How to use- TABLE 4. - GHA and Declination of the Sun for the Years 2001 to 2036- Argument “Orbit Time”

Before beginning

TABLE 4 is attached herein.

TABLE 4 is convenient in size as you don't have to print out a multitude of pages from The Nautical Almanac. It does take a little longer to get GHA & Declination but you may find the savings in space worth the effort.

The GMT hour numbers on the left column of the date & time sheet are very small and hard to see. It was the only way to fit the time in linear form on one page.

Certain words are in bold which should direct you to, or remind you of, specific numbers and places either on TABLE 4 or on the time & date sheet. Dec. is written as such because that's the word you'll be looking for on TABLE 4's first page and not the word *Declination*.

To speed the entire process get the **E** figure, **Dec**. and dec. difference figure in one step since they're located next to eachother.

This explanation was written because the “EXPLANATION” on page two of TABLE 4 is too confusing and obscure.

Errors or clarification in procedure

Contact us if you find any errors or need clarification about the following procedure.

<u>How to find Sun's GHA using TABLE 4</u>

TABLE 4. - GHA and Declination of the Sun for the Years 2001 to 2036- Argument "Orbit Time"

In this explanation use the following date and GMT-

January 22, 2017
GMT 17:20:14

1- Write in the date beside the word "**Today's date-**" on the **date & time sheet**.

2- Make an "X" beside the box of the GMT hour of 17 (whole, integral hour only).

Refer to- **TABLE 4. - GHA and Declination of the Sun for the Years 2001 to 2036- Argument "Orbit Time"**

3- In table **a. Corr. from GMT to OT** find the year 2017 in the **Year** column. To the right of 2017 In the **Corr. h** column find the **h** correction of +14. The **h** stands for *hours.*

4- Go back to the **date & time sheet** and add the table **a. Corr. from GMT to OT h** correction amount of +14 hours to the GMT hour figure that you put an X in. Just count 14 spaces down from the GMT time of 17. This will advance the date to *Tomorrow* at GMT 07:00. Beside the word **Tomorrow** write the date of January 23, 2017. This seems confusing but it's necessary to obtain the correct **E** figure.

Note! In this example you're adding the table **a. Corr. from GMT to OT h** correction of +14 hours to the GMT of 17:20:14. You can obtain the same result by adding the two figures and then subtracting the answer from 24 **ONLY IF** the sum is 24 or greater. See the following example-

GMT-	17:20:14
table a. Corr. h	+14
	31
	-24
	7 hours

Write the **7** below the **hours** box on the time & date sheet **Calculate GHA** area.

5- Now get the **E** figure of **° '** (degrees and minutes). It will be found in **TABLE 4** in the **JAN E** column. Find the **d** column on the left hand side of **TABLE 4.** The **d** stands for *day*. Move down the **d** column to the day number 23. To the right of 23 in the **JAN E** column find **2 06.** The **2 06** stands for **2° 06'**. Write the **E** figure of **2° 06'** below the **E** box on the time & date sheet.

6- Determine the difference between consecutive **E** figures. This is found by comparing the **E** figure you just obtained with the next **E** figure below it. Like this;

	2 06
-	**2 02**
	-4 Diff.

Label the answer **Diff.** for *Difference* and write – **4** below the **Diff.** box on the time & date sheet.

Notice the **E** figure is decreasing so the answer must have a **–** (minus) sign before it. If the **E** figure were increasing you'd still need the difference between the two figures but instead a **+** (plus) sign would be put before the result.

7- Next use table **b. Interpolation for Hours of OT** to get the amount to correct the **E** figure by. Locate the number **4** in the **Diff.** horizontal row of the table. Find the number **7** in the **h** column on the left side of the table. Where those two numbers (each row and column) intersect find the number **1.** This is 1 minute of arc so write **1'** in the box to the left of table **b. Interpolation for Hours of OT** on the date & time sheet.

8- The **Diff.** figure previously found has a – (minus) sign before it so that means you must subtract the **1** found in table **b. Interpolation for Hours of OT** from the **E** figure**.** The result is **2° 05'** which is the final corrected **E** figure.

From now on use the original date and GMT

January 22, 2017
GMT 17:20:14

9- Now use the second page of **TABLE 4** and find table **c. Hours and Tens of Minutes of GMT.** The top of the table is incremented from 00m (0 minutes) to 50m (50 minutes) in10 minute increments. The vertical **h** column is incremented in hours from 00 to 23.

First locate **17** in the **h** column. Next locate **20m** at the top of the table. Where row **17** and column **20m** intersect find **75 00.** This stands for **75° 00'.** Write the figure **75° 00'** in the box to the left of **c. Hours and Tens of Minutes of GMT** on the date & time sheet.

10- On the date & time sheet add the **Final corrected E figure** to the table **c. Hours and Tens of Minutes of GMT** to get **77° 05'.**

11- Now use the second page of **TABLE 4** and find table **d. Minutes and Seconds of GMT (in critical cases ascend).** The table is incremented from 00 00 (00 minutes 00 seconds) to 10 00 (10 minutes 00 seconds).

Note- there are no remaining minutes to find an increment for so you only need to find the increment for 14 seconds.

14 seconds would fall between 13 and 17 seconds in the far left hand column of table **d.** The increment amount is **0° 04'.**

Write the figure **0° 04'** in the box to the left of table **d. Minutes and Seconds of GMT** on the date & time sheet.

12- On the date & time sheet add the **77° 05'** figure to the table **d. Minutes and Seconds of GMT** figure of **0° 04'** to get the final GHA for number of **77° 09'.** This is the calculated GHA for the Sun on January 22, 2017 at GMT 17:20:14.

Compared with using The Nautical Almanac and *Increments & Corrections for Sun, Planets, Aries, Moon (the "yellow pages")* ? The result is 77° 08.3'. The difference is 0° 00.7'.

<u>How to find Sun's Declination using TABLE 4</u>

TABLE 4. - GHA and Declination of the Sun for the Years 2001 to 2036- Argument "Orbit Time"

In this explanation use the following date and GMT-

January 22, 2017
GMT 17:20:14

Refer to the **date & time sheet** and find the **Calculate Declination** area.

1- Write in the date beside the word "**Today's date-**" on the **date & time sheet**.

2- Make an "X" beside the box of the GMT hour of 17 (whole, integral hour only).

Refer to- **TABLE 4. - GHA and Declination of the Sun for the Years 2001 to 2036- Argument "Orbit Time"**

3- In table **a. Corr. from GMT to OT** find the year 2017 in the **Year** column. To the right of 2017 in the **Corr. h** column find the **h** correction of +14. The **h** stands for *hours.*

4- Go back to the **date & time sheet** and add the table **a. Corr. from GMT to OT h** correction amount of +14 hours to the GMT hour figure that you put an X in. Just count 14 spaces down from the GMT time of 17. This will advance the date to *Tomorrow* at GMT 07:00. Beside the word **Tomorrow** write the date of January 23, 2017. This seems confusing but it's necessary to obtain the correct **Dec.** figure.

Note! In this example you're adding the table **a. Corr. from GMT to OT h** correction of +14 hours to the GMT of 17:20:14. You can obtain the same result by adding the two figures and then subtracting the answer from 24 **ONLY IF** the sum is 24 or greater. See the following example-

GMT-	17:20:14
table **a. Corr. h**	+14
	31
	-24
	7 hours

Write the **7** below the **hours** box on the time & date sheet **Calculate Declination** area.

5- Now get the declination figure of **° '** (degrees and minutes). It will be found in **TABLE 4** in the **JAN Dec.** column. Find the **d** column on the left hand side of **TABLE 4.** The **d** stands for *day.* Move down the **d** column to the day number 23. To the right of 23 in the **JAN Dec.** column find **19 35.** The **19 35** stands for **19° 35'**. Write the **Dec.** figure of **19° 35'** below the **Dec.** box on the time & date sheet **Calculate Declination** area.

6- Find the difference between consecutive **Dec.** figures. This is already conveniently provided on **Table 4** and found to the right and slightly downward from the **Dec.** figure you just obtained. It's **14** (minutes of arc). Notice the **Dec.** figures are decreasing so the answer must have a **–** (minus) sign before it. If the **Dec.** figure were increasing you'd put a **+** (plus) sign before the result.

Write **– 14'** below the **Diff.** box on the time & date sheet **Calculate Declination** area.

7- Next use table **b. Interpolation for Hours of OT** to get the amount to correct the **Dec.** figure by. Locate the number **14** in the **Diff.** horizontal row of the table. Find the number **7** in the **h** column on the left side of the table. Where those two numbers (each row and column) intersect find the number **4.** This is 4 minutes of arc so write **4'** in the box to the left of table **b. Interpolation for Hours of OT** on the date & time sheet **Calculate Declination** area.

8- The **Diff.** figure previously found has a **–** (minus) sign before it so that means you must subtract the **4** found in table **b. Interpolation for Hours of OT** from the **Dec.** figure**.** The result is **19° 31'**. This is the calculated Declination for the Sun on January 22, 2017 at GMT 17:20:14.

How does the foregoing calculation compare with using The Nautical Almanac ?
The result is -19° 30.9'. The difference is 0° 00.1'

0	**Yesterday's date-**
01	
02	
03	`
04	
05	
06	
07	
08	
09	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
0	**Today's date-**
01	
02	
03	
04	
05	
06	
07	
08	
09	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
0	**Tomorrow's date-**
01	
02	
03	
04	
05	
06	
07	
08	
09	
10	
11	
12	
13	
14	
15	
16	
17	
18	
19	
20	
21	
22	
23	
0	

date & time sheet

Calculate GHA

E	Diff.	hours		Line
2° 06'	- 4	7		1
- 1'	**table b. Interpolation for Hours of OT**			2
2° 05'	Final corrected **E** figure			3
75° 00'	**table c. Hours and Tens of Minutes of GMT**			4
77° 05'	Add the two figures above		(add lines 3 & 4)	5
0° 04'	**table d. Minutes and Seconds of GMT**			6
77° 09'	Add the two figures above		(add lines 5 & 6)	7
77° 09'	GHA for the Sun for January 22, 2017 GMT 17:20:14			8

GHA work area

E	Diff.	hours		Line
				1
	table b. Interpolation for Hours of OT			2
	Final corrected **E** figure			3
	table c. Hours and Tens of Minutes of GMT			4
	Add the two figures above		(add lines 3 & 4)	5
	table d. Minutes and Seconds of GMT			6
	Add the two figures above		(add lines 5 & 6)	7
	GHA for the Sun for			8

Calculate Declination

Dec.	Diff.	hours		Line
19° 35'	- 14	7		1
- 4'	**table b. Interpolation for Hours of OT**			2
19° 31'	Final corrected **Dec.** figure			3
19° 31'	Declination for the Sun for January 22, 2017 GMT 17:20:14			4

Declination work area

Dec.	Diff.	hours		Line
				1
	table b. Interpolation for Hours of OT			2
	Final corrected **Dec.** figure			3
	Declination for the Sun for January 22, 2017 GMT 17:20:14			4`

TABLE 4.—GHA and Declination of the Sun for the Years 2001–2036 — Argument "Orbit Time"

OT	JAN			FEB			MAR			APR			MAY			JUN			JUL			AUG			SEP			OCT			NOV			DEC			OT
00h	E	Dec.		E	Dec.		E	Dec.		E	Dec.		E	Dec.		E	Dec.		E	Dec.		E	Dec.		E	Dec.		E	Dec.		E	Dec.		E	Dec.		00h
d	° ′	° ′		° ′	° ′		° ′	° ′		° ′	° ′		° ′	° ′		° ′	° ′		° ′	° ′		° ′	° ′		° ′	° ′		° ′	° ′		° ′	° ′		° ′	° ′		d
1	4 12	S23 03	5	1 38	S17 16	17	1 53	S 7 49	23	3 58	N 4 19	23	5 42	N14 54	18	5 35	N21 58	8	4 05	N23 08	4	3 24	N18 10	16	4 56	N 8 29	21	7 31	S 2 57	24	9 06	S14 14	19	7 50	S21 42	9	1
2	4 05	22 58	6	1 36	16 59	18	1 56	7 26	23	4 03	4 42	23	5 44	15 12	18	5 32	22 06	8	4 02	23 04	4	3 25	17 54	15	5 01	8 08	22	7 36	3 21	23	9 07	14 33	19	7 44	21 51	9	2
3	3 58	22 52	5	1 35	16 41	17	1 59	7 03	23	4 07	5 05	23	5 46	15 30	17	5 30	22 14	8	3 59	23 00	5	3 26	17 39	16	5 06	7 46	22	7 41	3 44	23	9 07	14 52	19	7 38	22 00	9	3
4	3 52	22 47	7	1 33	16 24	18	2 02	6 40	23	4 12	5 28	23	5 47	15 47	18	5 28	22 22	7	3 56	22 55	5	3 28	17 23	15	5 11	7 24	22	7 46	4 07	23	9 07	15 11	18	7 33	22 09	8	4
5	3 45	22 40	6	1 32	16 06	18	2 05	6 17	23	4 16	5 51	23	5 49	16 05	17	5 25	22 29	6	3 53	22 50	6	3 29	17 08	17	5 16	7 02	22	7 50	4 30	23	9 07	15 29	19	7 27	22 17	8	5
6	3 38	S22 34	8	1 30	S15 48	19	2 09	S 5 54	23	4 20	N 6 14	22	5 50	N16 22	17	5 22	N22 35	6	3 51	N22 44	6	3 30	N16 51	16	5 21	N 6 40	23	7 55	S 4 53	23	9 06	S15 48	18	7 20	S22 25	7	6
7	3 31	22 26	7	1 29	15 29	18	2 12	5 31	24	4 25	6 36	23	5 51	16 39	16	5 20	22 41	6	3 48	22 38	6	3 32	16 35	17	5 26	6 17	22	7 59	5 16	23	9 06	16 06	17	7 14	22 32	7	7
8	3 25	22 19	8	1 28	15 11	19	2 16	5 07	23	4 29	6 59	22	5 52	16 55	17	5 17	22 47	6	3 46	22 32	7	3 34	16 18	17	5 31	5 55	23	8 03	5 39	23	9 05	16 23	18	7 08	22 39	6	8
9	3 19	22 11	9	1 28	14 52	20	2 19	4 44	24	4 33	7 21	23	5 53	17 12	16	5 14	22 53	5	3 44	22 25	7	3 36	16 01	17	5 36	5 32	22	8 08	6 02	23	9 04	16 41	17	7 01	22 45	6	9
10	3 12	22 02	9	1 27	14 32	19	2 23	4 20	23	4 37	7 44	22	5 54	17 28	15	5 11	22 58	4	3 41	22 18	7	3 38	15 44	18	5 41	5 10	23	8 12	6 25	23	9 03	16 58	17	6 54	22 51	6	10
11	3 06	S21 53	9	1 27	S14 13	20	2 27	S 3 57	24	4 41	N 8 06	22	5 54	N17 43	16	5 08	N23 02	4	3 39	N22 11	8	3 40	N15 26	17	5 46	N 4 47	23	8 16	S 6 48	22	9 01	S17 15	17	6 47	S22 57	5	11
12	3 00	21 44	10	1 27	13 53	20	2 31	3 33	23	4 45	8 28	22	5 55	17 59	15	5 05	23 06	4	3 37	22 03	9	3 42	15 09	19	5 52	4 24	23	8 20	7 10	23	9 00	17 32	16	6 41	23 02	4	12
13	2 55	21 34	10	1 28	13 33	20	2 35	3 10	24	4 49	8 50	21	5 55	18 14	15	5 02	23 10	4	3 35	21 54	8	3 45	14 50	18	5 57	4 01	23	8 23	7 33	22	8 58	17 48	16	6 34	23 06	4	13
14	2 49	21 24	10	1 28	13 13	20	2 39	2 46	24	4 53	9 11	22	5 55	18 29	14	4 59	23 14	3	3 33	21 46	9	3 48	14 32	18	6 02	3 38	23	8 27	7 55	23	8 56	18 04	16	6 27	23 10	4	14
15	2 43	21 14	11	1 28	12 53	21	2 43	2 22	23	4 57	9 33	22	5 55	18 43	15	4 56	23 17	2	3 32	21 37	10	3 50	14 14	19	6 07	3 15	23	8 31	8 18	22	8 53	18 20	15	6 19	23 14	3	15
16	2 38	S21 03	12	1 29	S12 32	21	2 47	S 1 59	24	5 00	N 9 55	21	5 55	N18 58	13	4 52	N23 19	2	3 30	N21 27	10	3 53	N13 55	19	6 13	N 2 52	23	8 34	S 8 40	22	8 51	S18 35	15	6 12	S23 17	3	16
17	2 33	20 51	12	1 30	12 11	21	2 51	1 35	24	5 04	10 16	21	5 55	19 11	14	4 49	23 21	2	3 29	21 17	10	3 56	13 36	19	6 18	2 29	23	8 37	9 02	22	8 48	18 50	15	6 05	23 20	2	17
18	2 28	20 39	12	1 31	11 50	21	2 56	1 11	24	5 07	10 37	21	5 54	19 25	13	4 46	23 23	2	3 27	21 07	10	3 59	13 17	19	6 23	2 06	23	8 40	9 24	22	8 45	19 05	14	5 58	23 22	2	18
19	2 23	20 27	12	1 32	11 29	21	3 00	0 47	23	5 11	10 58	21	5 54	19 38	13	4 43	23 25	0	3 26	20 57	11	4 03	12 58	20	6 29	1 43	24	8 43	9 46	21	8 42	19 19	14	5 50	23 24	1	19
20	2 19	20 15	13	1 33	11 08	22	3 04	0 24	24	5 14	11 19	20	5 53	19 51	13	4 39	23 25	1	3 25	20 46	11	4 06	12 38	20	6 34	1 19	23	8 46	10 07	22	8 39	19 33	13	5 43	23 25	1	20
21	2 14	S20 02	14	1 35	S10 46	21	3 09	0 00	24	5 17	N11 39	21	5 52	N20 04	12	4 36	N23 26	0	3 24	N20 35	12	4 10	N12 18	20	6 40	N 0 56	23	8 49	S10 29	21	8 35	S19 46	14	5 35	S23 26	0	21
22	2 10	19 48	13	1 36	10 25	22	3 13	N 0 24	23	5 20	12 00	20	5 51	20 16	12	4 33	23 26	0	3 24	20 23	12	4 13	11 58	20	6 45	0 33	24	8 51	10 50	21	8 32	20 00	13	5 28	23 26	0	22
23	2 06	19 35	14	1 38	10 03	22	3 18	0 47	24	5 23	12 20	20	5 50	20 28	11	4 29	23 26	1	3 23	20 11	12	4 17	11 38	20	6 50	N 0 09	23	8 53	11 11	21	8 28	20 13	12	5 21	23 26	1	23
24	2 02	19 21	15	1 40	9 41	22	3 22	1 11	24	5 26	12 40	20	5 49	20 39	11	4 26	23 25	1	3 23	19 59	13	4 21	11 18	21	6 55	S 0 14	23	8 56	11 32	21	8 24	20 25	12	5 13	23 25	1	24
25	1 58	19 06	15	1 43	9 19	23	3 27	1 35	23	5 28	13 00	19	5 47	20 50	11	4 23	23 24	2	3 22	19 46	12	4 25	10 57	20	7 01	0 37	24	8 58	11 53	21	8 19	20 37	12	5 06	23 24	1	25
26	1 55	S18 51	15	1 45	S 8 56	22	3 31	N 1 58	24	5 31	N13 19	20	5 46	N21 01	11	4 20	N23 22	2	3 22	N19 34	14	4 29	N10 37	21	7 06	S 1 01	23	8 59	S12 14	21	8 15	S20 49	12	4 58	S23 23	2	26
27	1 52	18 36	15	1 47	8 34	23	3 36	2 22	23	5 34	13 39	19	5 44	21 12	10	4 17	23 20	3	3 22	19 20	13	4 34	10 16	21	7 11	1 24	23	9 01	12 35	20	8 10	21 01	11	4 51	23 21	3	27
28	1 48	18 21	16	1 50	8 11	22	3 40	2 45	24	5 36	13 58	19	5 43	21 22	9	4 14	23 18	3	3 22	19 07	14	4 38	9 55	21	7 16	1 47	24	9 02	12 55	20	8 05	21 12	10	4 44	23 18	3	28
29	1 46	18 05	16	1 53	7 49	23	3 45	3 09	23	5 38	14 17	18	5 41	21 31	10	4 11	23 15	4	3 23	18 53	14	4 42	9 34	21	7 21	2 11	23	9 04	13 15	20	8 00	21 22	10	4 36	23 15	3	29
30	1 43	17 49	16				3 49	3 32	23	5 40	14 35	19	5 39	21 41	9	4 08	23 12	4	3 23	18 39	15	4 47	9 13	22	7 26	2 34	23	9 05	13 35	19	7 55	21 32	10	4 29	23 12	4	30
31	1 41	S17 33	17				3 54	N 3 55	24				5 37	N21 50	8				3 24	N18 24	14	4 52	N 8 51	22				9 05	S13 54	20				4 22	S23 08	4	31

a. Corr. from GMT to OT

Year	Corr.	Year	Corr.	Year	Corr.
	h		h		h
2001	+10	2013	+13	2025	+15
2002	+ 5	2014	+ 7	2026	+ 9
2003	- 1	2015	+ 1	2027	+ 4
2004	- 7	2016	- 5	2028	- 2
2004	+17 *	2016	+19 *	2028	+22 *
2005	+11	2017	+14	2029	+16
2006	+ 6	2018	+ 8	2030	+10
2007	0	2019	+ 2	2031	+ 4
2008	- 6	2020	- 4	2032	- 1
2008	+18 *	2020	+20 *	2032	+23 *
2009	+12	2021	+14	2033	+17
2010	+ 6	2022	+ 8	2034	+11
2011	+ 1	2023	+ 3	2035	+ 5
2012	- 5	2024	- 3	2036	- 1
2012	+19 *	2024	+21 *	2036	+23 *

* After Feb. 29

b. Interpolation for Hours of OT

Diff.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
h	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1
2	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2
3	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	3	3	3
4	0	0	1	1	1	1	1	1	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4
5	0	0	1	1	1	1	1	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5
6	0	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6
7	0	1	1	1	1	2	2	2	3	3	3	4	4	4	4	5	5	5	6	6	6	6	7	7
8	0	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	6	6	6	7	7	7	8	8
9	0	1	1	2	2	2	3	3	3	4	4	5	5	5	6	6	6	7	7	8	8	8	9	9
10	0	1	1	2	2	3	3	3	4	4	5	5	5	6	6	7	7	8	8	8	9	9	10	10
11	0	1	1	2	2	3	3	4	4	5	5	6	6	6	7	7	8	8	9	9	10	10	11	11

Diff.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
h	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′
12	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10	10	11	11	12	12
13	1	1	2	2	3	3	4	4	5	5	6	7	7	8	8	9	9	10	10	11	11	12	12	13
14	1	1	2	2	3	4	4	5	5	6	6	7	8	8	9	9	10	11	11	12	12	13	13	14
15	1	1	2	3	3	4	4	5	6	6	7	8	8	9	9	10	11	11	12	13	13	14	14	15
16	1	1	2	3	3	4	5	5	6	7	7	8	9	9	10	11	11	12	13	13	14	15	15	16
17	1	1	2	3	4	4	5	6	6	7	8	8	9	10	10	11	12	12	13	14	14	15	16	16
18	1	2	2	3	4	5	5	6	7	8	8	9	10	11	11	12	13	13	14	15	16	17	17	18
19	1	2	2	3	4	5	6	6	7	8	9	10	10	11	12	13	13	14	15	16	17	17	18	19
20	1	2	3	3	4	5	6	7	8	8	9	10	11	12	13	13	14	15	16	17	18	18	19	20
21	1	2	3	4	4	5	6	7	8	9	10	11	11	12	13	14	15	16	17	18	18	19	20	21
22	1	2	3	4	5	6	6	7	8	9	10	11	12	13	14	15	16	17	17	18	19	20	21	22
23	1	2	3	4	5	6	7	8	9	10	11	12	12	13	14	15	16	17	18	19	20	21	22	23

TABLE 4.—GHA and Declination of the Sun for the Years 2001–2036 — Argument "Orbit Time" — Continued

c. Hours and Tens of Minutes of GMT

	00m		10m		20m		30m		40m		50m	
h	°	′	°	′	°	′	°	′	°	′	°	′
00	175	00	177	30	180	00	182	30	185	00	187	30
01	190	00	192	30	195	00	197	30	200	00	202	30
02	205	00	207	30	210	00	212	30	215	00	217	30
03	220	00	222	30	225	00	227	30	230	00	232	30
04	235	00	237	30	240	00	242	30	245	00	247	30
05	250	00	252	30	255	00	257	30	260	00	262	30
06	265	00	267	30	270	00	272	30	275	00	277	30
07	280	00	282	30	285	00	287	30	290	00	292	30
08	295	00	297	30	300	00	302	30	305	00	307	30
09	310	00	312	30	315	00	317	30	320	00	322	30
10	325	00	327	30	330	00	332	30	335	00	337	30
11	340	00	342	30	345	00	347	30	350	00	352	30
12	355	00	357	30	0	00	2	30	5	00	7	30
13	10	00	12	30	15	00	17	30	20	00	22	30
14	25	00	27	30	30	00	32	30	35	00	37	30
15	40	00	42	30	45	00	47	30	50	00	52	30
16	55	00	57	30	60	00	62	30	65	00	67	30
17	70	00	72	30	75	00	77	30	80	00	82	30
18	85	00	87	30	90	00	92	30	95	00	97	30
19	100	00	102	30	105	00	107	30	110	00	112	30
20	115	00	117	30	120	00	122	30	125	00	127	30
21	130	00	132	30	135	00	137	30	140	00	142	30
22	145	00	147	30	150	00	152	30	155	00	157	30
23	160	00	162	30	165	00	167	30	170	00	172	30

d. Minutes and Seconds of GMT (in critical cases ascend)

m	s	°	′	m	s	°	′	m	s	°	′	m	s	°	′	m	s	°	′	m	s	°	′
00	00			01	37			03	17			04	57			06	37			08	17		
	01	0	00		41	0	25		21	0	50	05	01	1	15		41	1	40		21	2	05
	05	0	01		45	0	26		25	0	51		05	1	16		45	1	41		25	2	06
	09	0	02		49	0	27		29	0	52		09	1	17		49	1	42		29	2	07
	13	0	03		53	0	28		33	0	53		13	1	18		53	1	43		33	2	08
	17	0	04	01	57	0	29		37	0	54		17	1	19	06	57	1	44		37	2	09
	21	0	05	02	01	0	30		41	0	55		21	1	20	07	01	1	45		41	2	10
	25	0	06		05	0	31		45	0	56		25	1	21		05	1	46		45	2	11
	29	0	07		09	0	32		49	0	57		29	1	22		09	1	47		49	2	12
	33	0	08		13	0	33		53	0	58		33	1	23		13	1	48		53	2	13
	37	0	09		17	0	34	03	57	0	59		37	1	24		17	1	49	08	57	2	14
	41	0	10		21	0	35	04	01	1	00		41	1	25		21	1	50	09	01	2	15
	45	0	11		25	0	36		05	1	01		45	1	26		25	1	51		05	2	16
	49	0	12		29	0	37		09	1	02		49	1	27		29	1	52		09	2	17
	53	0	13		33	0	38		13	1	03		53	1	28		33	1	53		13	2	18
00	57	0	14		37	0	39		17	1	04	05	57	1	29		37	1	54		17	2	19
01	01	0	15		41	0	40		21	1	05	06	01	1	30		41	1	55		21	2	20
	05	0	16		45	0	41		25	1	06		05	1	31		45	1	56		25	2	21
	09	0	17		49	0	42		29	1	07		09	1	32		49	1	57		29	2	22
	13	0	18		53	0	43		33	1	08		13	1	33		53	1	58		33	2	23
	17	0	19	02	57	0	44		37	1	09		17	1	34	07	57	1	59		37	2	24
	21	0	20	03	01	0	45		41	1	10		21	1	35	08	01	2	00		41	2	25
	25	0	21		05	0	46		45	1	11		25	1	36		05	2	01		45	2	26
	29	0	22		09	0	47		49	1	12		29	1	37		09	2	02		49	2	27
	33	0	23		13	0	48		53	1	13		33	1	38		13	2	03		53	2	28
	37	0	24		17	0	49	04	57	1	14		37	1	39		17	2	04	09	57	2	29
01	41	0	25	03	21	0	50	05	01	1	15	06	41	1	40	08	21	2	05	10	00	2	30

EXPLANATION

Table 4 and supplementary **Tables a**, **b**, **c**, and **d** make possible the determination of the GHA and declination of the Sun for any time during the years 2001–2036. The main table gives E (5° + Equation of Time) and declination of the Sun for the argument "Orbit Time" OT, the latter is formed by applying the *h* correction from **Table a** to the nearest integral hour of GMT. In leap years, the upper value of the correction is to be used for January and February and the lower value for the rest of the year. Thus, OT's corresponding to 2004 February $29^d\ 16^h\ 31^m$ GMT and 2004 March $1^d\ 05^h\ 29^m$ GMT are February $29^d\ 10^h\ 00^m$ and March $1^d\ 22^h\ 00^m$ respectively.

Corrections to E and declination for OT are determined by entering **Table b** with the differences between consecutive values of E and of declination respectively as the horizontal argument, and with the number of hours of OT as the vertical argument. The declination differences are given in the main table.

The GHA is obtained by adding to the corrected E the value of the diurnal arc obtained from **Tables c** and **d**. The latter two tables must be entered with argument GMT.

Example: To find the GHA and declination of the Sun on 2004 January 18^d at $03^h\ 30^m\ 35^s$ GMT.
OT = GMT (nearest integral hour) + Corr. (**Table a**).
= Jan. $18^d\ 04^h - 7^h$ = Jan. $17^d\ 21^h$.

		°	′	Diff.			°	′	Diff.
Main Table, Jan. 17^d OT, E		2	33	(- 5)	Dec.	S	20	51	(- 12)
Table b for 21^h OT			- 4					- 11	
Jan.$17^d\ 21^h$ OT, corrected	E	2	29		Dec.	S	20	40	
Table c for $03^h\ 30^m$ GMT		227	30						
Table d for $00^m\ 35^s$ GMT		0	09						
Sum	GHA Sun =	230	08						