363,229.00	check		
Vx	0.00	km/s					
Vy	-0.93	km/s					
Vz	0.00	km/s		0.93	check		
Lunar Gateway position wrt inertial center of Earth							
X	301,949.17	km					
Y	-16,419.88	km					

[illegible]