

Examples of the use of the ephemeris of universal and sidereal times

1. Conversion of universal time to local sidereal time

To find the local apparent sidereal time at 09<sup>h</sup> 44<sup>m</sup> 30<sup>s</sup> UT on 2016 July 8 in longitude 80° 22' 55.79" west.

Greenwich mean sidereal time on July 8 at 0 <sup>h</sup> UT (page B17)	h m s
	19 05 30.8058
Add the equivalent mean sidereal time interval from 0 <sup>h</sup> to 09 <sup>h</sup> 44 <sup>m</sup> 30 <sup>s</sup> UT (multiply UT interval by 1.002 737 9094)	9 46 06.0185
Greenwich mean sidereal time at required UT: Add equation of equinoxes, interpolated using second-order differences to approximate UT = 0 <sup>d</sup> .41	4 51 36.8243
Greenwich apparent sidereal time:	— 0.2129
Subtract west longitude (add east longitude)	4 51 36.6114
Local apparent sidereal time:	5 21 31.7193
	23 30 04.8921

The calculation for local mean sidereal time is similar, but omit the step which allows for the equation of the equinoxes.

2. Conversion of local sidereal time to universal time

To find the universal time at 23<sup>h</sup> 30<sup>m</sup> 04.8921 local apparent sidereal time on 2016 July 8 in longitude 80° 22' 55.79" west.

Local apparent sidereal time:	h m s
	23 30 04.8921
Add west longitude (subtract east longitude)	5 21 31.7193
Greenwich apparent sidereal time:	4 51 36.6114
Subtract equation of equinoxes, interpolated using second-order differences to approximate UT = 0 <sup>d</sup> .41	— 0.2129
Greenwich mean sidereal time:	4 51 36.8243
Subtract Greenwich mean sidereal time at 0 <sup>h</sup> UT	19 05 30.8058
Mean sidereal time interval from 0 <sup>h</sup> UT: Equivalent UT interval (multiply mean sidereal time interval by 0.997 269 5663)	9 46 06.0185
	9 44 30.0000

The conversion of mean sidereal time to universal time is carried out by a similar procedure; omit the step which allows for the equation of the equinoxes.

Date 0 <sup>h</sup> UT	Julian Date	G. SIDEREAL TIME (GHA of the Equinox) Apparent	Equation of Equinoxes at 0 <sup>h</sup> UT	GSD at 0 <sup>h</sup> GMST	UT1 at 0 <sup>h</sup> GMST (Greenwich Transit of the Mean Equinox)
		h m s	s	h m s	h m s
Jan. 0	245	6 36 25.2369	25.2858	246	0 17 20 43.7489
1	7388.5	6 40 21.7893	21.8412	4117.0	1 17 16 47.8394
2	7389.5	6 44 18.3413	18.3966	4118.0	2 17 12 51.9299
3	7390.5	6 48 14.8939	14.9519	4119.0	3 17 08 56.0204
4	7391.5	6 52 11.4475	11.5073	4120.0	4 17 05 00.1110
5	7392.5	6 56 08.0029	08.0627	4121.0	5 17 01 04.2015
6	7393.5	7 00 04.5602	04.6180	4122.0	6 16 57 08.2920
7	7394.5	7 04 01.1195	01.1734	4123.0	7 16 53 12.3826
8	7395.5	7 07 57.6806	57.7288	4124.0	8 16 49 16.4731
9	7396.5	7 11 54.2426	54.2841	4125.0	9 16 45 20.5636
10	7397.5	7 15 50.8046	50.8395	4126.0	10 16 41 24.6542
11	7398.5	7 19 47.3653	47.3949	4127.0	11 16 37 28.7447
12	7399.5	7 23 43.9238	43.9502	4128.0	12 16 33 32.8352
13	7400.5	7 27 40.4795	40.5056	4129.0	13 16 29 36.9258
14	7401.5	7 31 37.0327	37.0610	4130.0	14 16 25 41.0163
15	7402.5	7 35 33.5842	33.6163	4131.0	15 16 21 45.1068
16	7403.5	7 39 30.1354	30.1717	4132.0	16 16 17 49.1973
17	7404.5	7 43 26.6876	26.7271	4133.0	17 16 13 53.2879
18	7405.5	7 47 23.2420	23.2825	4134.0	18 16 09 57.3784
19	7406.5	7 51 19.7991	19.8378	4135.0	19 16 06 01.4689
20	7407.5	7 55 16.3586	16.3932	4136.0	20 16 02 05.5595
21	7408.5	7 59 12.9197	12.9486	4137.0	21 15 58 09.6500
22	7409.5	8 03 09.4813	09.5039	4138.0	22 15 54 13.7405
23	7410.5	8 07 06.0421	06.0593	4139.0	23 15 50 17.8311
24	7411.5	8 11 02.6011	02.6147	4140.0	24 15 46 21.9216
25	7412.5	8 14 59.1577	59.1700	4141.0	25 15 42 26.0121
26	7413.5	8 18 55.7119	55.7254	4142.0	26 15 38 30.1026
27	7414.5	8 22 52.2640	52.2808	4143.0	27 15 34 34.1932
28	7415.5	8 26 48.8147	48.8361	4144.0	28 15 30 38.2837
29	7416.5	8 30 45.3647	45.3915	4145.0	29 15 26 42.3742
30	7417.5	8 34 41.9149	41.9469	4146.0	30 15 22 46.4648
31	7418.5	8 38 38.4659	38.5022	4147.0	31 15 18 50.5553
Feb. 1	7419.5	8 42 35.0183	35.0576	4148.0	Feb. 1 15 14 54.6458
2	7420.5	8 46 31.5724	31.6130	4149.0	2 15 10 58.7364
3	7421.5	8 50 28.1285	28.1683	4150.0	3 15 07 02.8269
4	7422.5	8 54 24.6864	24.7237	4151.0	4 15 03 06.9174
5	7423.5	8 58 21.2456	21.2791	4152.0	5 14 59 11.0080
6	7424.5	9 02 17.8052	17.8344	4153.0	6 14 55 15.0985
7	7425.5	9 06 14.3641	14.3898	4154.0	7 14 51 19.1890
8	7426.5	9 10 10.9212	10.9452	4155.0	8 14 47 23.2795
9	7427.5	9 14 07.4756	07.5006	4156.0	9 14 43 27.3701
10	7428.5	9 18 04.0271	04.0559	4157.0	10 14 39 31.4606
11	7429.5	9 22 00.5764	00.6113	4158.0	11 14 35 35.5511
12	7430.5	9 25 57.1248	57.1667	4159.0	12 14 31 39.6417
13	7431.5	9 29 53.6740	53.7220	4160.0	13 14 27 43.7322
14	7432.5	9 33 50.2251	50.2774	4161.0	14 14 23 47.8227
15	7433.5	9 37 46.7789	46.8328	4162.0	15 14 19 51.9133

Date 0 <sup>h</sup> UT1	Julian Date	G. SIDEREAL TIME (GHA of the Equinox) Apparent	Equinoxes at 0 <sup>h</sup> UT1	GSD at 0 <sup>h</sup> GMST	UT1 at 0 <sup>h</sup> GMST (Greenwich Transit of the Mean Equinox)
		h m s	s	246	h m s
Feb. 15	7433.5	9 37 46.7789	-0.0539	4163.0	Feb. 15 14 19 51.9133
16	7434.5	9 41 43.3351	-0.0530	4164.0	16 14 15 56.0038
17	7435.5	9 45 39.8931	-0.0504	4165.0	17 14 12 00.0943
18	7436.5	9 49 36.4517	-0.0472	4166.0	18 14 08 04.1848
19	7437.5	9 53 33.0098	-0.0444	4167.0	19 14 04 08.2754
20	7438.5	9 57 29.5664	-0.0432	4168.0	20 14 00 12.3659
21	7439.5	10 01 26.1209	-0.0441	4169.0	21 13 56 16.4564
22	7440.5	10 05 22.6731	-0.0473	4170.0	22 13 52 20.5470
23	7441.5	10 09 19.2231	-0.0526	4171.0	23 13 48 24.6375
24	7442.5	10 13 15.7715	-0.0596	4172.0	24 13 44 28.7280
25	7443.5	10 17 12.3190	-0.0675	4173.0	25 13 40 32.8186
26	7444.5	10 21 08.8664	-0.0754	4174.0	26 13 36 36.9091
27	7445.5	10 25 05.4144	-0.0828	4175.0	27 13 32 40.9996
28	7446.5	10 29 01.9637	-0.0888	4176.0	28 13 28 45.0902
29	7447.5	10 32 58.5147	-0.0932	4177.0	29 13 24 49.1807
Mar. 1	7448.5	10 36 55.0675	-0.0957	4178.0	Mar. 1 13 20 53.2712
2	7449.5	10 40 51.6222	-0.0965	4179.0	2 13 16 57.3617
3	7450.5	10 44 48.1782	-0.0958	4180.0	3 13 13 01.4523
4	7451.5	10 48 44.7331	-0.0943	4181.0	4 13 09 05.5428
5	7452.5	10 52 41.2918	-0.0929	4182.0	5 13 05 09.6333
6	7453.5	10 56 37.8474	-0.0927	4183.0	6 13 01 13.7239
7	7454.5	11 00 34.4008	-0.0947	4184.0	7 12 57 17.8144
8	7455.5	11 04 30.9514	-0.0994	4185.0	8 12 53 21.9049
9	7456.5	11 08 27.4995	-0.1067	4186.0	9 12 49 25.9955
10	7457.5	11 12 24.0461	-0.1155	4187.0	10 12 45 30.0860
11	7458.5	11 16 20.5928	-0.1241	4188.0	11 12 41 34.1765
12	7459.5	11 20 17.1413	-0.1310	4189.0	12 12 37 38.2671
13	7460.5	11 24 13.6927	-0.1350	4190.0	13 12 33 42.3576
14	7461.5	11 28 10.2468	-0.1363	4191.0	14 12 29 46.4481
15	7462.5	11 32 06.8021	-0.1353	4192.0	15 12 25 50.5386
16	7463.5	11 36 03.3603	-0.1335	4193.0	16 12 21 54.6292
17	7464.5	11 39 59.9172	-0.1320	4194.0	17 12 17 58.7197
18	7465.5	11 43 56.4728	-0.1317	4195.0	18 12 14 02.8102
19	7466.5	11 47 53.0264	-0.1335	4196.0	19 12 10 06.9008
20	7467.5	11 51 49.5778	-0.1374	4197.0	20 12 06 10.9913
21	7468.5	11 55 46.1271	-0.1435	4198.0	21 12 02 15.0818
22	7469.5	11 59 42.6748	-0.1512	4199.0	22 11 58 19.1724
23	7470.5	12 03 39.2214	-0.1600	4200.0	23 11 54 23.2629
24	7471.5	12 07 35.7679	-0.1689	4201.0	24 11 50 27.3534
25	7472.5	12 11 32.3148	-0.1773	4202.0	25 11 46 31.4439
26	7473.5	12 15 28.8630	-0.1845	4203.0	26 11 42 35.5345
27	7474.5	12 19 25.4128	-0.1901	4204.0	27 11 38 39.6250
28	7475.5	12 23 21.9644	-0.1938	4205.0	28 11 34 43.7155
29	7476.5	12 27 18.5180	-0.1956	4206.0	29 11 30 47.8061
30	7477.5	12 31 15.0730	-0.1959	4207.0	30 11 26 51.8966
31	7478.5	12 35 11.6291	-0.1952	4208.0	31 11 22 55.9871
Apr. 1	7479.5	12 39 08.1854	-0.1943	4209.0	Apr. 1 11 19 00.0777

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		h m s	s	246	h m s
Apr. 1	7479.5	12 39 08.1854	-0.1943	4209.0	Apr. 1 11 19 00.0777
2	7480.5	12 43 04.7411	-0.1940	4210.0	2 11 15 04.1682
3	7481.5	12 47 01.2951	-0.1953	4211.0	3 11 11 08.2587
4	7482.5	12 50 57.8469	-0.1989	4212.0	4 11 07 12.3493
5	7483.5	12 54 54.3961	-0.2051	4213.0	5 11 03 16.4398
6	7484.5	12 58 50.9434	-0.2131	4214.0	6 10 59 20.5303
7	7485.5	13 02 47.4901	-0.2218	4215.0	7 10 55 24.6208
8	7486.5	13 06 44.0381	-0.2292	4216.0	8 10 51 28.7114
9	7487.5	13 10 40.5887	-0.2339	4217.0	9 10 47 32.8019
10	7488.5	13 14 37.1427	-0.2353	4218.0	10 10 43 36.8924
11	7489.5	13 18 33.6994	-0.2339	4219.0	11 10 39 40.9830
12	7490.5	13 22 30.2578	-0.2310	4220.0	12 10 35 45.0735
13	7491.5	13 26 26.8162	-0.2279	4221.0	13 10 31 49.1640
14	7492.5	13 30 23.3735	-0.2260	4222.0	14 10 27 53.2546
15	7493.5	13 34 19.9289	-0.2260	4223.0	15 10 23 57.3451
16	7494.5	13 38 16.4820	-0.2283	4224.0	16 10 20 01.4356
17	7495.5	13 42 13.0329	-0.2327	4225.0	17 10 16 05.5261
18	7496.5	13 46 09.5821	-0.2389	4226.0	18 10 12 09.6167
19	7497.5	13 50 06.1302	-0.2462	4227.0	19 10 08 13.7072
20	7498.5	13 54 02.6779	-0.2538	4228.0	20 10 04 17.7977
21	7499.5	13 57 59.2261	-0.2610	4229.0	21 10 00 21.8883
22	7500.5	14 01 55.7753	-0.2671	4230.0	22 9 56 25.9788
23	7501.5	14 05 52.3262	-0.2716	4231.0	23 9 52 30.0693
24	7502.5	14 09 48.8790	-0.2742	4232.0	24 9 48 34.1599
25	7503.5	14 13 45.4337	-0.2748	4233.0	25 9 44 38.2504
26	7504.5	14 17 41.9902	-0.2738	4234.0	26 9 40 42.3409
27	7505.5	14 21 38.5477	-0.2716	4235.0	27 9 36 46.4315
28	7506.5	14 25 35.1057	-0.2689	4236.0	28 9 32 50.5220
29	7507.5	14 29 31.6633	-0.2667	4237.0	29 9 28 54.6125
30	7508.5	14 33 28.2196	-0.2658	4238.0	30 9 24 58.7030
May 1	7509.5	14 37 24.7739	-0.2668	4239.0	May 1 9 21 02.7936
2	7510.5	14 41 21.3239	-0.2702	4240.0	2 9 17 06.8841
3	7511.5	14 45 17.8739	-0.2756	4241.0	3 9 13 10.9746
4	7512.5	14 49 14.4248	-0.2821	4242.0	4 9 09 15.0652
5	7513.5	14 53 10.9741	-0.2881	4243.0	5 9 05 19.1557
6	7514.5	14 57 07.5235	-0.2921	4244.0	6 9 01 23.2462
7	7515.5	15 01 04.0802	-0.2928	4245.0	7 8 57 27.3368
8	7516.5	15 05 00.6383	-0.2900	4246.0	8 8 53 31.4273
9	7517.5	15 08 57.1988	-0.2849	4247.0	9 8 49 35.5178
10	7518.5	15 12 53.7602	-0.2788	4248.0	10 8 45 39.6084
11	7519.5	15 16 50.3209	-0.2735	4249.0	11 8 41 43.6989
12	7520.5	15 20 46.8797	-0.2701	4250.0	12 8 37 47.7894
13	7521.5	15 24 43.4361	-0.2691	4251.0	13 8 33 51.8799
14	7522.5	15 28 39.9901	-0.2704	4252.0	14 8 29 55.9705
15	7523.5	15 32 36.5421	-0.2738	4253.0	15 8 26 00.0610
16	7524.5	15 36 33.0928	-0.2785	4254.0	16 8 22 04.1515
17	7525.5	15 40 29.6429	-0.2838	4255.0	17 8 18 08.2421

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		h m s	s	246	h m s
May 17	7525.5	15 40 29.6429	29.9266	4255.0	May 17 8 18 08.2421
18	7526.5	15 44 26.1932	26.4820	4256.0	18 8 14 12.3326
19	7527.5	15 48 22.7444	23.0374	4257.0	19 8 10 16.4231
20	7528.5	15 52 19.2972	19.5927	4258.0	20 8 06 20.5137
21	7529.5	15 56 15.8518	16.1481	4259.0	21 8 02 24.6042
22	7530.5	16 00 12.4084	12.7035	4260.0	22 7 58 28.6947
23	7531.5	16 04 08.9669	09.2588	4261.0	23 7 54 32.7852
24	7532.5	16 08 05.5266	05.8142	4262.0	24 7 50 36.8758
25	7533.5	16 12 02.0869	02.3696	4263.0	25 7 46 40.9663
26	7534.5	16 15 58.6469	58.9250	4264.0	26 7 42 45.0568
27	7535.5	16 19 55.2058	55.4803	4265.0	27 7 38 49.1474
28	7536.5	16 23 51.7628	52.0357	4266.0	28 7 34 53.2379
29	7537.5	16 27 48.3175	48.5911	4267.0	29 7 30 57.3284
30	7538.5	16 31 44.8702	45.1464	4268.0	30 7 27 01.4190
31	7539.5	16 35 41.4214	41.7018	4269.0	31 7 23 05.5095
June 1	7540.5	16 39 37.9725	38.2572	4270.0	June 1 7 19 09.6000
2	7541.5	16 43 34.5249	34.8125	4271.0	2 7 15 13.6906
3	7542.5	16 47 31.0800	31.3679	4272.0	3 7 11 17.7811
4	7543.5	16 51 27.6385	27.9233	4273.0	4 7 07 21.8716
5	7544.5	16 55 24.2000	24.4786	4274.0	5 7 03 25.9621
6	7545.5	16 59 20.7632	21.0340	4275.0	6 6 59 30.0527
7	7546.5	17 03 17.3265	17.5894	4276.0	7 6 55 34.1432
8	7547.5	17 07 13.8884	14.1447	4277.0	8 6 51 38.2337
9	7548.5	17 11 10.4478	10.7001	4278.0	9 6 47 42.3243
10	7549.5	17 15 07.0045	07.2555	4279.0	10 6 43 46.4148
11	7550.5	17 19 03.5589	03.8108	4280.0	11 6 39 50.5053
12	7551.5	17 23 00.1115	00.3662	4281.0	12 6 35 54.5959
13	7552.5	17 26 56.6632	56.9216	4282.0	13 6 31 58.6864
14	7553.5	17 30 53.2148	53.4769	4283.0	14 6 28 02.7769
15	7554.5	17 34 49.7671	50.0323	4284.0	15 6 24 06.8674
16	7555.5	17 38 46.3207	46.5877	4285.0	16 6 20 10.9580
17	7556.5	17 42 42.8761	43.1431	4286.0	17 6 16 15.0485
18	7557.5	17 46 39.4333	39.6984	4287.0	18 6 12 19.1390
19	7558.5	17 50 35.9925	36.2538	4288.0	19 6 08 23.2296
20	7559.5	17 54 32.5531	32.8092	4289.0	20 6 04 27.3201
21	7560.5	17 58 29.1145	29.3645	4290.0	21 6 00 31.4106
22	7561.5	18 02 25.6758	25.9199	4291.0	22 5 56 35.5012
23	7562.5	18 06 22.2360	22.4753	4292.0	23 5 52 39.5917
24	7563.5	18 10 18.7944	19.0306	4293.0	24 5 48 43.6822
25	7564.5	18 14 15.3504	15.5860	4294.0	25 5 44 47.7728
26	7565.5	18 18 11.9041	12.1414	4295.0	26 5 40 51.8633
27	7566.5	18 22 08.4562	08.6967	4296.0	27 5 36 55.9538
28	7567.5	18 26 05.0077	05.2521	4297.0	28 5 33 00.0443
29	7568.5	18 30 01.5599	01.8075	4298.0	29 5 29 04.1349
30	7569.5	18 33 58.1143	58.3628	4299.0	30 5 25 08.2254
July 1	7570.5	18 37 54.6716	54.9182	4300.0	July 1 5 21 12.3159
2	7571.5	18 41 51.2319	51.4736	4301.0	2 5 17 16.4065

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		h m s	s	246	h m s
July 2	7571.5	18 41 51.2319	51.4736	4301.0	July 2 5 17 16.4065
3	7572.5	18 45 47.7945	48.0289	4302.0	3 5 13 20.4970
4	7573.5	18 49 44.3578	44.5843	4303.0	4 5 09 24.5875
5	7574.5	18 53 40.9203	41.1397	4304.0	5 5 05 28.6781
6	7575.5	18 57 37.4828	37.6951	4305.0	6 5 01 32.7686
7	7576.5	19 01 34.0453	34.2504	4306.0	7 4 57 36.8591
8	7577.5	19 05 30.6077	30.8058	4307.0	8 4 53 40.9497
9	7578.5	19 09 27.1702	27.3612	4308.0	9 4 49 45.0402
10	7579.5	19 13 23.7326	23.9165	4309.0	10 4 45 49.1307
11	7580.5	19 17 20.2951	20.4719	4310.0	11 4 41 53.2212
12	7581.5	19 21 16.8575	17.0273	4311.0	12 4 37 57.3118
13	7582.5	19 25 13.4200	13.5826	4312.0	13 4 34 01.4023
14	7583.5	19 29 09.9824	10.1380	4313.0	14 4 30 05.4928
15	7584.5	19 33 06.5448	06.6934	4314.0	15 4 26 09.5834
16	7585.5	19 37 03.1073	03.2487	4315.0	16 4 22 13.6739
17	7586.5	19 40 59.6700	59.8041	4316.0	17 4 18 17.7644
18	7587.5	19 44 56.2324	56.3595	4317.0	18 4 14 21.8550
19	7588.5	19 48 52.7948	52.9148	4318.0	19 4 10 25.9455
20	7589.5	19 52 49.3573	49.4702	4319.0	20 4 06 30.0360
21	7590.5	19 56 45.9197	46.0256	4320.0	21 4 02 34.1265
22	7591.5	20 00 42.4821	42.5809	4321.0	22 3 58 38.2171
23	7592.5	20 04 39.0445	39.1363	4322.0	23 3 54 42.3076
24	7593.5	20 08 35.6069	35.6917	4323.0	24 3 50 46.3981
25	7594.5	20 12 32.1693	32.2470	4324.0	25 3 46 50.4887
26	7595.5	20 16 28.7317	28.8024	4325.0	26 3 42 54.5792
27	7596.5	20 20 25.2941	25.3578	4326.0	27 3 38 58.6697
28	7597.5	20 24 21.8565	21.9132	4327.0	28 3 35 02.7603
29	7598.5	20 28 18.4189	18.4685	4328.0	29 3 31 06.8508
30	7599.5	20 32 14.9813	15.0239	4329.0	30 3 27 10.9413
31	7600.5	20 36 11.5437	11.5793	4330.0	31 3 23 15.0319
Aug. 1	7601.5	20 40 07.9251	08.1346	4331.0	Aug. 1 3 19 19.1224
2	7602.5	20 44 04.4875	04.6900	4332.0	2 3 15 23.2129
3	7603.5	20 48 01.0500	01.2454	4333.0	3 3 11 27.3034
4	7604.5	20 51 57.6124	57.8007	4334.0	4 3 07 31.3940
5	7605.5	20 55 54.1748	54.3561	4335.0	5 3 03 35.4845
6	7606.5	20 59 50.7372	50.9115	4336.0	6 2 59 39.5750
7	7607.5	21 03 47.3000	47.4668	4337.0	7 2 55 43.6656
8	7608.5	21 07 43.8624	44.0222	4338.0	8 2 51 47.7561
9	7609.5	21 11 40.4248	40.5776	4339.0	9 2 47 51.8466
10	7610.5	21 15 36.9872	37.1329	4340.0	10 2 43 55.9372
11	7611.5	21 19 33.5496	33.6883	4341.0	11 2 40 00.0277
12	7612.5	21 23 30.1120	30.2437	4342.0	12 2 36 04.1182
13	7613.5	21 27 26.6744	26.7990	4343.0	13 2 32 08.2087
14	7614.5	21 31 23.2368	23.3544	4344.0	14 2 28 12.2993
15	7615.5	21 35 19.7992	19.9098	4345.0	15 2 24 16.3898
16	7616.5	21 39 16.3616	16.4651	4346.0	16 2 20 20.4803
17	7617.5	21 43 12.9240	13.0205	4347.0	17 2 16 24.5709

Date	Julian Date	G. SIDEREAL TIME (GHA of the Equinox) Apparent	Equation of Equinoxes at 0 <sup>h</sup> UT1	GSD at 0 <sup>h</sup> GMT	UT1 at 0 <sup>h</sup> GMT (Greenwich Transit of the Mean Equinox)
0 <sup>h</sup> UT1	h m s	s	s	246	h m s
Aug. 17	7617.5	21 43 09.3454	-0.2295	4347.0	Aug. 17 2 16 24.5709
18	7618.5	21 47 09.3454	-0.2305	4348.0	18 2 12 28.6614
19	7619.5	21 51 09.3454	-0.2315	4349.0	19 2 08 32.7519
20	7620.5	21 55 09.3454	-0.2325	4350.0	20 2 04 36.8425
21	7621.5	21 58 58.9943	-0.2477	4351.0	21 2 00 40.9330
22	7622.5	22 02 55.5422	-0.2551	4352.0	22 1 56 45.0235
23	7623.5	22 06 52.0916	-0.2611	4353.0	23 1 52 49.1141
24	7624.5	22 10 48.6435	-0.2646	4354.0	24 1 48 53.2046
25	7625.5	22 14 45.1981	-0.2653	4355.0	25 1 44 57.2951
26	7626.5	22 18 41.7532	-0.2636	4356.0	26 1 41 01.3856
27	7627.5	22 22 38.3136	-0.2606	4357.0	27 1 37 05.4762
28	7628.5	22 26 34.8721	-0.2575	4358.0	28 1 33 09.5667
29	7629.5	22 30 31.4294	-0.2556	4359.0	29 1 29 13.6572
30	7630.5	22 34 27.9845	-0.2558	4360.0	30 1 25 17.7478
31	7631.5	22 38 24.5372	-0.2585	4361.0	31 1 21 21.8383
Sept. 1	7632.5	22 42 21.0873	-0.2637	4362.0	Sept. 1 1 17 25.9288
2	7633.5	22 46 17.6356	-0.2708	4363.0	2 1 13 30.0194
3	7634.5	22 50 14.1828	-0.2790	4364.0	3 1 09 34.1099
4	7635.5	22 54 10.7297	-0.2874	4365.0	4 1 05 38.2004
5	7636.5	22 58 07.2773	-0.2953	4366.0	5 1 01 42.2909
6	7637.5	23 02 03.8260	-0.3019	4367.0	6 0 57 46.3815
7	7638.5	23 06 00.3764	-0.3068	4368.0	7 0 53 50.4720
8	7639.5	23 09 56.9287	-0.3100	4369.0	8 0 49 54.5625
9	7640.5	23 13 53.4826	-0.3114	4370.0	9 0 45 58.6531
10	7641.5	23 17 50.0379	-0.3115	4371.0	10 0 42 02.7436
11	7642.5	23 21 46.5940	-0.3107	4372.0	11 0 38 06.8341
12	7643.5	23 25 43.1502	-0.3099	4373.0	12 0 34 10.9247
13	7644.5	23 29 39.7056	-0.3099	4374.0	13 0 30 15.0152
14	7645.5	23 33 36.2592	-0.3116	4375.0	14 0 26 19.1057
15	7646.5	23 37 32.8104	-0.3158	4376.0	15 0 22 23.1963
16	7647.5	23 41 29.3591	-0.3224	4377.0	16 0 18 27.2868
17	7648.5	23 45 25.9080	-0.3310	4378.0	17 0 14 31.3773
18	7649.5	23 49 22.4523	-0.3400	4379.0	18 0 10 35.4678
19	7650.5	23 53 18.9997	-0.3480	4380.0	19 0 06 39.5584
20	7651.5	23 57 15.5495	-0.3535	4381.0	20 0 02 43.6489
21	7652.5	0 01 12.1025	-0.3559	4382.0	20 23 58 47.7394
22	7653.5	0 05 08.6532	-0.3556	4383.0	21 23 54 51.8300
23	7654.5	0 09 05.2156	-0.3536	4384.0	22 23 50 55.9205
24	7655.5	0 13 01.7733	-0.3512	4385.0	23 23 47 00.0110
25	7656.5	0 16 58.3300	-0.3499	4386.0	24 23 43 04.1016
26	7657.5	0 20 54.8848	-0.3504	4387.0	25 23 39 08.1921
27	7658.5	0 24 51.4372	-0.3534	4388.0	26 23 35 12.2826
28	7659.5	0 28 47.9873	-0.3587	4389.0	27 23 31 36.3732
29	7660.5	0 32 44.5354	-0.3660	4390.0	28 23 27 20.4637
30	7661.5	0 36 41.0822	-0.3745	4391.0	29 23 23 24.5542
Oct. 1	7662.5	0 40 37.6287	-0.3834	4392.0	30 23 19 28.6447
				4393.0	Oct. 1 23 15 32.7353

Date	Julian Date	G. SIDEREAL TIME (GHA of the Equinox) Apparent	Equation of Equinoxes at 0 <sup>h</sup> UT1	GSD at 0 <sup>h</sup> GMT	UT1 at 0 <sup>h</sup> GMT (Greenwich Transit of the Mean Equinox)
0 <sup>h</sup> UT1	h m s	s	s	246	h m s
Oct. 1	7662.5	0 40 37.6287	-0.3834	4393.0	Oct. 1 23 15 32.7353
2	7663.5	0 44 34.1756	-0.3919	4394.0	2 23 11 36.8258
3	7664.5	0 48 30.7237	-0.3992	4395.0	3 23 07 40.9163
4	7665.5	0 52 27.2734	-0.4048	4396.0	4 23 03 45.0069
5	7666.5	0 56 23.8249	-0.4087	4397.0	5 22 59 49.0974
6	7667.5	1 00 20.3782	-0.4107	4398.0	6 22 55 53.1879
7	7668.5	1 04 16.9331	-0.4112	4399.0	7 22 51 57.2785
8	7669.5	1 08 13.4890	-0.4107	4400.0	8 22 48 01.3690
9	7670.5	1 12 10.0452	-0.4098	4401.0	9 22 44 05.4595
10	7671.5	1 16 06.6010	-0.4094	4402.0	10 22 40 09.5500
11	7672.5	1 20 03.1556	-0.4102	4403.0	11 22 36 13.6406
12	7673.5	1 23 59.7081	-0.4130	4404.0	12 22 32 17.7311
13	7674.5	1 27 56.2584	-0.4181	4405.0	13 22 28 21.8216
14	7675.5	1 31 52.8066	-0.4253	4406.0	14 22 24 25.9122
15	7676.5	1 35 49.3536	-0.4336	4407.0	15 22 20 30.0027
16	7677.5	1 39 45.9011	-0.4415	4408.0	16 22 16 34.0932
17	7678.5	1 43 42.4508	-0.4472	4409.0	17 22 12 38.1838
18	7679.5	1 47 39.0037	-0.4496	4410.0	18 22 08 42.2743
19	7680.5	1 51 35.5600	-0.4487	4411.0	19 22 04 46.3648
20	7681.5	1 55 32.1188	-0.4453	4412.0	20 22 00 50.4554
21	7682.5	1 59 28.6783	-0.4411	4413.0	21 21 56 54.5459
22	7683.5	2 03 25.2372	-0.4376	4414.0	22 21 52 58.6364
23	7684.5	2 07 21.7942	-0.4360	4415.0	23 21 49 02.7269
24	7685.5	2 11 18.3488	-0.4388	4416.0	24 21 45 06.8175
25	7686.5	2 15 14.9009	-0.4400	4417.0	25 21 41 10.9080
26	7687.5	2 19 11.4510	-0.4453	4418.0	26 21 37 14.9985
27	7688.5	2 23 07.9997	-0.4519	4419.0	27 21 33 19.0891
28	7689.5	2 27 04.5479	-0.4591	4420.0	28 21 29 23.1796
29	7690.5	2 31 01.0964	-0.4660	4421.0	29 21 25 27.2701
30	7691.5	2 34 57.6460	-0.4718	4422.0	30 21 21 31.3607
31	7692.5	2 38 54.1971	-0.4760	4423.0	31 21 17 35.4512
Nov. 1	7693.5	2 42 50.7502	-0.4783	4424.0	Nov. 1 21 13 39.5417
2	7694.5	2 46 47.3051	-0.4787	4425.0	2 21 09 43.6322
3	7695.5	2 50 43.8617	-0.4775	4426.0	3 21 05 47.7228
4	7696.5	2 54 40.4195	-0.4751	4427.0	4 21 01 51.8133
5	7697.5	2 58 36.9778	-0.4721	4428.0	5 20 57 55.9038
6	7698.5	3 02 33.5359	-0.4694	4429.0	6 20 53 59.9944
7	7699.5	3 06 30.0930	-0.4677	4430.0	7 20 50 04.0849
8	7700.5	3 10 26.6485	-0.4676	4431.0	8 20 46 08.1754
9	7701.5	3 14 23.2019	-0.4696	4432.0	9 20 42 12.2660
10	7702.5	3 18 19.7532	-0.4736	4433.0	10 20 38 16.3565
11	7703.5	3 22 16.3031	-0.4791	4434.0	11 20 34 20.4471
12	7704.5	3 26 12.8527	-0.4849	4435.0	12 20 30 24.5376
13	7705.5	3 30 09.4037	-0.4892	4436.0	13 20 26 28.6281
14	7706.5	3 34 05.9576	-0.4907	4437.0	14 20 22 32.7186
15	7707.5	3 38 02.5151	-0.4885	4438.0	15 20 18 36.8091
16	7708.5	3 41 59.0760	-0.4830	4439.0	16 20 14 40.9007

Date 0 <sup>h</sup> UT1	Julian Date	G. SIDEREAL TIME (GHA of the Equinox)	Equation of Equinoxes at 0 <sup>h</sup> UT1	GSD at 0 <sup>h</sup> GMST	UT1 at 0 <sup>h</sup> GMST (Greenwich Transit of the Mean Equinox)	h m s
Nov. 16	7708.5	3 41 59.0760	-0.4830	4439.0	Nov. 16 20 14 40.8997	3 41 59.0760
17	7709.5	3 45 55.6387	-0.4757	4440.0	17 20 10 44.9902	3 45 55.6387
18	7710.5	3 49 52.2014	-0.4684	4441.0	18 20 06 49.0807	3 49 52.2014
19	7711.5	3 53 48.7624	-0.4628	4442.0	19 20 02 53.1713	3 53 48.7624
20	7712.5	3 57 45.3208	-0.4597	4443.0	20 19 58 57.2618	3 57 45.3208
21	7713.5	4 01 41.8765	-0.4593	4444.0	21 19 55 01.3523	4 01 41.8765
22	7714.5	4 05 38.4299	-0.4613	4445.0	22 19 51 05.4429	4 05 38.4299
23	7715.5	4 09 34.9816	-0.4650	4446.0	23 19 47 09.5334	4 09 34.9816
24	7716.5	4 13 31.5325	-0.4695	4447.0	24 19 43 13.6239	4 13 31.5325
25	7717.5	4 17 28.0835	-0.4738	4448.0	25 19 39 17.7144	4 17 28.0835
26	7718.5	4 21 24.6354	-0.4773	4449.0	26 19 35 21.8050	4 21 24.6354
27	7719.5	4 25 21.1888	-0.4793	4450.0	27 19 31 25.8955	4 25 21.1888
28	7720.5	4 29 17.7439	-0.4795	4451.0	28 19 27 29.9860	4 29 17.7439
29	7721.5	4 33 14.3010	-0.4778	4452.0	29 19 23 34.0766	4 33 14.3010
30	7722.5	4 37 10.8598	-0.4743	4453.0	30 19 19 38.1671	4 37 10.8598
Dec. 1	7723.5	4 41 07.4200	-0.4695	4454.0	Dec. 1 19 15 42.2576	4 41 07.4200
2	7724.5	4 45 03.9808	-0.4641	4455.0	2 19 11 46.3482	4 45 03.9808
3	7725.5	4 49 00.5416	-0.4587	4456.0	3 19 07 50.4387	4 49 00.5416
4	7726.5	4 52 57.1014	-0.4543	4457.0	4 19 03 54.5292	4 52 57.1014
5	7727.5	4 56 53.6596	-0.4514	4458.0	5 18 59 58.6198	4 56 53.6596
6	7728.5	5 00 50.2159	-0.4505	4459.0	6 18 56 02.7103	5 00 50.2159
7	7729.5	5 04 46.7701	-0.4517	4460.0	7 18 52 06.8008	5 04 46.7701
8	7730.5	5 08 43.3226	-0.4545	4461.0	8 18 48 10.8913	5 08 43.3226
9	7731.5	5 12 39.8744	-0.4581	4462.0	9 18 44 14.9819	5 12 39.8744
10	7732.5	5 16 36.4268	-0.4611	4463.0	10 18 40 19.0724	5 16 36.4268
11	7733.5	5 20 32.9812	-0.4620	4464.0	11 18 36 23.1629	5 20 32.9812
12	7734.5	5 24 29.5389	-0.4597	4465.0	12 18 32 27.2535	5 24 29.5389
13	7735.5	5 28 26.1002	-0.4538	4466.0	13 18 28 31.3440	5 28 26.1002
14	7736.5	5 32 22.6642	-0.4451	4467.0	14 18 24 35.4345	5 32 22.6642
15	7737.5	5 36 19.2293	-0.4354	4468.0	15 18 20 39.5251	5 36 19.2293
16	7738.5	5 40 15.7935	-0.4266	4469.0	16 18 16 43.6156	5 40 15.7935
17	7739.5	5 44 12.3552	-0.4202	4470.0	17 18 12 47.7061	5 44 12.3552
18	7740.5	5 48 08.9140	-0.4168	4471.0	18 18 08 51.7967	5 48 08.9140
19	7741.5	5 52 05.4699	-0.4163	4472.0	19 18 04 55.8872	5 52 05.4699
20	7742.5	5 56 02.0236	-0.4180	4473.0	20 18 00 59.9777	5 56 02.0236
21	7743.5	5 59 58.5760	-0.4209	4474.0	21 17 57 04.0682	5 59 58.5760
22	7744.5	6 03 55.1282	-0.4241	4475.0	22 17 53 08.1588	6 03 55.1282
23	7745.5	6 07 51.6810	-0.4267	4476.0	23 17 49 12.2493	6 07 51.6810
24	7746.5	6 11 48.2350	-0.4281	4477.0	24 17 45 16.3398	6 11 48.2350
25	7747.5	6 15 44.7906	-0.4278	4478.0	25 17 41 20.4304	6 15 44.7906
26	7748.5	6 19 41.3481	-0.4256	4479.0	26 17 37 24.5209	6 19 41.3481
27	7749.5	6 23 37.9074	-0.4217	4480.0	27 17 33 28.6114	6 23 37.9074
28	7750.5	6 27 34.4681	-0.4164	4481.0	28 17 29 32.7020	6 27 34.4681
29	7751.5	6 31 31.0295	-0.4103	4482.0	29 17 25 36.7925	6 31 31.0295
30	7752.5	6 35 27.5911	-0.4042	4483.0	30 17 21 40.8830	6 35 27.5911
31	7753.5	6 39 24.1518	-0.3988	4484.0	31 17 17 44.9735	6 39 24.1518
32	7754.5	6 43 20.7109	-0.3950	4485.0	32 17 13 49.0641	6 43 20.7109

GHA =  $\theta - \alpha_1$ ,  $\alpha_1 = \alpha_2 + E_0$

$\alpha_1, \alpha_2$  are the right ascensions with respect to the CIO and the true equinox of date, respectively.

Date 0 <sup>h</sup> UT1	Julian Date	Earth Rotation Angle $\theta$	Equation of Origins $E_0$	Date 0 <sup>h</sup> UT1	Julian Date	Earth Rotation Angle $\theta$	Equation of Origins $E_0$
Jan. 0	7387.5	98 54 01.4815	-12 17 07.06	Feb. 15	7433.5	144 14 18.8764	-12 22 80.66
1	7388.5	99 53 09.6857	-12 17 15.34	16	7434.5	145 13 27.0806	-12 22 94.59
2	7389.5	100 52 17.8900	-12 17 23.00	17	7435.5	146 12 35.2849	-12 23 11.13
3	7390.5	101 51 26.0942	-12 17 31.37	18	7436.5	147 11 43.4891	-12 23 28.63
4	7391.5	102 50 34.2984	-12 17 41.44	19	7437.5	148 10 51.6934	-12 23 45.37
5	7392.5	103 49 42.5027	-12 17 54.01	20	7438.5	149 09 59.8976	-12 23 59.87
6	7393.5	104 48 50.7069	-12 17 68.57	21	7439.5	150 08 10.1018	-12 23 71.18
7	7394.5	105 47 58.9112	-12 17 88.16	22	7440.5	151 06 16.3061	-12 23 78.98
8	7395.5	106 47 07.1154	-12 18 09.31	23	7441.5	152 07 24.5103	-12 23 83.57
9	7396.5	107 46 15.3196	-12 18 31.94	24	7442.5	153 06 32.7145	-12 23 85.73
10	7397.5	108 45 23.5239	-12 18 54.49	25	7443.5	154 05 40.9188	-12 23 86.56
11	7398.5	109 44 31.7281	-12 18 75.17	26	7444.5	155 04 49.1230	-12 23 87.25
12	7399.5	110 43 39.9323	-12 18 92.48	27	7445.5	156 03 57.3272	-12 23 88.91
13	7400.5	111 42 48.1366	-12 19 05.65	28	7446.5	157 03 05.5315	-12 23 92.46
14	7401.5	112 41 56.3408	-12 19 19.49	29	7447.5	158 02 13.7357	-12 23 98.50
15	7402.5	113 41 04.5451	-12 19 21.81	Mar. 1	7448.5	159 01 21.9400	-12 24 07.32
16	7403.5	114 40 12.7493	-12 19 28.15	2	7449.5	160 00 30.1442	-12 24 18.82
17	7404.5	115 39 20.9535	-12 19 36.11	3	7450.5	160 59 38.3484	-12 24 32.48
18	7405.5	116 38 29.1578	-12 19 47.70	4	7451.5	161 58 46.5527	-12 24 47.34
19	7406.5	117 37 37.3620	-12 19 52.46	5	7452.5	162 57 54.7569	-12 24 62.04
20	7407.5	118 36 45.5662	-12 19 81.23	6	7453.5	163 57 02.9611	-12 24 74.98
21	7408.5	119 35 53.7705	-12 20 02.56	7	7454.5	164 56 11.1654	-12 24 84.66
22	7409.5	120 35 01.9747	-12 20 24.52	8	7455.5	165 55 19.3696	-12 24 90.21
23	7410.5	121 34 10.1790	-12 20 45.28	9	7456.5	166 54 27.5739	-12 24 91.89
24	7411.5	122 33 18.3832	-12 20 63.35	10	7457.5	167 53 35.7781	-12 24 91.33
25	7412.5	123 32 26.5874	-12 20 77.86	11	7458.5	168 52 43.9823	-12 24 91.00
26	7413.5	124 31 34.7917	-12 20 88.71	12	7459.5	169 51 52.1866	-12 24 93.37
27	7414.5	125 30 42.9959	-12 20 96.45	13	7460.5	170 51 00.3908	-12 24 99.91
28	7415.5	126 29 51.2001	-12 21 02.03	14	7461.5	171 50 08.5950	-12 25 10.73
29	7416.5	127 28 59.4044	-12 21 06.63	15	7462.5	172 49 16.7993	-12 25 24.71
30	7417.5	128 28 07.6086	-12 21 11.44	16	7463.5	173 48 25.0035	-12 25 40.10
31	7418.5	129 27 15.8128	-12 21 17.51	17	7464.5	174 47 33.2078	-12 25 55.04
Feb. 1	7419.5	130 26 24.0171	-12 21 25.69	18	7465.5	175 46 41.4120	-12 25 68.01
2	7420.5	131 25 32.2213	-12 21 36.54	19	7466.5	176 45 49.6162	-12 25 78.03
3	7421.5	132 24 40.4256	-12 21 50.27	20	7467.5	177 44 57.8205	-12 25 84.70
4	7422.5	133 23 48.6298	-12 21 66.65	21	7468.5	178 44 06.0247	-12 25 88.23
5	7423.5	134 22 56.8340	-12 21 84.96	22	7469.5	179 43 14.2289	-12 25 89.27
6	7424.5	135 22 05.0383	-12 22 03.93	23	7470.5	180 42 22.4332	-12 25 88.83
7	7425.5	136 21 13.2425	-12 22 21.90	24	7471.5	181 41 30.6374	-12 25 88.05
8	7426.5	137 20 21.4467	-12 22 37.10	25	7472.5	182 40 38.8417	-12 25 88.08
9	7427.5	138 19 29.6510	-12 22 48.26	26	7473.5	183 39 47.0459	-12 25 89.88
10	7428.5	139 18 37.8552	-12 22 55.10	27	7474.5	184 38 55.2501	-12 25 94.15
11	7429.5	140 17 46.0595	-12 22 58.62	28	7475.5	185 38 03.4544	-12 26 01.24
12	7430.5	141 16 54.2637	-12 22 58.68	29	7476.5	186 37 11.6586	-12 26 11.09
13	7431.5	142 16 02.4679	-12 22 64.15	30	7477.5	187 36 19.8628	-12 26 23.27
14	7432.5	143 15 10.6722	-12 22 70.45	31	7478.5	188 35 28.0671	-12 26 36.96
15	7433.5	144 14 18.8764	-12 22 80.66	Apr. 1	7479.5	189 34 36.2713	-12 26 51.01