

COMPUTATION OF SUNRISE AND SUNSET TIMES

Father Jack Pejza

The worldwide sunrise/sunset maps published by IRCA a few years ago (and now available as IRCA Reprints) provide approximate values (within 15 minutes) of the times of sunrise and sunset. However, a DXer might want to know more accurately the time of sunrise or sunset. The tables which follow and which will be published in future issues as space allows permit such calculation. They are taken from Useful Tables from the Practical Navigator, published by the U.S. Hydrologic Office, 1938.

The world is divided into 24 standard time zones (plus some small areas using variations). Unless you live exactly on one of the meridians on which the time zones are centered, your local time will not agree perfectly with standard time. If you live east of the standard meridian, local noon (the time when the sun is highest in the sky) will occur before standard noon. For instance, San Diego local noon occurs about 11 minutes before noon PST; El Paso, TX, west of the CST center meridian, has noon 66 minutes after standard noon, and really should be in the Mountain Time Zone.

Time zones are generally centered on multiples of 15°. From the map of time zones, you can find what meridian your time zone is centered on. You also can multiply the number of hours difference between GMT and your zone by 15° to find the center meridian.

The tables which follow show the time of local sunrise and sunset. In order to put them to practical use, it is necessary to convert the times to standard times.

Method of Computation:

1. Find the difference between the longitude of the place you are interested in and the center meridian for that time zone. From Table 1, find the difference in minutes.
2. From table 2, find the date in which you are interested and the nearest degree of latitude. Convert the sunset time to a 24 hour clock by adding 12 hours.
3. If the city is east of the center meridian, subtract the number found in Table 1 from the number found in Table 2. If the city is west of the center meridian, add the two numbers.
4. To convert to GMT, add or subtract the appropriate number of hours (as indicated on the edge of the time zone map) to the standard time.

EXAMPLES: December 3 used for all examples

San Diego, CA (117°07'W, 32°40'N)
 Longitude diff. 120° - 117°07' = 2°53'
 Time diff. (Table 1) 11 min
 Local sunrise 6:46 AM = 0646
 Local sunset 4:55 PM = 1655
 Standard sunrise 0646 - 0011 = 0635
 Standard sunset 1655 - 0011 = 1644

Osaka, Japan (135°27'E, 34°40'N)
 135°27' - 135° = 27'
 2 min.
 6:50 AM = 0650
 4:53 PM = 1653
 0650 + 0002 = 0652
 1653 + 0002 = 1655

TABLE 1

Reduction of Local Civil Time to Standard Meridian Time, and the reverse.

(If local meridian is east of standard meridian, subtract from local civil time, or add to standard meridian time. If local meridian is west of standard meridian, add to local civil time, or subtract from standard meridian time.)

Difference of longitude between local meridian and standard meridian.	Reduction to be applied to local civil time.	Difference of longitude between local meridian and standard meridian.	Reduction to be applied to local civil time.
0 00 to 0 07	0	7 23 to 7 37	30
0 08 to 0 22	1	7 38 to 7 52	31
0 23 to 0 37	2	7 53 to 8 07	32
0 38 to 0 52	3	8 08 to 8 22	33
0 53 to 1 07	4	8 23 to 8 37	34
1 08 to 1 22	5	8 38 to 8 52	35
1 23 to 1 37	6	8 53 to 9 07	36
1 38 to 1 52	7	9 08 to 9 22	37
1 53 to 2 07	8	9 23 to 9 37	38
2 08 to 2 22	9	9 38 to 9 52	39
2 23 to 2 37	10	9 53 to 10 07	40
2 38 to 2 52	11	10 08 to 10 22	41
2 53 to 3 07	12	10 23 to 10 37	42
3 08 to 3 22	13	10 38 to 10 52	43
3 23 to 3 37	14	10 53 to 11 07	44
3 38 to 3 52	15	11 08 to 11 22	45
3 53 to 4 07	16	11 23 to 11 37	46
4 08 to 4 22	17	11 38 to 11 52	47
4 23 to 4 37	18	11 53 to 12 07	48
4 38 to 4 52	19	12 08 to 12 22	49
4 53 to 5 07	20	12 23 to 12 37	50
5 08 to 5 22	21	12 38 to 12 52	51
5 23 to 5 37	22	12 53 to 13 07	52
5 38 to 5 52	23	13 08 to 13 22	53
5 53 to 6 07	24	13 23 to 13 37	54
6 08 to 6 22	25	13 38 to 13 52	55
6 23 to 6 37	26	13 53 to 14 07	56
6 38 to 6 52	27	14 08 to 14 22	57
6 53 to 7 07	28	14 23 to 14 37	58
7 08 to 7 22	29	14 38 to 14 52	59

Conversion to GMT:

San Diego:
 SR 0635 + 0800 = 1435
 SS 1644 + 0800 = 2444
 = 0044

(When it's Sunday evening in S.D, it's already Monday morning GMT)

Osaka:
 SR 0652 - 0900 = 2152
 SS 1655 - 0900 = 0755

(When it's Monday morning in Japan, it's still Sunday evening GMT)

In a case like the Osaka SR, add 24 hours to the smaller number, then subtract; e.g, 0652 + 2400 = 3052 - 0900 = 2152.

North Latitude: 21° to 40°—September 23 to December 22

[R—Local civil time of sun's visible rising. S—Local civil time of sun's visible setting.]

Table for North Latitude 21° to 40°. Columns include Lat. N., Approx. date, months (SEPTEMBER, OCTOBER, NOVEMBER, DECEMBER), and Lat. N. Rows show sunrise and sunset times in hours and minutes for various latitudes.

North Latitude: 41° to 60°—September 23 to December 22

[R—Local civil time of sun's visible rising. S—Local civil time of sun's visible setting.]

Table for North Latitude 41° to 60°. Columns include Lat. N., Approx. date, months (SEPTEMBER, OCTOBER, NOVEMBER, DECEMBER), and Lat. N. Rows show sunrise and sunset times in hours and minutes for various latitudes.

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4.

South Latitude: 0° to 20°—September 23 to December 22.

[R—Local civil time of sun's visible rising. S—Local civil time of sun's visible setting.]

Table for South Latitude 0° to 20°. Columns include Lat. S., Approx. date, and months SEPTEMBER, OCTOBER, NOVEMBER, DECEMBER. Rows list times for each day from 0° to 20° latitude.

South Latitude: 21° to 40°—September 23 to December 22.

[R—Local civil time of sun's visible rising. S—Local civil time of sun's visible setting.]

Table for South Latitude 21° to 40°. Columns include Lat. S., Approx. date, and months SEPTEMBER, OCTOBER, NOVEMBER, DECEMBER. Rows list times for each day from 21° to 40° latitude.

South Latitude: 41° to 60°—September 23 to December 22.

[R—Local civil time of sun's visible rising. S—Local civil time of sun's visible setting.]

Lat. R.	Approx. date.	SEPTEMBER.									OCTOBER.											NOVEMBER.							DECEMBER.			Approx. date.	Lat. R.
		23	26	28	1	4	6	9	11	14	17	19	22	25	28	31	3	6	10	14	17	22	27	3	11	22							
		0°	1°	2°	3°	4°	5°	6°	7°	8°	9°	10°	11°	12°	13°	14°	15°	16°	17°	18°	19°	20°	21°	22°	23°	23° 27'							
41	R. S. S.	5 47	5 43	5 39	5 35	5 31	5 27	5 22	5 17	5 13	5 09	5 05	5 01	4 56	4 52	4 48	4 45	4 41	4 37	4 33	4 30	4 27	4 24	4 22	4 21	4 24	4 21	4 24	R. S. S.	41			
42	R. S. S.	5 57	5 53	5 49	5 45	5 41	5 37	5 32	5 27	5 23	5 19	5 15	5 11	5 07	5 03	4 59	4 56	4 52	4 48	4 44	4 41	4 38	4 35	4 32	4 30	4 33	4 30	4 33	R. S. S.	42			
43	R. S. S.	5 67	5 63	5 59	5 55	5 51	5 47	5 42	5 38	5 34	5 30	5 26	5 22	5 18	5 14	5 10	5 07	5 03	4 59	4 55	4 52	4 49	4 46	4 43	4 41	4 44	4 41	4 44	R. S. S.	43			
44	R. S. S.	5 77	5 73	5 69	5 65	5 61	5 57	5 52	5 48	5 44	5 40	5 36	5 32	5 28	5 24	5 20	5 17	5 13	5 09	5 05	5 02	4 59	4 56	4 53	4 51	4 54	4 51	4 54	R. S. S.	44			
45	R. S. S.	5 87	5 83	5 79	5 85	5 81	5 77	5 72	5 68	5 64	5 60	5 56	5 52	5 48	5 44	5 40	5 37	5 33	5 29	5 25	5 22	5 19	5 16	5 13	5 11	5 14	5 11	5 14	R. S. S.	45			
46	R. S. S.	5 97	5 93	5 89	5 95	5 91	5 87	5 82	5 78	5 74	5 70	5 66	5 62	5 58	5 54	5 50	5 47	5 43	5 39	5 35	5 32	5 29	5 26	5 23	5 21	5 24	5 21	5 24	R. S. S.	46			
47	R. S. S.	6 07	6 03	6 00	6 06	6 02	5 98	5 93	5 89	5 85	5 81	5 77	5 73	5 69	5 65	5 61	5 58	5 54	5 50	5 46	5 43	5 40	5 37	5 34	5 32	5 35	5 32	5 35	R. S. S.	47			
48	R. S. S.	6 17	6 13	6 10	6 16	6 12	6 08	6 03	5 99	5 95	5 91	5 87	5 83	5 79	5 75	5 71	5 68	5 64	5 60	5 56	5 53	5 50	5 47	5 44	5 42	5 45	5 42	5 45	R. S. S.	48			
49	R. S. S.	6 27	6 23	6 20	6 26	6 22	6 18	6 13	6 09	6 05	6 01	5 97	5 93	5 89	5 85	5 81	5 78	5 74	5 70	5 66	5 63	5 60	5 57	5 54	5 52	5 55	5 52	5 55	R. S. S.	49			
50	R. S. S.	6 37	6 33	6 30	6 36	6 32	6 28	6 23	6 19	6 15	6 11	6 07	6 03	5 99	5 95	5 91	5 88	5 84	5 80	5 76	5 73	5 70	5 67	5 64	5 62	5 65	5 62	5 65	R. S. S.	50			
51	R. S. S.	6 47	6 43	6 40	6 46	6 42	6 38	6 33	6 29	6 25	6 21	6 17	6 13	6 09	6 05	6 01	5 98	5 94	5 90	5 86	5 83	5 80	5 77	5 74	5 72	5 75	5 72	5 75	R. S. S.	51			
52	R. S. S.	6 57	6 53	6 50	6 56	6 52	6 48	6 43	6 39	6 35	6 31	6 27	6 23	6 19	6 15	6 11	6 08	6 04	6 00	5 96	5 93	5 90	5 87	5 84	5 82	5 85	5 82	5 85	R. S. S.	52			
53	R. S. S.	7 07	7 03	7 00	7 06	7 02	6 58	6 53	6 49	6 45	6 41	6 37	6 33	6 29	6 25	6 21	6 18	6 14	6 10	6 06	6 03	6 00	5 97	5 94	5 92	5 95	5 92	5 95	R. S. S.	53			
54	R. S. S.	7 17	7 13	7 10	7 16	7 12	7 08	7 03	6 59	6 55	6 51	6 47	6 43	6 39	6 35	6 31	6 28	6 24	6 20	6 16	6 13	6 10	6 07	6 04	6 02	6 05	6 02	6 05	R. S. S.	54			
55	R. S. S.	7 27	7 23	7 20	7 26	7 22	7 18	7 13	7 09	7 05	7 01	6 57	6 53	6 49	6 45	6 41	6 38	6 34	6 30	6 26	6 23	6 20	6 17	6 14	6 12	6 15	6 12	6 15	R. S. S.	55			
56	R. S. S.	7 37	7 33	7 30	7 36	7 32	7 28	7 23	7 19	7 15	7 11	7 07	7 03	6 59	6 55	6 51	6 48	6 44	6 40	6 36	6 33	6 30	6 27	6 24	6 22	6 25	6 22	6 25	R. S. S.	56			
57	R. S. S.	7 47	7 43	7 40	7 46	7 42	7 38	7 33	7 29	7 25	7 21	7 17	7 13	7 09	7 05	7 01	6 98	6 94	6 90	6 86	6 83	6 80	6 77	6 74	6 72	6 75	6 72	6 75	R. S. S.	57			
58	R. S. S.	7 57	7 53	7 50	7 56	7 52	7 48	7 43	7 39	7 35	7 31	7 27	7 23	7 19	7 15	7 11	7 08	7 04	7 00	6 96	6 93	6 90	6 87	6 84	6 82	6 85	6 82	6 85	R. S. S.	58			
59	R. S. S.	8 07	8 03	8 00	8 06	8 02	7 58	7 53	7 49	7 45	7 41	7 37	7 33	7 29	7 25	7 21	7 18	7 14	7 10	7 06	7 03	7 00	6 97	6 94	6 92	6 95	6 92	6 95	R. S. S.	59			
60	R. S. S.	8 17	8 13	8 10	8 16	8 12	8 08	8 03	7 99	7 95	7 91	7 87	7 83	7 79	7 75	7 71	7 68	7 64	7 60	7 56	7 53	7 50	7 47	7 44	7 42	7 45	7 42	7 45	R. S. S.	60			

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North Latitude: 0° to 20°—December 22 to March 21.

[R—Local civil time of sun's visible rising. S—Local civil time of sun's visible setting.]

Table for North Latitude 0° to 20°. Columns include Lat. N., Approx. date, Dec. S., and months DECEMBER, JANUARY, FEBRUARY, MARCH. Rows list times for various latitudes from 0 to 20 degrees.

North Latitude: 21° to 40°—December 22 to March 21.

[R—Local civil time of sun's visible rising. S—Local civil time of sun's visible setting.]

Table for North Latitude 21° to 40°. Columns include Lat. N., Approx. date, Dec. S., and months DECEMBER, JANUARY, FEBRUARY, MARCH. Rows list times for various latitudes from 21 to 40 degrees.

95-14-7

North Latitude: 41° to 60°—December 22 to March 21.

[R—Local civil time of sun's visible rising. S—Local civil time of sun's visible setting.]

Lat. N.	Approx. date.	North Latitude: 41° to 60°—December 22 to March 21.																					Approx. date.	Lat. N.							
		DECEMBER.							JANUARY.							FEBRUARY.									MARCH.						
		22	23	10	16	21	25	29	2	5	9	12	15	18	20	23	26	1	3	6	8	11			13	16	18	21			
23° 27'	23°	22°	21°	20°	19°	18°	17°	16°	15°	14°	13°	12°	11°	10°	9°	8°	7°	6°	5°	4°	3°	2°	1°	0°							
41	R. R. R. S. S.	7:21 4:31 7:28	7:25 4:33 7:28	7:24 4:31 7:27	7:22 4:29 7:26	7:20 4:27 7:25	7:17 4:25 7:22	7:14 4:23 7:20	7:10 4:21 7:19	7:07 4:19 7:17	7:03 4:17 7:15	6:59 4:15 7:13	6:55 4:13 7:11	6:52 4:11 7:09	6:48 4:09 7:07	6:44 4:07 7:05	6:40 4:05 7:03	6:36 4:03 7:01	6:32 4:01 6:59	6:28 3:59 6:55	6:24 3:57 6:51	6:19 3:55 6:47	6:15 3:53 6:43	6:11 3:51 6:39	6:07 3:49 6:35	6:02 3:47 6:31	R. R. R. S. S.	41			

South Latitude: 0° to 20°—December 22 to March 21.

[R—Local civil time of sun's visible rising. S—Local civil time of sun's visible setting.]

Lat. S.	Approx. date.	South Latitude: 0° to 20°—December 22 to March 21.																					Approx. date.	Lat. S.							
		DECEMBER.							JANUARY.							FEBRUARY.									MARCH.						
		22	23	10	16	21	25	29	2	5	9	12	15	18	20	23	26	1	3	6	8	11			13	16	18	21			
23° 27'	23°	22°	21°	20°	19°	18°	17°	16°	15°	14°	13°	12°	11°	10°	9°	8°	7°	6°	5°	4°	3°	2°	1°	0°							
0	R. S. R. S. R.	5:54 6:02 5:53	6:00 6:08 5:53	6:07 6:16 6:02	6:14 6:24 6:08	6:21 6:31 6:15	6:28 6:38 6:22	6:35 6:45 6:29	6:42 6:52 6:36	6:49 6:59 6:43	6:56 7:06 6:50	7:03 7:13 6:57	7:10 7:20 7:04	7:17 7:27 7:11	7:24 7:34 7:18	7:31 7:41 7:25	7:38 7:48 7:32	7:45 7:55 7:39	7:52 8:02 7:46	8:00 8:10 7:54	8:07 8:17 8:01	8:14 8:24 8:08	8:21 8:31 8:05	8:28 8:38 8:12	8:35 8:45 8:19	R. S. R. S. R.	0				

95-14-8

South Latitude: 21° to 40°—December 22 to March 21.

[R— Local civil time of sun's visible rising. S— Local civil time of sun's visible setting.]

Table with columns for Latitude (Lat.), Approximate Date, and months DECEMBER, JANUARY, FEBRUARY, and MARCH. Each month has columns for specific dates. Rows include time of sunrise (R) and sunset (S) in hours and minutes for various latitudes from 21° to 40°.

South Latitude: 41° to 60°—December 22 to March 21.

[R— Local civil time of sun's visible rising. S— Local civil time of sun's visible setting.]

Table with columns for Latitude (Lat.), Approximate Date, and months DECEMBER, JANUARY, FEBRUARY, and MARCH. Each month has columns for specific dates. Rows include time of sunrise (R) and sunset (S) in hours and minutes for various latitudes from 41° to 60°.

45-14-9

North Latitude: 0° to 20°—March 21 to June 22.

[R—Local civil time of sun's visible rising. S—Local civil time of sun's visible setting.]

Table for North Latitude 0° to 20°. Columns include Lat. N., Approx. Date, Dec. N., and months MARCH, APRIL, MAY, JUNE. Rows list latitude from 0 to 20 degrees.

North Latitude: 21° to 40°—March 21 to June 22.

[R—Local civil time of sun's visible rising. S—Local civil time of sun's visible setting.]

Table for North Latitude 21° to 40°. Columns include Lat. N., Approx. Date, Dec. N., and months MARCH, APRIL, MAY, JUNE. Rows list latitude from 21 to 40 degrees.

95-14-10

North Latitude: 41° to 60°—March 21 to June 22.

[R=Local civil time of sun's visible rising. S=Local civil time of sun's visible setting.]

Table for North Latitude (41° to 60°) showing sunrise and sunset times from March to June. Columns include Latitude, Approximate Date, Month, Day, and Time (A.M./P.M.).

South Latitude: 0° to 20°—March 21 to June 22.

[R=Local civil time of sun's visible rising. S=Local civil time of sun's visible setting.]

Table for South Latitude (0° to 20°) showing sunrise and sunset times from March to June. Columns include Latitude, Approximate Date, Month, Day, and Time (A.M./P.M.).

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11.

South Latitude: 21° to 40°—March 21 to June 22.

[R—Local civil time of sun's visible rising. S—Local civil time of sun's visible setting.]

Table for South Latitude 21° to 40°. Columns include Lat. S., Approx. date, Dec. N., and months MARCH, APRIL, MAY, JUNE. Rows list dates from 21 to 40.

South Latitude: 41° to 60°—March 21 to June 22.

[R—Local civil time of sun's visible rising. S—Local civil time of sun's visible setting.]

Table for South Latitude 41° to 60°. Columns include Lat. S., Approx. date, Dec. N., and months MARCH, APRIL, MAY, JUNE. Rows list dates from 41 to 60.

45-14-12

North Latitude: 0° to 20°—June 22 to September 23.

(R—Local civil time of sun's visible rising. S—Local civil time of sun's visible setting.)

Table for North Latitude 0° to 20°. Columns include Lat. N., Approx. date, Dec. N., and months JUNE, JULY, AUGUST, SEPTEMBER. Rows are labeled with numbers 0 through 20.

North Latitude: 21° to 40°—June 22 to September 23.

(R—Local civil time of sun's visible rising. S—Local civil time of sun's visible setting.)

Table for North Latitude 21° to 40°. Columns include Lat. N., Approx. date, Dec. N., and months JUNE, JULY, AUGUST, SEPTEMBER. Rows are labeled with numbers 21 through 40.

95-14-13

North Latitude: 41° to 60°—June 22 to September 23.

[R—Local civil time of sun's visible rising. S—Local civil time of sun's visible setting.]

Table with columns for Latitude (Lat. N.), Approximate Date, Month (JUNE, JULY, AUGUST, SEPTEMBER), and Day (22, 23, 24, 25, 26, 27, 28, 29, 30). Rows include times for sun's rising (R) and setting (S) in hours and minutes for various latitudes from 41° to 60°.

South Latitude: 0° to 20°—June 22 to September 23.

[R—Local civil time of sun's visible rising. S—Local civil time of sun's visible setting.]

Table with columns for Latitude (Lat. S.), Approximate Date, Month (JUNE, JULY, AUGUST, SEPTEMBER), and Day (22, 23, 24, 25, 26, 27, 28, 29, 30). Rows include times for sun's rising (R) and setting (S) in hours and minutes for various latitudes from 0° to 20°.

South Latitude: 21° to 40°—June 22 to September 23.

[R—Local civil time of sun's visible rising. S—Local civil time of sun's visible setting.]

Table with columns for Latitude (Lat. S.), Approx. Date, and months (JUNE, JULY, AUGUST, SEPTEMBER) with sub-columns for days (22, 23, 19, 24, 28, 2, 5, 9, 12, 16, 19, 22, 25, 28, 30, 1, 5, 8, 10, 13, 16, 18, 21, 23). Rows list latitudes from 21 to 40.

South Latitude: 41° to 60°—June 22 to September 23.

[R—Local civil time of sun's visible rising. S—Local civil time of sun's visible setting.]

Table with columns for Latitude (Lat. S.), Approx. Date, and months (JUNE, JULY, AUGUST, SEPTEMBER) with sub-columns for days (22, 23, 19, 24, 28, 2, 5, 9, 12, 16, 19, 22, 25, 28, 30, 1, 5, 8, 10, 13, 16, 18, 21, 23). Rows list latitudes from 41 to 60.