

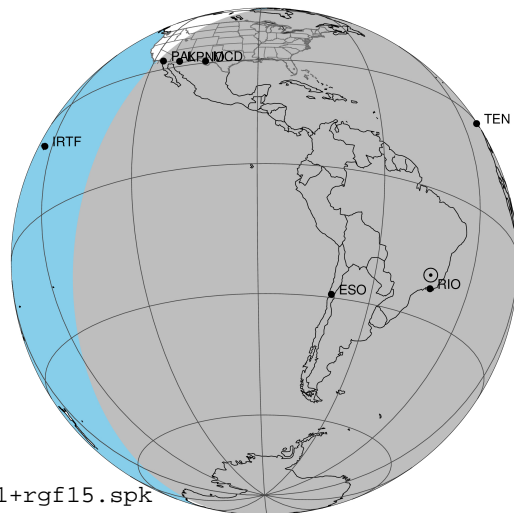
target : Jupiter  
 target radius (km) : 71492.00  
 C/A epoch : 2031-07-24T03:02:58.140  
 Event type : Pgt  
 : Jupiter occs: geocentric, topocentric  
 : Not a ringed target  
 Gaia source ID : 4114543352096968576  
 2Mass ID (if available) : 17142802-2239366

Jupiter 2031-07-24T03:02:58 K9.22 G13.31 Pgt

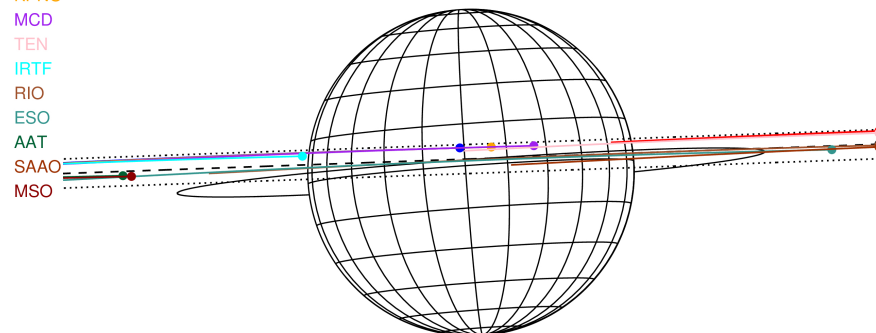
ICRS Star Coord at Epoch: 17h 14m 28.01142s -22:39:36.97047s

RUWE (>1.4 is poor) : 1.00  
 K magnitude : 9.221  
 G magnitude : 13.312  
 RP magnitude : 12.217  
 BP magnitude : 14.566  
 DUPflag : 0  
 Distance (au) : 4.459  
 f0 (km) : 0.00  
 g0 (km) : 0.00  
 skyplane vel. (km/s) : -9.29  
 Sun-Target sep (deg) : 138.87  
 Sun-Moon sep (deg) : 88.20  
 B (ring opening deg) : -2.53  
 PA of pole (deg) : 4.05  
 Pole direction: RA (deg): 268.05689  
 Dec (deg): 64.49652  
 C/A sky separation (") : 1.837  
 C/A sky separation (km) : 5940.9  
 NAIF SPICE kernels : RAJobs\_U111+rgf15.spk

Jupiter 2031-07-24T03:02:58 K9.22 G13.31  
 Pgt



Earth  
 PIC  
 PAL  
 KPNO  
 MCD  
 TEN  
 IRTF  
 RIO  
 ESO  
 AAT  
 SAAO  
 MSO

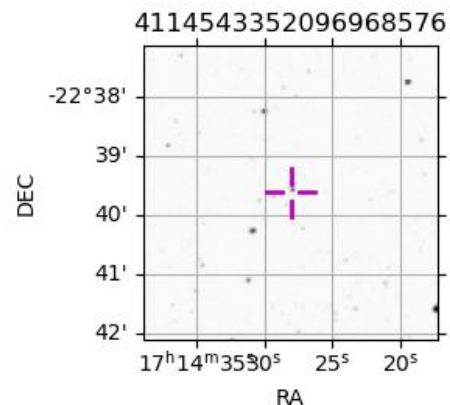


2031-07-24T03:02:58.1400 at: 17 14 28.0114 s -22 39 36.970 C/A 1.826" PA 182.06 deg v\_sky - 9.29 km/s D 04.46 AU

Credit: Styled after SORA/Lucky Star

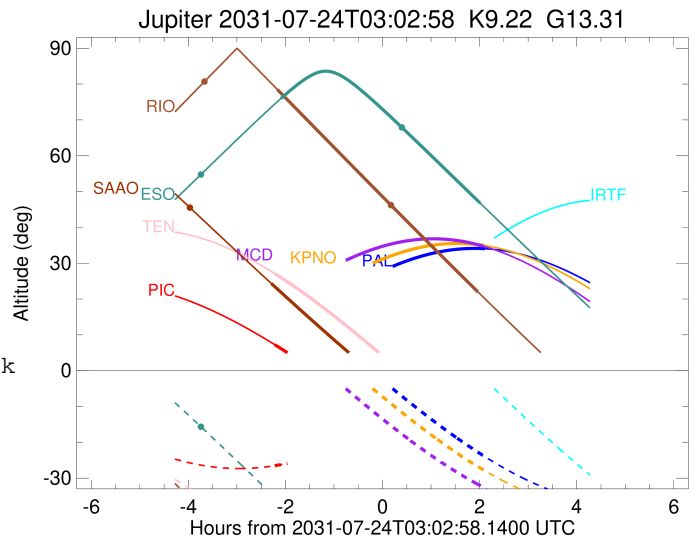
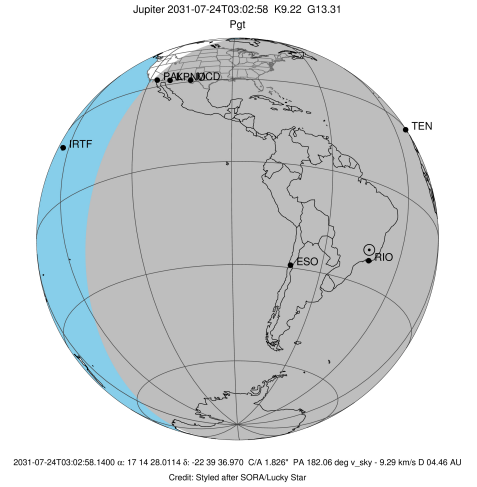
Observable events with sun below -5 deg and altitude above 5 deg

| Obs  | Location                          | lat   | Elon  | Target | Observed Events Interval    | OCode |
|------|-----------------------------------|-------|-------|--------|-----------------------------|-------|
| PIC  | Pic du Midi                       | 42.9  | 0.1   | +      | JUL 24 00:49 - JUL 24 00:49 | Pin   |
| PAL  | Palomar Mt (200")                 | 33.4  | 243.1 | +      | JUL 24 05:09 - JUL 24 05:09 | Pne   |
| PMO  | Purple Mtn Obs. Nanking           | 32.1  | 118.8 |        |                             | Pnn   |
| KPNO | Kitt Peak Natl Obs                | 32.0  | 248.4 | +      | JUL 24 05:08 - JUL 24 05:08 | Pne   |
| MCD  | McDonald Obs. 2.7m                | 30.7  | 256.0 | +      | JUL 24 05:07 - JUL 24 05:07 | Pne   |
| TEN  | Teide Obs./Tenerife               | 28.3  | 343.5 | +      | JUL 24 00:50 - JUL 24 00:50 | Pin   |
| IRTF | Mauna Kea/IRTF                    | 19.8  | 204.5 |        |                             | Pnn   |
| KAV  | Kavalur Observatory               | 12.6  | 78.8  |        |                             | Pnn   |
| RIO  | Rio de Janeiro                    | -22.9 | 316.8 | +      | JUL 24 00:53 - JUL 24 05:00 | Pie   |
| ESO  | European Southern Obs. (3.6m)     | -29.3 | 289.3 | +      | JUL 24 00:57 - JUL 24 05:03 | Pie   |
| AAT  | Siding Spring (AAT)               | -31.3 | 149.1 |        |                             | Pnn   |
| SAAO | So. Afr. Astro. Obs. (Sutherland) | -32.4 | 20.8  | +      | JUL 24 00:45 - JUL 24 00:45 | Pin   |
| MSO  | Mt. Stromlo Observatory           | -35.3 | 149.0 |        |                             | Pnn   |



```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch             : 2031-07-24T02:55:05.360
Event type           : Pgt
: Jupiter occs: geocentric, topocentric
: Not a ringed target
Observer code        : PIC
Location             : Pic du Midi
Latitude (deg)       : 42.93656
E. Longitude (deg)   : 0.14231
Altitude (km)        : 2.890
Gaia source ID       : 4114543352096968576
2Mass ID (if available) : 17142802-2239366
ICRS Star Coord at Epoch: 17h 14m 28.01142s -22:39:36.97047s
RUWE (>1.4 is poor) : 1.00
K magnitude           : 9.221
G magnitude           : 13.312
RP magnitude          : 12.217
BP magnitude          : 14.566
DUPflag              : 0
Distance (au)         : 4.459
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s) : -9.29
Sun-Target sep (deg) : 138.87
Sun-Moon sep (deg)   : 88.00
B (ring opening deg) : -2.53
PA of pole (deg)     : 4.05
Pole direction: RA (deg): 268.05689
Dec (deg): 64.49652
C/A sky separation (") : 3.152
C/A sky separation (km) : 10192.8
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLv1.spk
naif0012.tls
nep097.bsp
nep101.bsp
sat4401.bsp
de440.bsp
earth_720101_070426.bpc
jup365.bsp
urall6.bsp
IAU_SATURN_for_RINGFIT.tpc
pck00010.tpc
earth_200101_990628_predict.bpc
uranus_ringframes_rfrench20220627_v1.tf
neptune_ringframes_rfrench20220702a_v1.tf
earth_flat_IAU.spk
    
```

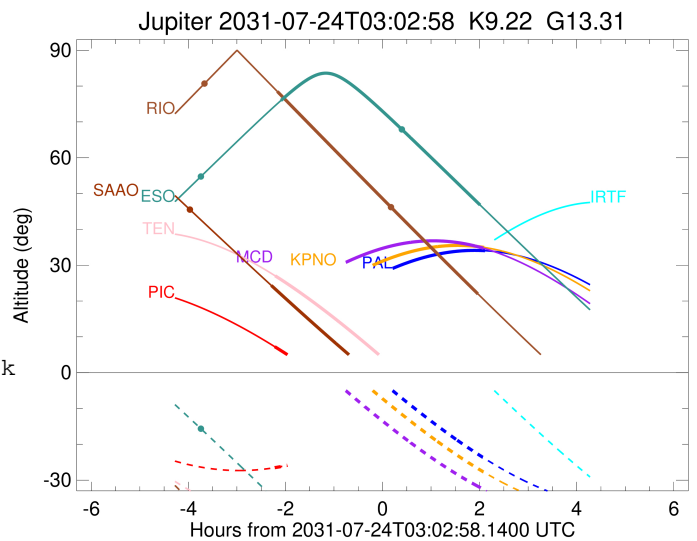
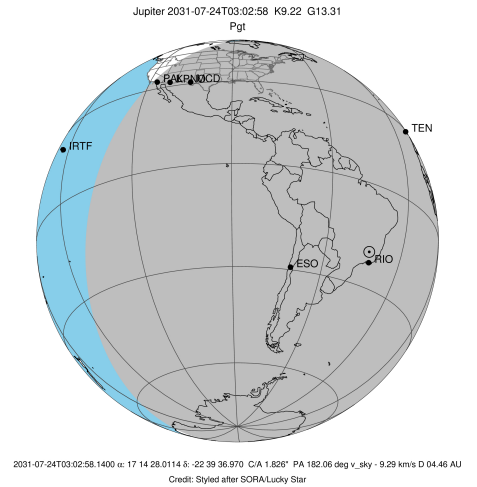


x: target alt < 5.0 deg or sun > -5.0 deg

| Target  | I/E | UTC                     | alt     | alt-sun | radius  | lat-geo | lat-geodetic |
|---------|-----|-------------------------|---------|---------|---------|---------|--------------|
| Jupiter | I   | 2031-07-24T00:49:50.083 | 7.24    | -26.51  | 71491.9 | 6.92    | 7.90         |
| Jupiter | E   | 2031-07-24T05:03:12.219 | -35.88x | 2.53x   | 71491.8 | 9.38    | 10.69        |

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch            : 2031-07-24T03:07:30.510
Event type          : Pgt
                    : Jupiter occs: geocentric, topocentric
                    : Not a ringed target
Observer code       : PAL
Location            : Palomar Mt (200")
Latitude (deg)      : 33.35622
E. Longitude (deg)  : 243.13601
Altitude (km)       : 1.706
Gaia source ID      : 4114543352096968576
2Mass ID (if available) : 17142802-2239366
ICRS Star Coord at Epoch: 17h 14m 28.01142s -22:39:36.97047s
RUWE (>1.4 is poor) : 1.00
K magnitude         : 9.221
G magnitude         : 13.312
RP magnitude        : 12.217
BP magnitude        : 14.566
DUPflag            : 0
Distance (au)       : 4.459
f0 (km)             : 0.00
g0 (km)             : 0.00
skyplane vel. (km/s) : -9.29
Sun-Target sep (deg) : 138.87
Sun-Moon sep (deg)  : 88.62
B (ring opening deg) : -2.53
PA of pole (deg)    : 4.05
Pole direction: RA (deg): 268.05689
Dec (deg): 64.49652
C/A sky separation (" ) : 3.371
C/A sky separation (km) : 10903.1
NAIF SPICE kernels  : RAJobs_U111+rgf15.spk
URKALLv1.spk
naif0012.tls
nep097.bsp
nep101.bsp
sat4401.bsp
de440.bsp
earth_720101_070426.bpc
jup365.bsp
urall6.bsp
IAU_SATURN_for_RINGFIT.tpc
pck00010.tpc
earth_200101_990628_predict.bpc
uranus_ringframes_rfrench20220627_v1.tf
neptune_ringframes_rfrench20220702a_v1.tf
earth_flat_IAU.spk
    
```

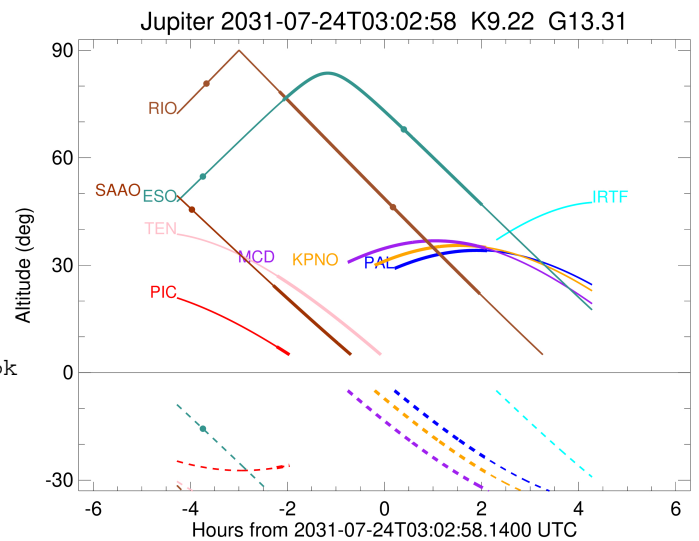
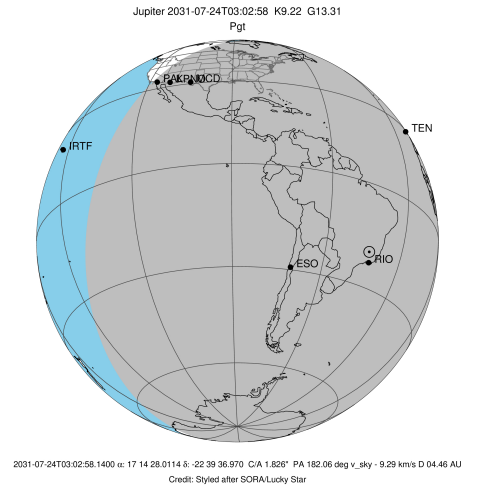


x: target alt < 5.0 deg or sun > -5.0 deg

| Target  | I/E | UTC                     | alt   | alt-sun | radius  | lat-geo | lat-geodetic |
|---------|-----|-------------------------|-------|---------|---------|---------|--------------|
| Jupiter | I   | 2031-07-24T01:04:29.935 | 11.25 | 20.80x  | 71491.9 | 6.12    | 6.99         |
| Jupiter | E   | 2031-07-24T05:09:39.664 | 34.04 | -24.01  | 71491.7 | 11.02   | 12.55        |

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch             : 2031-07-24T03:06:48.930
Event type           : Pgt
: Jupiter occs: geocentric, topocentric
: Not a ringed target
Observer code        : KPNO
Location             : Kitt Peak Natl Obs
Latitude (deg)       : 31.96333
E. Longitude (deg)   : 248.40000
Altitude (km)        : 2.120
Gaia source ID       : 4114543352096968576
2Mass ID (if available) : 17142802-2239366
ICRS Star Coord at Epoch: 17h 14m 28.01142s -22:39:36.97047s
RUWE (>1.4 is poor) : 1.00
K magnitude          : 9.221
G magnitude          : 13.312
RP magnitude         : 12.217
BP magnitude         : 14.566
DUPflag             : 0
Distance (au)        : 4.459
f0 (km)              : 0.00
g0 (km)              : 0.00
skyplane vel. (km/s) : -9.29
Sun-Target sep (deg) : 138.87
Sun-Moon sep (deg)   : 88.67
B (ring opening deg) : -2.53
PA of pole (deg)     : 4.05
Pole direction: RA (deg): 268.05689
Dec (deg): 64.49652
C/A sky separation (") : 3.371
C/A sky separation (km) : 10902.9
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLv1.spk
naif0012.tls
nep097.bsp
nep101.bsp
sat4401.bsp
de440.bsp
earth_720101_070426.bpc
jup365.bsp
urall6.bsp
IAU_SATURN_for_RINGFIT.tpc
pck00010.tpc
earth_200101_990628_predict.bpc
uranus_ringframes_rfrench20220627_v1.tf
neptune_ringframes_rfrench20220702a_v1.tf
earth_flat_IAU.spk
    
```

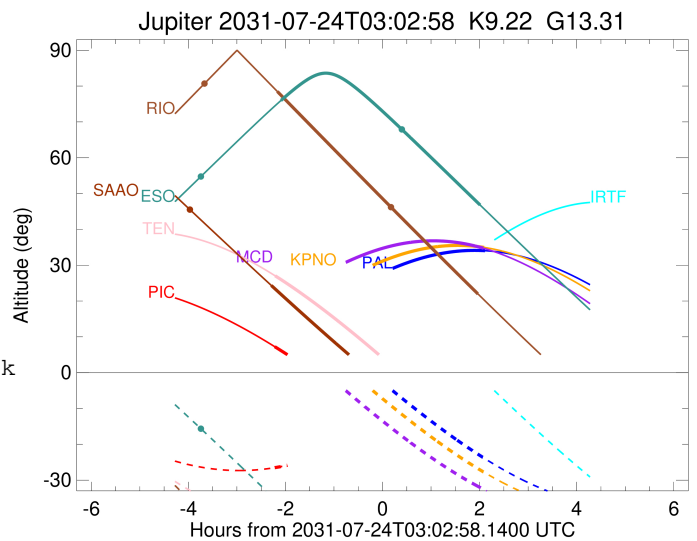
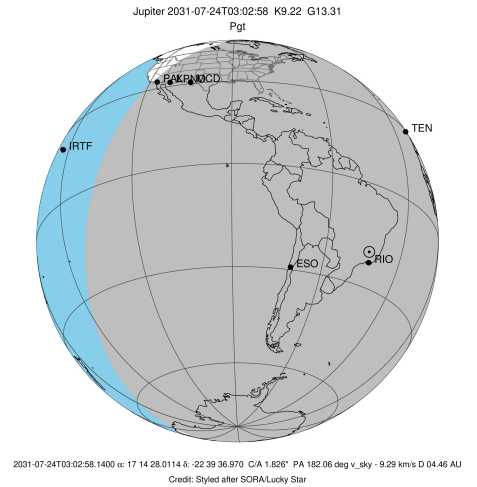


x: target alt < 5.0 deg or sun > -5.0 deg

| Target  | I/E | UTC                     | alt   | alt-sun | radius  | lat-geo | lat-geodetic |
|---------|-----|-------------------------|-------|---------|---------|---------|--------------|
| Jupiter | I   | 2031-07-24T01:04:09.064 | 15.53 | 16.24x  | 71491.9 | 6.17    | 7.04         |
| Jupiter | E   | 2031-07-24T05:08:49.024 | 34.94 | -27.84  | 71491.7 | 10.94   | 12.46        |

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch             : 2031-07-24T03:05:42.740
Event type            : Pgt
: Jupiter occs: geocentric, topocentric
: Not a ringed target
Observer code         : MCD
Location              : McDonald Obs. 2.7m
Latitude (deg)       : 30.67158
E. Longitude (deg)   : 255.97844
Altitude (km)        : 2.075
Gaia source ID       : 4114543352096968576
2Mass ID (if available) : 17142802-2239366
ICRS Star Coord at Epoch: 17h 14m 28.01142s -22:39:36.97047s
RUWE (>1.4 is poor) : 1.00
K magnitude           : 9.221
G magnitude           : 13.312
RP magnitude          : 12.217
BP magnitude          : 14.566
DUPflag              : 0
Distance (au)        : 4.459
f0 (km)              : 0.00
g0 (km)              : 0.00
skyplane vel. (km/s) : -9.29
Sun-Target sep (deg) : 138.87
Sun-Moon sep (deg)   : 88.72
B (ring opening deg) : -2.53
PA of pole (deg)     : 4.05
Pole direction: RA (deg): 268.05689
Dec (deg): 64.49652
C/A sky separation (") : 3.377
C/A sky separation (km) : 10923.5
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLv1.spk
naif0012.tls
nep097.bsp
nep101.bsp
sat4401.bsp
de440.bsp
earth_720101_070426.bpc
jup365.bsp
urall6.bsp
IAU_SATURN_for_RINGFIT.tpc
pck00010.tpc
earth_200101_990628_predict.bpc
uranus_ringframes_rfrench20220627_v1.tf
neptune_ringframes_rfrench20220702a_v1.tf
earth_flat_IAU.spk
    
```

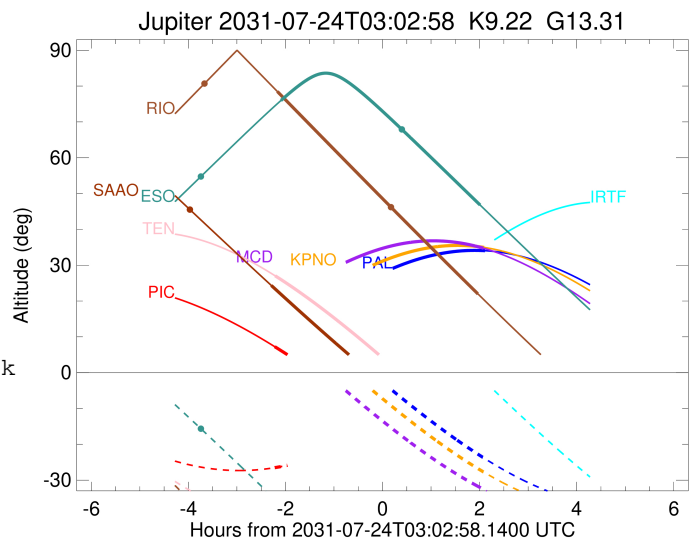
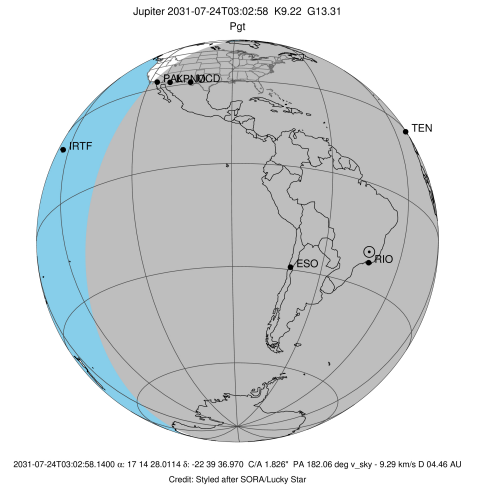


x: target alt < 5.0 deg or sun > -5.0 deg

| Target  | I/E | UTC                     | alt   | alt-sun | radius  | lat-geo | lat-geodetic |
|---------|-----|-------------------------|-------|---------|---------|---------|--------------|
| Jupiter | I   | 2031-07-24T01:03:28.204 | 21.07 | 9.79x   | 71491.9 | 6.27    | 7.16         |
| Jupiter | E   | 2031-07-24T05:07:35.767 | 34.75 | -32.51  | 71491.7 | 10.85   | 12.36        |

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch             : 2031-07-24T02:53:59.370
Event type            : Pgt
: Jupiter occs: geocentric, topocentric
: Not a ringed target
Observer code         : TEN
Location              : Teide Obs./Tenerife
Latitude (deg)        : 28.30050
E. Longitude (deg)    : 343.48909
Altitude (km)         : 2.395
Gaia source ID        : 4114543352096968576
2Mass ID (if available) : 17142802-2239366
ICRS Star Coord at Epoch: 17h 14m 28.01142s -22:39:36.97047s
RUWE (>1.4 is poor) : 1.00
K magnitude           : 9.221
G magnitude           : 13.312
RP magnitude          : 12.217
BP magnitude          : 14.566
DUPflag              : 0
Distance (au)         : 4.459
f0 (km)               : 0.00
g0 (km)               : 0.00
skyplane vel. (km/s) : -9.29
Sun-Target sep (deg) : 138.87
Sun-Moon sep (deg)   : 88.29
B (ring opening deg) : -2.53
PA of pole (deg)     : 4.05
Pole direction: RA (deg): 268.05689
Dec (deg): 64.49652
C/A sky separation ("): 2.982
C/A sky separation (km): 9643.2
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLv1.spk
naif0012.tls
nep097.bsp
nep101.bsp
sat4401.bsp
de440.bsp
earth_720101_070426.bpc
jup365.bsp
urall6.bsp
IAU_SATURN_for_RINGFIT.tpc
pck00010.tpc
earth_200101_990628_predict.bpc
uranus_ringframes_rfrench20220627_v1.tf
neptune_ringframes_rfrench20220702a_v1.tf
earth_flat_IAU.spk
    
```

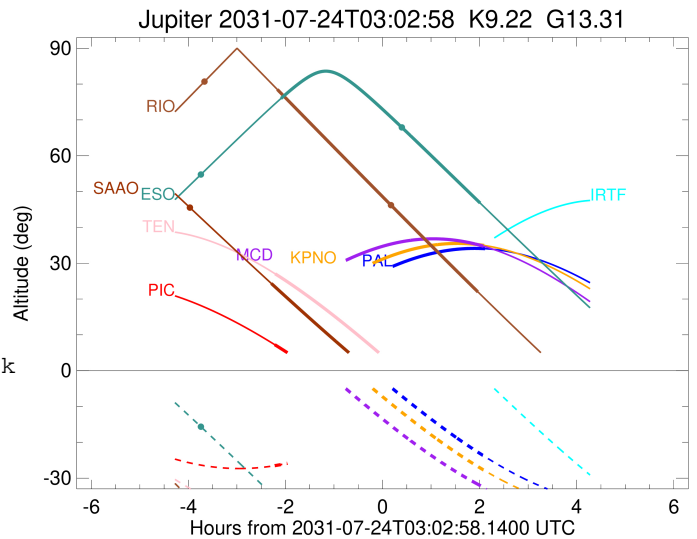
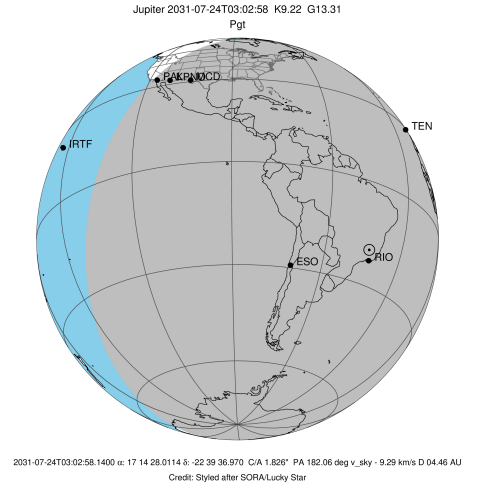


x: target alt < 5.0 deg or sun > -5.0 deg

| Target  | I/E | UTC                     | alt     | alt-sun | radius  | lat-geo | lat-geodetic |
|---------|-----|-------------------------|---------|---------|---------|---------|--------------|
| Jupiter | I   | 2031-07-24T00:50:14.650 | 27.04   | -41.64  | 71491.9 | 6.47    | 7.39         |
| Jupiter | E   | 2031-07-24T05:00:47.763 | -20.00x | -16.88  | 71491.8 | 8.79    | 10.02        |

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch            : 2031-07-24T02:55:48.490
Event type           : Pgt
: Jupiter occs: geocentric, topocentric
: Not a ringed target
Observer code        : RIO
Location             : Rio de Janeiro
Latitude (deg)       : -22.89506
E. Longitude (deg)   : 316.77708
Altitude (km)        : 0.033
Gaia source ID       : 4114543352096968576
2Mass ID (if available) : 17142802-2239366
ICRS Star Coord at Epoch: 17h 14m 28.01142s -22:39:36.97047s
RUWE (>1.4 is poor) : 1.00
K magnitude          : 9.221
G magnitude          : 13.312
RP magnitude         : 12.217
BP magnitude         : 14.566
DUPflag             : 0
Distance (au)        : 4.459
f0 (km)              : 0.00
g0 (km)              : 0.00
skyplane vel. (km/s) : -9.29
Sun-Target sep (deg) : 138.87
Sun-Moon sep (deg)   : 88.90
B (ring opening deg) : -2.53
PA of pole (deg)     : 4.05
Pole direction: RA (deg): 268.05689
Dec (deg): 64.49652
C/A sky separation (") : 1.685
C/A sky separation (km) : 5449.0
NAIF SPICE kernels   : RAJobs_U111+rgf15.spk
URKALLv1.spk
naif0012.tls
nep097.bsp
nep101.bsp
sat4401.bsp
de440.bsp
earth_720101_070426.bpc
jup365.bsp
urall6.bsp
IAU_SATURN_for_RINGFIT.tpc
pck00010.tpc
earth_200101_990628_predict.bpc
uranus_ringframes_rfrench20220627_v1.tf
neptune_ringframes_rfrench20220702a_v1.tf
earth_flat_IAU.spk
    
```

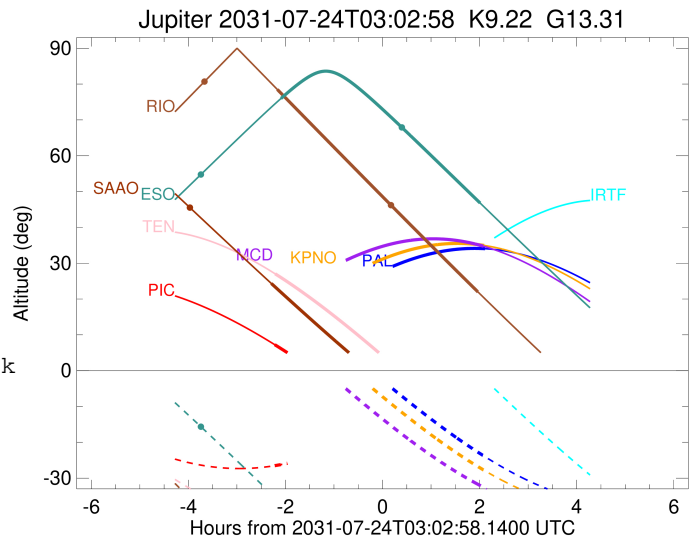
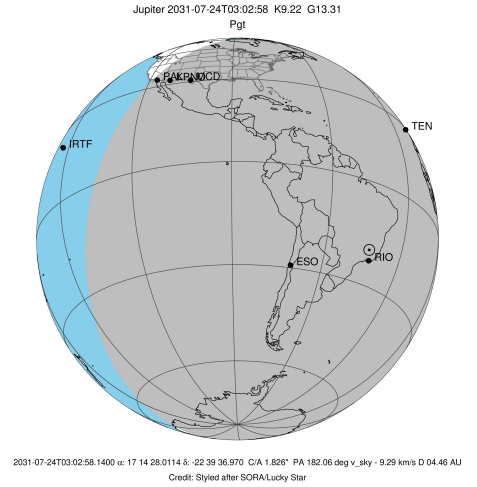


x: target alt < 5.0 deg or sun > -5.0 deg

| Target  | I/E | UTC                     | alt   | alt-sun | radius  | lat-geo | lat-geodetic |
|---------|-----|-------------------------|-------|---------|---------|---------|--------------|
| Jupiter | I   | 2031-07-24T00:53:00.796 | 78.48 | -60.48  | 71492.0 | 2.76    | 3.15         |
| Jupiter | E   | 2031-07-24T05:00:56.104 | 21.98 | -61.61  | 71491.9 | 5.56    | 6.35         |

```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch            : 2031-07-24T03:00:03.510
Event type          : Pgt
                    : Jupiter occs: geocentric, topocentric
                    : Not a ringed target
Observer code       : ESO
Location            : European Southern Obs. (3.6m)
Latitude (deg)      : -29.26097
E. Longitude (deg)  : 289.26831
Altitude (km)       : 2.400
Gaia source ID      : 4114543352096968576
2Mass ID (if available) : 17142802-2239366
ICRS Star Coord at Epoch: 17h 14m 28.01142s -22:39:36.97047s
RUWE (>1.4 is poor) : 1.00
K magnitude          : 9.221
G magnitude          : 13.312
RP magnitude         : 12.217
BP magnitude         : 14.566
DUPflag             : 0
Distance (au)       : 4.459
f0 (km)             : 0.00
g0 (km)             : 0.00
skyplane vel. (km/s) : -9.29
Sun-Target sep (deg) : 138.87
Sun-Moon sep (deg)  : 89.08
B (ring opening deg) : -2.53
PA of pole (deg)    : 4.05
Pole direction: RA (deg): 268.05689
Dec (deg): 64.49652
C/A sky separation (" ) : 1.605
C/A sky separation (km) : 5190.8
NAIF SPICE kernels  : RAJobs_U111+rgf15.spk
URKALLv1.spk
naif0012.tls
nep097.bsp
nep101.bsp
sat4401.bsp
de440.bsp
earth_720101_070426.bpc
jup365.bsp
urall6.bsp
IAU_SATURN_for_RINGFIT.tpc
pck00010.tpc
earth_200101_990628_predict.bpc
uranus_ringframes_rfrench20220627_v1.tf
neptune_ringframes_rfrench20220702a_v1.tf
earth_flat_IAU.spk
    
```



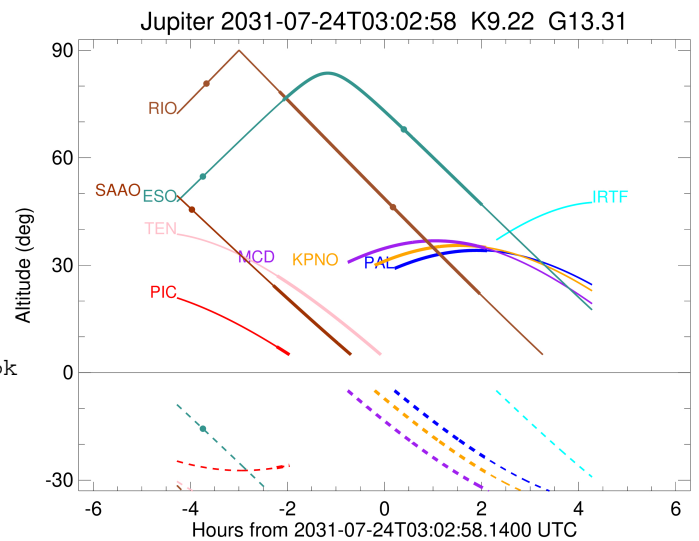
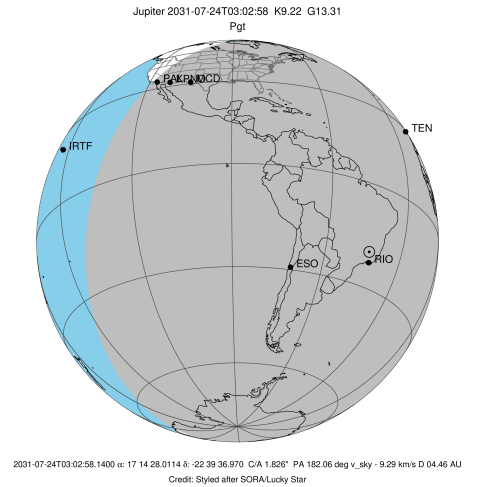
x: target alt < 5.0 deg or sun > -5.0 deg

| Target  | I/E | UTC                     | alt   | alt-sun | radius  | lat-geo | lat-geodetic |
|---------|-----|-------------------------|-------|---------|---------|---------|--------------|
| Jupiter | I   | 2031-07-24T00:57:31.553 | 75.98 | -36.96  | 71492.0 | 2.12    | 2.42         |
| Jupiter | E   | 2031-07-24T05:03:41.793 | 46.77 | -80.25  | 71491.9 | 5.73    | 6.54         |



```

target                : Jupiter
target radius (km)   : 71492.00
C/A epoch            : 2031-07-24T02:53:33.410
Event type          : Pgt
                    : Jupiter occs: geocentric, topocentric
                    : Not a ringed target
Observer code       : SAAO
Location            : So. Afr. Astro. Obs. (Sutherland)
Latitude (deg)      : -32.37953
E. Longitude (deg)  : 20.81070
Altitude (km)       : 1.768
Gaia source ID      : 4114543352096968576
2Mass ID (if available) : 17142802-2239366
ICRS Star Coord at Epoch: 17h 14m 28.01142s -22:39:36.97047s
RUWE (>1.4 is poor) : 1.00
K magnitude          : 9.221
G magnitude          : 13.312
RP magnitude         : 12.217
BP magnitude         : 14.566
DUPflag             : 0
Distance (au)       : 4.459
f0 (km)              : 0.00
g0 (km)              : 0.00
skyplane vel. (km/s) : -9.29
Sun-Target sep (deg) : 138.87
Sun-Moon sep (deg)  : 88.17
B (ring opening deg) : -2.53
PA of pole (deg)    : 4.05
Pole direction: RA (deg): 268.05689
Dec (deg): 64.49652
C/A sky separation (") : 0.735
C/A sky separation (km) : 2378.0
NAIF SPICE kernels  : RAJobs_U111+rgf15.spk
URKALLv1.spk
naif0012.tls
nep097.bsp
nep101.bsp
sat4401.bsp
de440.bsp
earth_720101_070426.bpc
jup365.bsp
urall6.bsp
IAU_SATURN_for_RINGFIT.tpc
pck00010.tpc
earth_200101_990628_predict.bpc
uranus_ringframes_rfrench20220627_v1.tf
neptune_ringframes_rfrench20220702a_v1.tf
earth_flat_IAU.spk
    
```



x: target alt < 5.0 deg or sun > -5.0 deg

| Target  | I/E | UTC                     | alt     | alt-sun | radius  | lat-geo | lat-geodetic |
|---------|-----|-------------------------|---------|---------|---------|---------|--------------|
| Jupiter | I   | 2031-07-24T00:45:33.442 | 24.34   | -60.07  | 71492.0 | 0.84    | 0.96         |
| Jupiter | E   | 2031-07-24T05:04:54.272 | -22.93x | -6.12   | 71492.0 | 3.07    | 3.50         |