HORIZONS Web-Interface
This tool provides a web-based *limited* interface to JPL's HORIZONS system which can be used to generate ephemerides for solar-system bodies. Full access to HORIZONS features is available via the primary telnet interface. HORIZONS system news shows recent changes and improvements. A web-interface tutorial is available to assist new users.

Current Settings

Ephemeris Type [change] : **OBSERVER**
Target Body [change] : **Mars** [499]
Observer Location [change] : **Geocentric** [500]
Time Span [change] : Start=**2019-04-27 00:00**, Stop=**2019-04-27 12:00**, Step=**1 d**
Table Settings [change] : QUANTITIES=**1-3,19-21**; date/time format=**BOTH**; angle format=**DEG**; output units=**AU-D**; extra precision=**YES**
Display/Output [change] : *default* (formatted HTML)

Object Data Page

```
Revised: June 21, 2016                Mars                              499 / 4

PHYSICAL DATA (updated 2019-Oct-29):
 Vol. mean radius (km) = 3389.92+-0.04   Density (g/cm^3)      =  3.933(5+-4)
 Mass x10^23 (kg)      =    6.4171       Flattening, f         =  1/169.779
 Volume (x10^10 km^3)  =   16.318        Equatorial radius (km)=  3396.19
 Sidereal rot. period  =   24.622962 hr  Sid. rot. rate, rad/s =  0.0000708822
 Mean solar day (sol)  =   88775.24415 s Polar gravity m/s^2   =  3.758
 Core radius (km)      = ~1700           Equ. gravity  m/s^2   =  3.71
 Geometric Albedo      =    0.150

 GM (km^3/s^2)         = 42828.375214    Mass ratio (Sun/Mars) = 3098703.59
 GM 1-sigma (km^3/s^2) = +- 0.00028      Mass of atmosphere, kg= ~ 2.5 x 10^16
 Mean temperature (K)  =  210            Atmos. pressure (bar) =    0.0056
 Obliquity to orbit    =   25.19 deg     Max. angular diam.    =  17.9"
 Mean sidereal orb per =    1.88081578 y Visual mag. V(1,0)    =  -1.52
 Mean sidereal orb per =  686.98 d       Orbital speed,  km/s  =  24.13
 Hill's sphere rad. Rp =  319.8          Escape speed, km/s    =   5.027
                             Perihelion  Aphelion    Mean
 Solar Constant (W/m^2)         717         493         589
 Maximum Planetary IR (W/m^2)   470         315         390
 Minimum Planetary IR (W/m^2)    30          30          30
```

Results

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*******************************************************************************
Ephemeris / WWW_USER Fri Feb 14 06:04:57 2020 Pasadena, USA      / Horizons
*******************************************************************************
Target body name: Mars (499)                      {source: mar097}
Center body name: Earth (399)                     {source: mar097}
Center-site name: GEOCENTRIC
*******************************************************************************
Start time      : A.D. 2019-Apr-27 00:00:00.0000 UT
Stop  time      : A.D. 2019-Apr-27 12:00:00.0000 UT
Step-size       : 1440 minutes
*******************************************************************************
Target pole/equ : IAU_MARS                        {West-longitude positive}
Target radii    : 3396.2 x 3396.2 x 3376.2 km     {Equator, meridian, pole}
Center geodetic : 0.00000000,0.00000000,0.0000000 {E-lon(deg),Lat(deg),Alt(km)}
Center cylindric: 0.00000000,0.00000000,0.0000000 {E-lon(deg),Dxy(km),Dz(km)}
Center pole/equ : High-precision EOP model        {East-longitude positive}
Center radii    : 6378.1 x 6378.1 x 6356.8 km     {Equator, meridian, pole}
Target primary  : Sun
Vis. interferer : MOON (R_eq= 1737.400) km        {source: mar097}
Rel. light bend : Sun, EARTH                      {source: mar097}
Rel. lght bnd GM: 1.3271E+11, 3.9860E+05 km^3/s^2
Atmos refraction: NO (AIRLESS)
RA format       : DEG
Time format     : BOTH
EOP file        : eop.200212.p200505
EOP coverage    : DATA-BASED 1962-JAN-20 TO 2020-FEB-12. PREDICTS-> 2020-MAY-04
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 )
Table cut-offs 3: RA/DEC angular rate (     0.0=NO )
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*******************************************************************************************************************************************************************
 Date__(UT)__HR:MN Date_____JDUT     R.A._____(ICRF)_____DEC R.A.__(airless-appar)__DEC. dRA*cosD d(DEC)/dt               r        rdot
*******************************************************************************************************************************************************************
$$SOE
 2019-Apr-27 00:00 2458600.500000000      76.107414227  23.884882701  76.391533106  23.908809827 97.35433  9.774876  1.597310107901   1.8405165 2.2117
$$EOE
*******************************************************************************************************************************************************************
Column meaning:

TIME

  Times PRIOR to 1962 are UT1, a mean-solar time closely related to the
prior but now-deprecated GMT. Times AFTER 1962 are in UTC, the current
civil or "wall-clock" time-scale. UTC is kept within 0.9 seconds of UT1
using integer leap-seconds for 1972 and later years.

  Conversion from the internal Barycentric Dynamical Time (TDB) of solar
system dynamics to the non-uniform civil UT time-scale requested for output
has not been determined for UTC times after the next July or January 1st.
Therefore, the last known leap-second is used as a constant over future
intervals.

  Time tags refer to the UT time-scale conversion from TDB on Earth
regardless of observer location within the solar system, although clock
rates may differ due to the local gravity field and no analog to "UT"
may be defined for that location.

  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.

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

 R.A._____(ICRF)_____DEC =
  Astrometric right ascension and declination of the target center with
respect to the observing site (coordinate origin) in the reference frame of
the planetary ephemeris (ICRF). Compensated for down-leg light-time delay
aberration.

  Units: RA  in decimal degrees (ddd.fffffffff)
         DEC in decimal degrees (sdd.fffffffff)


 R.A.__(airless-appar)__DEC. =
  Airless apparent right ascension and declination of the target center with
respect to an instantaneous reference frame defined by the Earth equator
of-date (z-axis) and meridian containing the Earth equinox of-date (x-axis,
IAU76/80). Compensated for down-leg light-time delay, gravitational deflection
of light, stellar aberration, precession & nutation. Note: equinox (RA origin)
is offset -53 mas from the of-date frame defined by the IAU06/00a P & N system.

  Units: RA  in decimal degrees (ddd.fffffffff)
         DEC in decimal degrees (sdd.fffffffff)

 dRA*cosD d(DEC)/dt =
  The angular rate of change in apparent RA and DEC (airless) of target center.
d(RA)/dt is multiplied by the cosine of declination to provide a linear rate.
  Units: ARCSECONDS PER HOUR

 r       rdot =
   Heliocentric range ("r", light-time corrected) and range-rate ("rdot")
of the target center 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 Sun-to-target distance traveled by a ray of light emanating from the
center of the Sun that reaches the target center point at some instant and
is recordable by the observer one down-leg light-time later at print-time.
Units: AU and KM/S

 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

 1-way_down_LT =
   1-way down-leg light-time from target center to observer. The elapsed time
since light (observed at print-time) would have left or reflected off a point
at the center of the target. Units: MINUTES


 Computations by ...
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     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.D.Giorgini@jpl.nasa.gov

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2020-Feb-14 14:04 UT
(server date/time)

Site Manager: Ryan S. Park
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