```
*******************************************************************************
Ephemeris / WWW_USER Tue Feb 18 03:06:42 2014 Pasadena, USA      / Horizons
*******************************************************************************
Target body name: Moon (301)                     {source: DE-0431LE-0431}
Center body name: Earth (399)                    {source: DE-0431LE-0431}
Center-site name: (user defined site below)
*******************************************************************************
Start time      : A.D. 2011-Jun-15 21:48:00.0000 UT
Stop  time      : A.D. 2011-Jun-15 21:51:00.0000 UT
Step-size       : 1 minutes
*******************************************************************************
Target pole/equ : IAU_MOON                       {East-longitude +}
Target radii    : 1737.4 x 1737.4 x 1737.4 km    {Equator, meridian, pole}
Center geodetic : 5.20833300,45.6972220,300.00000 {E-lon(deg),Lat(deg),Alt(km)}
Center cylindric: 5.20833300,4672.00136,4756.5038 {E-lon(deg),Dxy(km),Dz(km)}
Center pole/equ : High-precision EOP model        {East-longitude +}
Center radii    : 6378.1 x 6378.1 x 6356.8 km    {Equator, meridian, pole}
Target primary  : Earth
Vis. interferer : MOON (R_eq= 1737.400) km        {source: DE-0431LE-0431}
Rel. light bend : Sun, EARTH                      {source: DE-0431LE-0431}
Rel. lght bnd GM: 1.3271E+11, 3.9860E+05 km^3/s^2
Atmos refraction: NO (AIRLESS)
RA format       : HMS
Time format     : CAL
RTS-only print  : NO
EOP file        : eop.140217.p140511
EOP coverage    : DATA-BASED 1962-JAN-20 TO 2014-FEB-17. PREDICTS-> 2014-MAY-10
Units conversion: 1 au= 149597870.700 km, c= 299792.458 km/s, 1 day= 86400.0 s
Table cut-offs 1: Elevation (-90.0deg=NO ),Airmass (>38.000=NO), Daylight (NO )
Table cut-offs 2: Solar Elongation (  0.0,180.0=NO ),Local Hour Angle( 0.0=NO )
*******************************************************************************
 Date__(UT)__HR:MN     R.A._(ICRF/J2000.0)_DEC Azi_(a-appr)_Elev APmag S-brt          delta      deldot    S-O-T /r   S-T-O
*******************************************************************************
$$SOE
 2011-Jun-15 21:48 Am  17 40 18.82 -24 05 44.1 152.4755  15.3171 -12.71   3.45 0.00249286694130  -0.1015826 178.5702 /L   1.4264
 2011-Jun-15 21:49 Am  17 40 20.64 -24 05 44.3 152.6909  15.3953 -12.71   3.45 0.00249282642152  -0.1004733 178.5650 /L   1.4317
 2011-Jun-15 21:50 Am  17 40 22.46 -24 05 44.4 152.9065  15.4728 -12.71   3.45 0.00249278634721  -0.0993613 178.5597 /L   1.4369
 2011-Jun-15 21:51 Am  17 40 24.29 -24 05 44.6 153.1225  15.5499 -12.71   3.45 0.00249274671941  -0.0982467 178.5544 /L   1.4422
$$EOE
*******************************************************************************
Column meaning:

TIME

  Prior to 1962, times are UT1. Dates thereafter are UTC. Any 'b' symbol in
the 1st-column denotes a B.C. date. First-column blank (" ") denotes an A.D.
date. Calendar dates prior to 1582-Oct-15 are in the Julian calendar system.
Later calendar dates are in the Gregorian system.

  Time tags refer to the same instant throughout the universe, regardless of
```

where the observer is located.

   The dynamical Coordinate Time scale is used internally. It is equivalent to
the current IAU definition of "TDB". Conversion between CT and the selected
non-uniform UT output scale has not been determined for UTC times after the
next July or January 1st.  The last known leap-second is used over any future
interval.

   NOTE: "n.a." in output means quantity "not available" at the print-time.

SOLAR PRESENCE (OBSERVING SITE)
   Time tag is followed by a blank, then a solar-presence symbol:

        '*'  Daylight (refracted solar upper-limb on or above apparent horizon)
        'C'  Civil twilight/dawn
        'N'  Nautical twilight/dawn
        'A'  Astronomical twilight/dawn
        ' '  Night OR geocentric ephemeris

LUNAR PRESENCE WITH TARGET RISE/TRANSIT/SET MARKER (OBSERVING SITE)
   The solar-presence symbol is immediately followed by another marker symbol:

        'm'  Refracted upper-limb of Moon on or above apparent horizon
        ' '  Refracted upper-limb of Moon below apparent horizon OR geocentric
        'r'  Rise    (target body on or above cut-off RTS elevation)
        't'  Transit (target body at or past local maximum RTS elevation)
        's'  Set     (target body on or below cut-off RTS elevation)

RTS MARKERS (TVH)
   Rise and set are with respect to the reference ellipsoid true visual horizon
defined by the elevation cut-off angle. Horizon dip and yellow-light refraction
(Earth only) are considered. Accuracy is < or = to twice the requested search
step-size.

 R.A._(ICRF/J2000.0)_DEC =
   J2000.0 astrometric right ascension and declination of target center.
Adjusted for light-time. Units: HMS (HH MM SS.ff) and DMS (DD MM SS.f)

 Azi_(a-appr)_Elev =
   Airless apparent azimuth and elevation of target center. Adjusted for
light-time, the gravitational deflection of light, stellar aberration,
precession and nutation. Azimuth measured North(0) -> East(90) -> South(180) ->
West(270) -> North (360). Elevation is with respect to plane perpendicular
to local zenith direction.  TOPOCENTRIC ONLY. Units: DEGREES

 APmag S-brt =
   Moon's approximate apparent visual magnitude & surface brightness. When
phase angle < 7 deg (within ~ 1 day of full Moon), computed magnitude tends to
be about 0.12 too small.
   Units: MAGNITUDE & VISUAL MAGNITUDES PER SQUARE ARCSECOND

delta  deldot =
   Range ("delta") and range-rate ("delta-dot") of target center with respect
to the observer at the instant light seen by the observer at print-time would
have left the target center (print-time minus down-leg light-time); the
distance traveled by a light ray emanating from the center of the target and
recorded by the observer at print-time. "deldot" is a projection of the
velocity vector along this ray, the light-time-corrected line-of-sight from the
coordinate center, and indicates relative motion. A positive "deldot" means the
target center is moving away from the observer (coordinate center). A negative
"deldot" means the target center is moving toward the observer.
Units: AU and KM/S

 S-O-T /r =
   Sun-Observer-Target angle; target's apparent solar elongation seen from
observer location at print-time. If negative, the target center is behind
the Sun. Angular units: DEGREES.

   The '/r' column is a Sun-relative code, output for observing sites
with defined rotation models only.

        /T indicates target trails Sun (evening sky)
        /L indicates target leads Sun  (morning sky)

   NOTE: The S-O-T solar elongation angle is the total separation in any
direction. It does not indicate the angle of Sun leading or trailing.

 S-T-O =
   "S-T-O" is the Sun->Target->Observer angle; the interior vertex angle at
target center formed by a vector to the apparent center of the Sun at
reflection time on the target and the apparent vector to the observer at
print-time. Slightly different from true PHASE ANGLE (requestable separately)
at the few arcsecond level in that it includes stellar aberration on the
down-leg from target to observer.  Units: DEGREES


 Computations by ...
     Solar System Dynamics Group, Horizons On-Line Ephemeris System
     4800 Oak Grove Drive, Jet Propulsion Laboratory
     Pasadena, CA  91109   USA
     Information: http://ssd.jpl.nasa.gov/
     Connect    : telnet://ssd.jpl.nasa.gov:6775  (via browser)
                  telnet ssd.jpl.nasa.gov 6775    (via command-line)
     Author     : Jon.Giorgini@jpl.nasa.gov

*******************************************************************************************