Korrekturtabellen

Inhalt

Allgemeines

Fuer genaue Nvigations- und Messergebnisse werden bei bestimmten Werten Korrekturwerte beruecksichtigt.

Refraction und Coriolis Correction

To facilitate use of Pub. No. 249, Volumes 2, 3.

TABLE 6.—Refraction

To be subtracted from sextant altitude

R_0	Height above sea level in thousands of feet: 0	5	10	15	20	25	30	35	40	45	50	55
	Sextant Altitude											
′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′	° ′
0	90	90	90	90	90	90	90	90	90	90	90	90
1	63	59	55	51	46	41	36	31	26	20	17	13
2	33	29	26	22	19	16	14	11	9	7	6	4
3	21	19	16	14	12	10	8	7	5	4	2 40	1 40
4	16	14	12	10	8	7	6	5	3 10	2 20	1 30	0 40
5	12	11	9	8	7	5	4 00	3 10	2 10	1 30	0 39	+0 05
6	10	9	7	5 50	4 50	3 50	3 10	2 20	1 30	0 49	+0 11	−0 19
7	8 10	6 50	5 50	4 50	4 00	3 00	2 20	1 50	1 10	0 24	−0 11	−0 38
8	6 50	5 50	5 00	4 00	3 10	2 30	1 50	1 20	0 38	+0 04	−0 28	−0 54
9	6 00	5 10	4 10	3 20	2 40	2 00	1 30	1 00	0 19	−0 13	−0 42	−1 08
10	5 20	4 30	3 40	2 50	2 10	1 40	1 10	0 35	+0 03	−0 27	−0 53	−1 18
12	4 30	3 40	2 50	2 20	1 40	1 10	0 37	+0 11	−0 16	−0 43	−1 08	−1 31
14	3 30	2 50	2 10	1 40	1 10	0 34	+0 09	−0 14	−0 37	−1 00	−1 23	−1 44
16	2 50	2 10	1 40	1 10	0 37	+0 10	−0 13	−0 34	−0 53	−1 14	−1 35	−1 56
18	2 20	1 40	1 20	0 43	+0 15	−0 08	−0 31	−0 52	−1 08	−1 27	−1 46	−2 05
20	1 50	1 20	0 49	+0 23	−0 02	−0 26	−0 46	−1 06	−1 22	−1 39	−1 57	−2 14
25	1 12	0 44	+0 19	−0 06	−0 28	−0 48	−1 09	−1 27	−1 42	−1 58	−2 14	−2 30
30	0 34	+0 10	−0 13	−0 36	−0 55	−1 14	−1 32	−1 51	−2 06	−2 21	−2 34	−2 49
35	+0 06	−0 16	−0 37	−0 59	−1 17	−1 33	−1 51	−2 07	−2 23	−2 37	−2 51	−3 04
40	−0 18	−0 37	−0 58	−1 16	−1 34	−1 49	−2 06	−2 22	−2 35	−2 49	−3 03	−3 16
45		−0 53	−1 14	−1 31	−1 47	−2 03	−2 18	−2 33	−2 47	−2 59	−3 13	−3 25
50		−1 10	−1 28	−1 44	−1 59	−2 15	−2 28	−2 43	−2 56	−3 08	−3 22	−3 33
55			−1 40	−1 53	−2 09	−2 24	−2 38	−2 52	−3 04	−3 17	−3 29	−3 41
60				−2 03	−2 18	−2 33	−2 46	−3 01	−3 12	−3 25	−3 37	−3 48
							−2 53	−3 07	−3 19	−3 31	−3 42	−3 53

f	Height above sea level in thousands of feet: 0	5	10	15	20	25	30	35	40	45	50	55
	Temperature in degrees Celsius (centigrade)											
0.9	+47	+36	+27	+18	+10	+ 3	− 5	−13	For these heights no temperature correction is necessary: use $R = R_0$.			
1.0	+26	+16	+ 6	− 4	−13	−22	−31	−40				
1.1	+ 5	− 5	−15	−25	−36	−46	−57	−68				
1.2	−16	−25	−36	−46	−58	−71	−83	−95				
	−37	−45	−56	−67	−81	−95						

R_0	$R = R_0 \times f$: f = 0.9	1.0	1.1	1.2
	R			
′	′	′	′	′
0	0	0	0	0
1	1	1	1	1
2	2	2	2	2
3	3	3	3	4
4	4	4	4	5
5	5	5	5	6
6	5	6	7	7
7	6	7	8	8
8	7	8	9	10
9	8	9	10	11
10	9	10	11	12
12	11	12	13	14
14	13	14	15	17
16	14	16	18	19
18	16	18	20	22
20	18	20	22	24
25	22	25	28	30
30	27	30	33	36
35	31	35	38	42
40	36	40	44	48
45	40	45	50	54
50	45	50	55	60
55	49	55	60	66
60	54	60	66	72

f	Refraction $R = R_0 \times f$
0.9	When R_0 is less than 10′ or the height is more than 35,000 ft.: use $R = R_0$.
1.0	
1.1	
1.2	

Choose the column appropriate to height, in units of 1,000 feet, and find the range of altitude in which the sextant altitude lies; thus find R_0. This is the refraction corresponding to the sextant altitude unless conditions are extreme. In that case find f from the lower table corresponding to the range of temperature for the appropriate height, and use the table on the right to find R. Example: at a height of 30,000 feet and temperature (−) 60° C a celestial body is observed at altitude (−) 2°36′. R_0 is 50′, f is 1.1 and R is 55′. Subtracting this from the sextant altitude gives (−) 3°31′.

TABLE 7.—Coriolis (Z) Correction

Ground Speed	Latitude: 0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	Ground Speed
Kts.	′	′	′	′	′	′	′	′	′	′	Kts.
50	0	0	0	1	1	1	1	1	1	1	50
100	0	0	1	1	2	2	2	2	3	3	100
150	0	1	1	2	3	3	3	4	4	4	150
200	0	1	2	3	3	4	5	5	5	5	200
250	0	1	2	3	4	5	6	6	6	7	250
300	0	1	3	4	5	6	7	7	8	8	300
350	0	2	3	5	6	7	8	9	9	9	350
400	0	2	4	5	7	8	9	10	10	10	400
450	0	2	4	6	8	9	10	11	12	12	450
500	0	2	4	7	8	10	11	12	13	13	500
550	0	3	5	7	9	11	12	14	14	14	550
600	0	3	5	8	10	12	14	15	16	16	600
650	0	3	6	9	11	13	15	16	17	17	650
700	0	3	6	9	12	14	16	17	18	18	700
750	0	3	7	10	13	15	17	18	19	20	750
800	0	4	7	10	13	16	18	20	21	21	800
850	0	4	8	11	14	17	19	21	22	22	850
900	0	4	8	12	15	18	20	22	23	24	900

To be applied by moving the position line a distance Z to starboard (right) of the track in northern latitudes and to port (left) in southern latitudes.

STANDARD DOME REFRACTION

To be *subtracted* from observed altitude when using sextant suspension in a perspex dome.

Alt. °	Refn. ′	Alt. °	Refn. ′
10	8	50	4
20	7	60	4
30	6	70	3
40	5	80	3

This table must not be used if a calibration table is fitted to the dome, or if a flat glass plate is provided, or for non-standard domes.

BUBBLE SEXTANT ERROR

Sextant No.

Alt. °	Corr. ′

Correction to Tabulated Altitude for Minutes of Declination

d / ′	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	d / ′
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	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	0	0	0	0	0	0	0	0	0	0	0	0
1	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	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	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	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2
3	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3
4	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4	4	4
5	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	5	5
6	0	0	0	0	0	1	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	4	5	5	5	5	5	5	5	6	6	6	6	6	6	6	6	6	6	6	6	6	6
7	0	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4	4	4	4	4	5	5	5	5	5	5	6	6	6	6	6	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
8	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	3	4	4	4	4	4	5	5	5	5	5	6	6	6	6	6	7	7	7	7	7	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
9	0	0	0	1	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	3	4	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9
10	0	0	0	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	4	4	5	5	5	6	6	6	6	6	7	7	7	8	8	8	8	8	9	9	9	9	9	9	10	10	10	10	10	10	10	10	10	10	10	10	10	10
11	0	0	1	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	9	10	10	10	10	10	10	10	10	10	11	11	11	11	11	11	11	11	11
12	0	0	1	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	9	10	10	10	10	10	11	11	11	11	11	11	12	12	12	12	12	12	12
13	0	0	1	1	1	1	2	2	2	2	2	3	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12	12	12	12	12	13	13	13	13	13	13	13	13	13
14	0	0	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	10	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	14	14
15	0	0	1	1	1	2	2	2	2	2	3	3	3	4	4	4	4	4	5	5	5	6	6	6	6	6	7	7	7	8	8	8	8	8	9	9	9	9	10	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	14	14	14	14	15	15	15
16	0	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	5	5	5	5	6	6	6	6	7	7	7	8	8	8	8	9	9	9	9	10	10	10	10	11	11	11	11	12	12	12	12	13	13	13	13	14	14	14	14	15	15	15	15	16	16
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18	0	1	1	1	2	2	2	2	3	3	3	4	4	4	4	5	5	5	6	6	6	7	7	7	8	8	8	8	9	9	9	10	10	10	10	11	11	11	12	12	12	13	13	13	14	14	14	15	15	15	16	16	16	17	17	18	18	18	18	18	18
19	0	1	1	1	2	2	2	3	3	3	3	4	4	4	5	5	5	6	6	6	7	7	7	8	8	8	9	9	9	10	10	10	10	11	11	11	12	12	12	13	13	13	14	14	14	15	15	15	16	16	16	17	17	17	18	18	18	19	19	19	19
20	0	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	6	6	6	7	7	7	8	8	8	9	9	9	10	10	10	10	11	11	11	12	12	12	13	13	13	14	14	14	15	15	15	16	16	16	17	17	17	18	18	18	19	19	20	20	20
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22	0	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	6	6	6	7	7	7	8	8	8	9	9	10	10	10	10	11	11	11	12	12	12	13	13	13	14	14	14	15	15	15	16	16	16	17	17	18	18	18	19	19	20	20	21	21	22
23	0	1	1	2	2	2	3	3	3	4	4	5	5	5	6	6	6	7	7	8	8	8	9	9	9	10	10	10	11	11	12	12	12	13	13	13	14	14	14	15	15	15	16	16	16	17	17	18	18	19	19	19	20	20	21	21	22	22	23	23	23
24	0	1	1	2	2	2	3	3	4	4	4	5	5	6	6	6	7	7	8	8	8	9	9	10	10	10	11	11	12	12	12	13	13	13	14	14	14	15	15	16	16	16	17	17	18	18	18	19	19	19	20	20	20	21	21	22	22	23	23	24	24
25	0	1	1	2	2	2	3	3	4	4	5	5	5	6	6	6	7	7	8	8	8	9	9	10	10	10	11	11	12	12	12	13	13	14	14	14	15	15	16	16	16	17	17	18	18	18	19	19	20	20	20	21	21	22	22	22	23	23	24	25	25
26	0	1	1	2	2	3	3	3	4	4	5	5	6	6	6	7	7	8	8	8	9	9	10	10	10	11	11	12	12	13	13	13	14	14	15	15	16	16	16	17	17	18	18	18	19	19	20	20	20	21	21	22	22	23	23	23	24	24	25	26	26
27	0	1	1	2	2	3	3	4	4	4	5	5	6	6	7	7	8	8	9	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16	17	17	18	18	19	19	20	20	21	21	22	22	23	23	24	24	25	25	26	26	27	27	27	27	27	27
28	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	7	8	8	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	16	17	17	18	18	19	19	20	20	21	21	22	22	23	23	24	24	25	25	26	26	27	27	28	28	28	28	28
29	0	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	13	14	14	15	15	16	16	17	17	18	18	19	19	20	20	21	21	22	22	23	23	24	24	25	25	26	26	27	27	28	28	29	29	29	29
30	0	1	2	2	2	3	4	4	4	5	6	6	6	7	8	8	8	9	10	10	10	11	12	12	12	13	14	14	14	15	16	16	16	17	18	18	18	19	20	20	20	21	22	22	22	23	24	24	24	25	26	26	26	27	28	28	28	29	30	30	30
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32	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	9	9	10	10	11	11	12	12	13	13	14	14	15	15	16	17	17	18	18	19	19	20	20	21	21	22	22	23	23	24	25	25	26	27	27	28	28	29	30	30	31	31	32	32
33	1	1	2	2	3	3	4	4	5	6	6	7	7	8	8	9	9	10	10	11	12	12	13	13	14	14	15	15	16	16	17	18	18	19	19	20	20	21	21	22	23	23	24	24	25	25	26	26	27	28	28	29	29	30	30	31	32	32	33	33	33
34	1	1	2	2	3	3	4	5	5	6	6	7	7	8	8	9	10	10	11	11	12	13	13	14	14	15	15	16	16	17	18	18	19	19	20	20	21	22	22	23	23	24	25	25	26	26	27	27	28	28	29	30	31	31	32	32	33	33	34	34	34
35	1	1	2	2	3	4	4	5	5	6	6	7	8	8	9	9	10	10	11	12	12	13	13	14	15	15	16	16	17	18	18	19	19	20	20	21	22	22	23	23	24	24	25	26	26	27	27	28	29	29	30	30	31	32	32	33	33	34	34	35	35
36	1	1	2	2	3	4	4	5	5	6	7	7	8	8	9	10	10	11	11	12	13	13	14	14	15	16	16	17	17	18	19	19	20	20	21	22	22	23	23	24	25	25	26	26	27	28	28	29	30	31	31	32	32	33	34	34	35	35	36	36	36
37	1	1	2	2	3	4	4	5	6	6	7	7	8	9	9	10	10	11	12	12	13	14	14	15	15	16	16	17	18	18	19	20	20	21	22	22	23	23	24	25	25	26	27	27	28	28	29	30	31	31	32	33	33	34	35	35	36	36	37	37	37
38	1	1	2	3	3	4	4	5	6	6	7	8	8	9	10	10	11	11	12	13	13	14	15	15	16	16	17	18	18	19	20	20	21	22	22	23	23	24	25	25	26	27	27	28	29	29	30	30	31	32	32	33	34	34	35	36	36	37	37	38	38
39	1	1	2	3	3	4	5	5	6	6	7	8	8	9	10	10	11	12	12	13	14	14	15	16	16	17	18	18	19	20	20	21	21	22	23	23	24	25	25	26	27	27	28	29	29	30	31	31	32	32	33	34	34	35	36	36	37	38	38	39	39
40	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	17	18	19	19	20	21	21	22	23	23	24	25	25	26	27	27	28	29	29	30	31	31	32	33	33	34	35	35	36	37	37	38	39	39	40	40
41	1	1	2	3	3	4	5	5	6	7	8	8	9	10	10	11	12	12	13	14	14	15	16	16	17	18	18	19	20	20	21	22	23	23	24	25	25	26	27	27	28	29	29	30	31	31	32	33	33	34	35	36	36	37	38	38	39	40	40	41	41
42	1	1	2	3	4	4	5	6	6	7	8	8	9	10	10	11	12	13	13	14	15	15	16	17	18	18	19	20	20	21	22	22	23	24	24	25	26	27	27	28	29	29	30	31	32	32	33	34	34	35	36	36	37	38	38	39	40	41	41	42	42
43	1	1	2	3	4	4	5	6	6	7	8	9	9	10	11	11	12	13	14	14	15	16	16	17	18	19	19	20	21	22	22	23	24	24	25	26	27	27	28	29	29	30	31	32	32	33	34	34	35	36	37	38	39	39	40	41	42	42	43	43	
44	1	1	2	3	4	4	5	6	7	7	8	9	10	10	11	12	12	13	14	15	15	16	17	18	18	19	20	21	21	22	23	23	24	25	26	26	27	28	29	29	30	31	32	32	33	34	34	35	36	37	37	38	39	40	40	41	42	43	43	44	44
45	1	2	2	3	4	4	5	6	7	8	8	9	10	10	11	12	13	14	14	15	16	16	17	18	19	20	20	21	22	22	23	24	25	26	26	27	28	28	29	30	31	32	32	33	34	34	35	36	37	38	38	39	40	40	41	42	43	44	44	45	45
46	1	2	2	3	4	5	5	6	7	8	8	9	10	11	12	12	13	14	15	15	16	17	18	18	19	20	21	21	22	23	24	25	25	26	27	28	28	29	30	31	31	32	33	34	34	35	36	37	38	38	39	40	41	41	42	43	44	45	46	46	
47	1	2	2	3	4	5	5	6	7	8	9	9	10	11	12	13	13	14	15	16	16	17	18	19	20	20	21	22	23	24	24	25	26	27	27	28	29	30	31	31	32	33	34	34	35	36	37	38	38	39	40	41	42	42	43	44	45	46	47	47	
48	1	2	2	3	4	5	6	6	7	8	9	10	10	11	12	13	14	14	15	16	17	17	18	19	20	21	22	22	23	24	25	25	26	27	28	29	30	30	31	32	33	34	34	35	36	37	38	38	39	40	41	42	42	43	44	45	46	47	48	48	
49	1	2	2	3	4	5	6	7	7	8	9	10	11	11	12	13	14	15	16	16	17	18	19	20	20	21	22	23	24	24	25	26	27	28	29	29	30	31	32	33	34	34	35	36	37	38	38	39	40	41	42	43	44	45	46	47	48	49	49		
50	1	2	2	3	4	5	6	7	8	8	9	10	11	12	12	13	14	15	16	17	18	18	19	20	21	22	22	23	24	25	26	27	28	28	29	30	31	32	32	33	34	35	36	37	38	38	39	40	41	42	42	43	44	45	46	47	48	49	50		
51	1	2	3	3	4	5	6	7	8	8	9	10	11	12	13	14	14	15	16	17	18	19	20	20	21	22	23	24	25	26	26	27	28	29	30	31	32	33	34	35	36	37	38	38	39	40	41	42	43	44	45	46	47	48	48	49	50	51			
52	1	2	3	3	4	5	6	7	8	9	10	10	11	12	13	14	15	15	16	17	18	19	20	21	22	23	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	38	39	40	41	42	43	44	45	46	47	48	49	49	50	51	52			
53	1	2	3	4	4	5	6	7	8	9	10	11	11	12	13	14	15	16	17	18	19	19	20	21	22	23	24	25	26	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	49	50	51	52	53			
54	1	2	3	4	4	5	6	7	8	9	10	11	12	13	14	14	15	16	17	18	19	20	21	22	22	23	24	25	26	27	28	29	30	31	32	32	33	34	35	36	37	38	39	40	40	41	42	43	44	45	46	47	48	49	50	50	51	52	53	54	
55	1	2	3	4	5	6	6	7	8	9	10	11	12	13	14	15	16	16	17	18	19	20	21	22	23	24	25	26	27	28	28	29	30	31	32	33	34	35	36	37	38	38	39	40	41	42	43	44	45	46	47	48	49	50	50	51	52	53	54	55	
56	1	2	3	4	5	6	7	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	49	50	51	52	53	54	55	56	
57	1	2	3	4	5	6	7	8	9	10	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	24	25	26	27	28	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	48	49	50	51	52	53	54	55	56	57
58	1	2	3	4	5	6	7	8	9	10	11	12	13	14	14	15	16	17	18	19	20	21	22	23	24	25	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	
59	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	

Interpoliertabelle

Altitude Correction for Less Than 4 Minutes of Time

Interval of Time	Value from Tables 1 and 2																																				Interval of Time
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84	87	90	93	96	99	102	105	108	111	114	117	120	
m s	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	m s
0 00	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	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 00
10	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	5	5	5	5	5	10
20	0	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	20
30	0	1	1	2	2	2	3	3	3	4	4	5	5	5	6	6	6	7	7	8	8	8	9	9	9	10	10	11	11	11	12	12	12	13	13	14	14	14	15	15	30
40	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	13	14	14	15	15	16	16	17	17	18	18	19	19	20	20	40
0 50	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	16	17	18	18	19	19	20	21	21	22	23	23	24	24	25	0 50
1 00	1	2	2	3	4	5	5	6	7	8	8	9	10	11	11	12	13	14	14	15	16	17	17	18	19	20	20	21	22	23	23	24	25	26	26	27	28	29	29	30	1 00
10	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	23	24	25	25	26	27	28	29	30	31	32	32	33	34	35	10
20	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	20
30	1	2	3	5	6	7	8	9	10	11	12	14	15	16	17	18	19	20	21	23	24	25	26	27	28	29	30	32	33	34	35	36	37	38	39	41	42	43	44	45	30
40	1	3	4	5	6	8	9	10	11	13	14	15	16	18	19	20	21	23	24	25	26	28	29	30	31	33	34	35	36	38	39	40	41	43	44	45	46	48	49	50	40
1 50	1	3	4	6	7	8	10	11	12	14	15	17	18	19	21	22	23	25	26	28	29	30	32	33	34	36	37	39	40	41	43	44	45	47	48	50	51	52	54	55	1 50
2 00	2	3	5	6	8	9	11	12	14	15	17	18	20	21	23	24	26	27	29	30	32	33	35	36	38	39	41	42	44	45	47	48	50	51	53	54	56	57	59	60	2 00
10	2	3	5	7	8	10	11	13	15	16	18	20	21	23	24	26	28	29	31	33	34	36	37	39	41	42	44	46	47	49	50	52	54	55	57	59	60	62	63	65	10
20	2	4	5	7	9	11	12	14	16	18	19	21	23	25	26	28	30	32	33	35	37	39	40	42	44	46	47	49	51	53	54	56	58	60	61	63	65	67	68	70	20
30	2	4	6	8	9	11	13	15	17	19	21	23	24	26	28	30	32	34	36	38	39	41	43	45	47	49	51	53	54	56	58	60	62	64	66	68	69	71	73	75	30
40	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	40
2 50	2	4	6	9	11	13	15	17	19	21	23	26	28	30	32	34	36	38	40	43	45	47	49	51	53	55	57	60	62	64	66	68	70	72	74	77	79	81	83	85	2 50
3 00	2	5	7	9	11	14	16	18	20	23	25	27	29	32	34	36	38	41	43	45	47	50	52	54	56	59	61	63	65	68	70	72	74	77	79	81	83	86	88	90	3 00
10	2	5	7	10	12	14	17	19	21	24	26	29	31	33	36	38	40	43	45	48	50	52	55	57	59	62	64	67	69	71	74	76	78	81	83	86	88	90	93	95	10
20	3	5	8	10	13	15	18	20	23	25	28	30	33	35	38	40	43	45	48	50	53	55	58	60	63	65	68	70	73	75	78	80	83	85	88	90	93	95	98	100	20
30	3	5	8	11	13	16	18	21	24	26	29	32	34	37	39	42	45	47	50	53	55	58	60	63	66	68	71	74	76	79	81	84	87	89	92	95	97	100	102	105	30
40	3	6	8	11	14	17	19	22	25	28	30	33	36	39	41	44	47	50	52	55	58	61	63	66	69	72	74	77	80	83	85	88	91	94	96	99	102	105	107	110	40
3 50	3	6	9	12	14	17	20	23	26	29	32	35	37	40	43	46	49	52	55	58	60	63	66	69	72	75	78	81	83	86	89	92	95	98	101	104	106	109	112	115	3 50
4 00	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	63	66	69	72	75	78	81	84	87	90	93	96	99	102	105	108	111	114	117	120	4 00

Time of fix (tab 1) or computation (tab 2)	Sign from 4-min. Table	To observed altitude	To tabulated altitude	To Intercept
Later than observation	+	Add	Subtract	Toward
	−	Subtract	Add	Away
Earlier than observation	+	Subtract	Add	Away
	−	Add	Subtract	Toward

Altitude Correction for Change in Position of Observer

Correction for 4 Minutes of Time

Rel. Zn	Ground Speed in Knots																	Rel. Zn
	50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	
°	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	°
000	+3	+7	+10	+13	+17	+20	+23	+27	+30	+33	+37	+40	+43	+47	+50	+53	+57	+60	000
005	3	7	10	13	17	20	23	27	30	33	37	40	43	46	50	53	56	60	355
010	3	7	10	13	16	20	23	26	30	33	36	39	43	46	49	53	56	59	350
015	3	6	10	13	16	19	23	26	29	32	35	39	42	45	48	52	55	58	345
020	3	6	9	13	16	19	22	25	28	31	34	38	41	44	47	50	53	56	340
025	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	335
030	+3	+6	+9	+12	+14	+17	+20	+23	+26	+29	+32	+35	+38	+40	+43	+46	+49	+52	330
035	3	5	8	11	14	16	19	22	25	27	30	33	35	38	41	44	46	49	325
040	3	5	8	10	13	15	18	20	23	26	28	31	33	36	38	41	43	46	320
045	2	5	7	9	12	14	16	19	21	24	26	28	31	33	35	38	40	42	315
050	2	4	6	9	11	13	15	17	19	21	24	26	28	30	32	34	36	39	310
055	2	4	6	8	10	11	13	15	17	19	21	23	25	27	29	31	33	34	305
060	+2	+3	+5	+7	+8	+10	+12	+13	+15	+17	+18	+20	+22	+23	+25	+27	+28	+30	300
065	1	3	4	6	7	8	10	11	13	14	15	17	18	20	21	23	24	25	295
070	1	2	3	5	6	7	8	9	10	11	13	14	15	16	17	18	19	21	290
075	1	2	3	3	4	5	6	7	8	9	9	10	11	12	13	14	15	16	285
080	1	1	2	2	3	3	4	5	5	6	6	7	8	8	9	9	10	10	280
085	+0	+1	+1	+1	+1	+2	+2	+2	+3	+3	+3	+3	+4	+4	+4	+5	+5	+5	275
090	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	270
095	−0	−1	−1	−1	−1	−2	−2	−2	−3	−3	−3	−3	−4	−4	−4	−5	−5	−5	265
100	1	1	2	2	3	3	4	5	5	6	6	7	8	8	9	9	10	10	260
105	1	2	3	3	4	5	6	7	8	9	9	10	11	12	13	14	15	16	255
110	1	2	3	5	6	7	8	9	10	11	13	14	15	16	17	18	19	21	250
115	1	3	4	6	7	8	10	11	13	14	15	17	18	20	21	23	24	25	245
120	2	3	5	7	8	10	12	13	15	17	18	20	22	23	25	27	28	30	240
125	−2	−4	−6	−8	−10	−11	−13	−15	−17	−19	−21	−23	−25	−27	−29	−31	−33	−34	235
130	2	4	6	9	11	13	15	17	19	21	24	26	28	30	32	34	36	39	230
135	2	5	7	9	12	14	16	19	21	24	26	28	31	33	35	38	40	42	225
140	3	5	8	10	13	15	18	20	23	26	28	31	33	36	38	41	43	46	220
145	3	5	8	11	14	16	19	22	25	27	30	33	35	38	41	44	46	49	215
150	3	6	9	12	14	17	20	23	26	29	32	35	38	40	43	46	49	52	210
155	−3	−6	−9	−12	−15	−18	−21	−24	−27	−30	−33	−36	−39	−42	−45	−48	−51	−54	205
160	3	6	9	13	16	19	22	25	28	31	34	38	41	44	47	50	53	56	200
165	3	6	10	13	16	19	23	26	29	32	35	39	42	45	48	52	55	58	195
170	3	7	10	13	16	20	23	26	30	33	36	39	43	46	49	53	56	59	190
175	3	7	10	13	17	20	23	27	30	33	37	40	43	46	50	53	56	60	185
180	−3	−7	−10	−13	−17	−20	−23	−27	−30	−33	−37	−40	−43	−47	−50	−53	−57	−60	180

Time of fix (tab 1) or computation (tab 2)	Sign from 4-min. Table	To observed altitude	To tabulated altitude	To intercept
Later than observation	+	Add	Subtract	Toward
	−	Subtract	Add	Away
Earlier than observation	+	Subtract	Add	Away
	−	Add	Subtract	Toward

Altitude Correction for Change in Position of Body

Correction for 4 Minutes of Time

True Zn	Latitude in Degrees																	True Zn
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	
°	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	°
090	+60	+60	+59	+58	+56	+54	+52	+49	+46	+42	+39	+34	+30	+25	+21	+16	+10	+5	090
095	60	60	59	58	56	54	52	49	46	42	38	34	30	25	20	15	10	5	085
100	59	59	58	57	56	54	51	48	45	42	38	34	30	25	20	15	10	5	080
105	58	58	57	56	54	53	50	47	44	41	37	33	29	24	20	15	10	5	075
110	56	56	56	54	53	51	49	46	43	40	36	32	28	24	19	15	10	5	070
115	54	54	54	53	51	49	47	45	42	38	35	31	27	23	19	14	9	5	065
120	+52	+52	+51	+50	+49	+47	+45	+43	+40	+37	+33	+30	+26	+22	+18	+13	+9	+5	060
125	49	49	48	47	46	45	43	40	38	35	32	28	25	21	17	13	9	4	055
130	46	46	45	44	43	42	40	38	35	33	30	26	23	19	16	12	8	4	050
135	42	42	42	41	40	38	37	35	33	30	27	24	21	18	15	11	7	4	045
140	39	38	38	37	36	35	33	32	30	27	25	22	19	16	13	10	7	3	040
145	34	34	34	33	32	31	30	28	26	24	22	20	17	15	12	9	6	3	035
150	+30	+30	+30	+29	+28	+27	+26	+25	+23	+21	+19	+17	+15	+13	+10	+8	+5	+3	030
155	25	25	25	24	24	23	22	21	19	18	16	15	13	11	9	7	4	2	025
160	21	20	20	20	19	19	18	17	16	15	13	12	10	9	7	5	4	2	020
165	16	15	15	15	15	14	13	13	12	11	10	9	8	7	5	4	3	1	015
170	10	10	10	10	10	9	9	9	8	7	7	6	5	4	4	3	2	1	010
175	+5	+5	+5	+5	+5	+5	+5	+4	+4	+4	+3	+3	+3	+2	+2	+1	+1	+0	005
180	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	000
185	−5	−5	−5	−5	−5	−5	−5	−4	−4	−4	−3	−3	−3	−2	−2	−1	−1	−0	355
190	10	10	10	10	10	9	9	9	8	7	7	6	5	4	4	3	2	1	350
195	16	15	15	15	15	14	13	13	12	11	10	9	8	7	5	4	3	1	345
200	21	20	20	20	19	19	18	17	16	15	13	12	10	9	7	5	4	2	340
205	25	25	25	24	24	23	22	21	19	18	16	15	13	11	9	7	4	2	335
210	30	30	30	29	28	27	26	25	23	21	19	17	15	13	10	8	5	3	330
215	−34	−34	−34	−33	−32	−31	−30	−28	−26	−24	−22	−20	−17	−15	−12	−9	−6	−3	325
220	39	38	38	37	36	35	33	32	30	27	25	22	19	16	13	10	7	3	320
225	42	42	42	41	40	38	37	35	33	30	27	24	21	18	15	11	7	4	315
230	46	46	45	44	43	42	40	38	35	33	30	26	23	19	16	12	8	4	310
235	49	49	48	47	46	45	43	40	38	35	32	28	25	21	17	13	9	4	305
240	52	52	51	50	49	47	45	43	40	37	33	30	26	22	18	13	9	5	300
245	−54	−54	−54	−53	−51	−49	−47	−45	−42	−38	−35	−31	−27	−23	−19	−14	−9	−5	295
250	56	56	56	54	53	51	49	46	43	40	36	32	28	24	19	15	10	5	290
255	58	58	57	56	54	53	50	47	44	41	37	33	29	24	20	15	10	5	285
260	59	59	58	57	56	54	51	48	45	42	38	34	30	25	20	15	10	5	280
265	60	60	59	58	56	54	52	49	46	42	38	34	30	25	20	15	10	5	275
270	−60	−60	−59	−58	−56	−54	−52	−49	−46	−42	−39	−34	−30	−25	−21	−16	−10	−5	270

Time of fix (tab 1) or computation (tab 2)	Sign from 4-min. Table	To observed altitude	To tabulated altitude	To intercept
Later than observation	+	Add	Subtract	Toward
	−	Subtract	Add	Away
Earlier than observation	+	Subtract	Add	Away
	−	Add	Subtract	Toward

Refraction

TO BE *SUBTRACTED* FROM SEXTANT ALTITUDE

R	(a) Height in thousands of feet												R
	0	5	10	15	20	25	30	35	40	45	50	55	
′	°	°	°	°	°	°	°	°	°	°	°	°	′
0	90	90	90	90	90	90	90	90	90	90	90	90	0
1	63	59	55	51	46	41	36	31	26	20	17	13	1
2	33	29	26	22	19	16	14	11	10	10	10	10	2
3	21	19	16	14	12	10	10	10					3
4	16	14	12	10	10								4
5	12	11	10										5
	10	10											

R	(b) Height in thousands of metres																R
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	
0	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	0
1	63	61	58	55	53	50	46	43	40	37	33	30	26	23	20	17	15	13	11	10	1
2	33	31	28	26	24	21	19	17	16	14	12	11	10	10	10	10	10	10	10		2
3	21	20	18	16	15	13	12	11	10	10	10	10									3
4	16	14	13	12	11	10	10	10													4
5	12	11	10	10	10																5
	10	10																			

Choose the column appropriate to height, in units of 1000 feet in table 8(a) or in units of 1000 metres in table 8(b), and find the range of altitude in which the sextant altitude lies; the corresponding value of *R* is the refraction to be subtracted from the sextant altitude.

TABLE 9—CORIOLIS (*Z*) CORRECTION

Ground speed knots	Latitude										Ground speed knots
	0°	10°	20°	30°	40°	50°	60°	70°	80°	90°	
	′	′	′	′	′	′	′	′	′	′	
50	0	0	0	1	1	1	1	1	1	1	50
100	0	0	1	1	2	2	2	2	3	3	100
150	0	1	1	2	3	3	3	4	4	4	150
200	0	1	2	3	3	4	5	5	5	5	200
250	0	1	2	3	4	5	6	6	6	7	250
300	0	1	3	4	5	6	7	7	8	8	300
350	0	2	3	5	6	7	8	9	9	9	350
400	0	2	4	5	7	8	9	10	10	10	400
450	0	2	4	6	8	9	10	11	12	12	450
500	0	2	4	7	8	10	11	12	13	13	500
550	0	3	5	7	9	11	12	14	14	14	550
600	0	3	5	8	10	12	14	15	16	16	600
650	0	3	6	9	11	13	15	16	17	17	650
700	0	3	6	9	12	14	16	17	18	18	700
750	0	3	7	10	13	15	17	18	19	20	750
800	0	4	7	10	13	16	18	20	21	21	800
850	0	4	8	11	14	17	19	21	22	22	850
900	0	4	8	12	15	18	20	22	23	24	900

Apply by moving the position line a distance *Z* to starboard (right) of the track in northern latitudes, and to port (left) in southern latitudes.

STANDARD DOME REFRACTION

To be *subtracted* from sextant altitude when using sextant suspension in a perspex dome.

Alt.	Refn.	Alt.	Refn.
°	′	°	′
10	8	50	4
20	7	60	4
30	6	70	3
40	5	80	3

This table must not be used if a calibration table is fitted to the dome, or if a flat glass plate is provided, or for non-standard domes.

BUBBLE SEXTANT ERROR

Sextant No.

Alt.	Corr.
°	′

Correction for Polaris

LHA ♈	Q	LHA ♈	Q	LHA ♈	Q	LHA ♈	Q	LHA ♈	Q	LHA ♈	Q	LHA ♈	Q	LHA ♈	Q
° ′	′	° ′	′	° ′	′	° ′	′	° ′	′	° ′	′	° ′	′	° ′	′
358 46	−36	86 00	−29	120 50	− 4	153 30	+21	227 46	+44	281 46	+19	314 17	− 6	349 32	−31
0 50	−37	87 38	−28	122 07	− 3	154 56	+22	233 14	+43	283 10	+18	315 33	− 7	351 16	−32
3 01	−38	89 14	−27	123 23	− 2	156 23	+23	237 18	+42	284 32	+17	316 50	− 8	353 02	−33
5 20	−39	90 49	−26	124 39	− 1	157 51	+24	240 42	+41	285 55	+16	318 07	− 9	354 53	−34
7 48	−40	92 21	−25	125 54	0	159 21	+25	243 42	+40	287 16	+15	319 24	−10	356 47	−35
10 29	−41	93 52	−24	127 11	+ 1	160 53	+26	246 25	+39	288 36	+14	320 42	−11	358 46	−36
13 27	−42	95 21	−23	128 27	+ 2	162 26	+27	248 55	+38	289 56	+13	322 00	−12	0 50	−37
16 49	−43	96 49	−22	129 43	+ 3	164 01	+28	251 15	+37	291 16	+12	323 19	−13	3 01	−38
20 50	−44	98 15	−21	130 59	+ 4	165 37	+29	253 28	+36	292 35	+11	324 38	−14	5 20	−39
26 13	−45	99 40	−20	132 16	+ 5	167 17	+30	255 33	+35	293 53	+10	325 57	−15	7 48	−40
47 38	−44	101 05	−19	133 32	+ 6	168 58	+31	257 34	+34	295 11	+ 9	327 18	−16	10 29	−41
53 01	−43	102 28	−18	134 49	+ 7	170 43	+32	259 29	+33	296 28	+ 8	328 39	−17	13 27	−42
57 02	−42	103 51	−17	136 05	+ 8	172 31	+33	261 20	+32	297 46	+ 7	330 00	−18	16 49	−43
60 24	−41	105 12	−16	137 23	+ 9	174 22	+34	263 08	+31	299 02	+ 6	331 23	−19	20 50	−44
63 22	−40	106 33	−15	138 40	+10	176 17	+35	264 53	+30	300 19	+ 5	332 46	−20	26 13	−45
66 03	−39	107 54	−14	139 58	+11	178 18	+36	266 34	+29	301 35	+ 4	334 11	−21	47 38	−44
68 31	−38	109 13	−13	141 16	+12	180 23	+37	268 14	+28	302 52	+ 3	335 36	−22	53 01	−43
70 50	−37	110 32	−12	142 35	+13	182 36	+38	269 50	+27	304 08	+ 2	337 02	−23	57 02	−42
73 01	−36	111 51	−11	143 55	+14	184 56	+39	271 25	+26	305 24	+ 1	338 30	−24	60 24	−41
75 05	−35	113 09	−10	145 15	+15	187 26	+40	272 58	+25	306 40	0	339 59	−25	63 22	−40
77 04	−34	114 27	− 9	146 35	+16	190 09	+41	274 30	+24	307 57	− 1	341 30	−26	66 03	−39
78 58	−33	115 44	− 8	147 56	+17	193 09	+42	276 00	+23	309 12	− 2	343 02	−27	68 31	−38
80 49	−32	117 01	− 7	149 19	+18	196 33	+43	277 28	+22	310 28	− 3	344 37	−28	70 50	−37
82 35	−31	118 18	− 6	150 41	+19	200 37	+44	278 55	+21	311 44	− 4	346 13	−29	73 01	−36
84 19	−30	119 34	− 5	152 05	+20	206 05	+45	280 21	+20	313 01	− 5	347 51	−30	75 05	−35
86 00		120 50		153 30		227 46		281 46		314 17		349 32		77 04	

The above table, which does *not* include refraction, gives the quantity Q to be applied to the corrected sextant altitude of *Polaris* to give the latitude of the observer. In critical cases ascend.

Polaris: Mag. 2.1, SHA 323 04′, Dec N 89° 14′.7

TABLE 7 — AZIMUTH OF *POLARIS*

LHA ♈	Latitude							LHA ♈	Latitude						
	0°	30°	50°	55°	60°	65°	70°		0°	30°	50°	55°	60°	65°	70°
°	°	°	°	°	°	°	°	°	°	°	°	°	°	°	°
0	0·5	0·5	0·7	0·8	0·9	1·1	1·4	180	359·5	359·5	359·3	359·2	359·1	359·0	358·7
10	0·3	0·4	0·5	0·6	0·7	0·8	1·0	190	359·7	359·6	359·5	359·4	359·3	359·2	359·0
20	0·2	0·3	0·3	0·4	0·4	0·5	0·7	200	359·8	359·7	359·7	359·6	359·6	359·5	359·4
30	0·1	0·1	0·1	0·2	0·2	0·2	0·3	210	359·9	359·9	359·9	359·8	359·8	359·8	359·7
40	0·0	0·0	359·9	359·9	359·9	359·9	359·9	220	0·0	0·0	0·1	0·1	0·1	0·1	0·1
50	359·8	359·8	359·7	359·7	359·7	359·6	359·5	230	0·2	0·2	0·3	0·3	0·3	0·4	0·5
60	359·7	359·7	359·5	359·5	359·4	359·3	359·1	240	0·3	0·3	0·5	0·5	0·6	0·7	0·8
70	359·6	359·5	359·4	359·3	359·2	359·0	358·8	250	0·4	0·5	0·6	0·7	0·8	1·0	1·2
80	359·5	359·4	359·2	359·1	359·0	358·8	358·5	260	0·5	0·6	0·8	0·9	1·0	1·2	1·5
90	359·4	359·3	359·1	358·9	358·8	358·5	358·2	270	0·6	0·7	0·9	1·0	1·2	1·4	1·7
100	359·3	359·2	358·9	358·8	358·6	358·4	358·0	280	0·7	0·8	1·0	1·2	1·3	1·6	1·9
110	359·3	359·2	358·9	358·7	358·5	358·3	357·9	290	0·7	0·8	1·1	1·3	1·4	1·7	2·1
120	359·3	359·1	358·8	358·7	358·5	358·2	357·8	300	0·7	0·9	1·2	1·3	1·5	1·8	2·2
130	359·2	359·1	358·8	358·7	358·5	358·2	357·8	310	0·8	0·9	1·2	1·3	1·5	1·8	2·2
140	359·3	359·2	358·9	358·7	358·5	358·3	357·9	320	0·7	0·9	1·1	1·3	1·5	1·8	2·2
150	359·3	359·2	358·9	358·8	358·6	358·4	358·0	330	0·7	0·8	1·1	1·2	1·4	1·7	2·1
160	359·4	359·3	359·0	358·9	358·8	358·5	358·2	340	0·6	0·7	1·0	1·1	1·3	1·5	1·9
170	359·4	359·4	359·2	359·1	358·9	358·7	358·4	350	0·6	0·6	0·9	1·0	1·1	1·3	1·7
180	359·5	359·5	359·3	359·2	359·1	359·0	358·7	360	0·5	0·5	0·7	0·8	0·9	1·1	1·4

When Cassiopeia is left (right), *Polaris* is west (east).

Altitude Correction for Change in Position of Body

Correction for 4 Minutes of Time

True Zn	Latitude in Degrees																		True Zn
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	
°	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	°
090	+60	+60	+59	+58	+56	+54	+52	+49	+46	+42	+39	+34	+30	+25	+21	+16	+10	+5	090
095	60	60	59	58	56	54	52	49	46	42	38	34	30	25	20	15	10	5	085
100	59	59	58	57	56	54	51	48	45	42	38	34	30	25	20	15	10	5	080
105	58	58	57	56	54	53	50	47	44	41	37	33	29	24	20	15	10	5	075
110	56	56	56	54	53	51	49	46	43	40	36	32	28	24	19	15	10	5	070
115	54	54	54	53	51	49	47	45	42	38	35	31	27	23	19	14	9	5	065
120	+52	+52	+51	+50	+49	+47	+45	+43	+40	+37	+33	+30	+26	+22	+18	+13	+9	+5	060
125	49	49	48	47	46	45	43	40	38	35	32	28	25	21	17	13	9	4	055
130	46	46	45	44	43	42	40	38	35	33	30	26	23	19	16	12	8	4	050
135	42	42	42	41	40	38	37	35	33	30	27	24	21	18	15	11	7	4	045
140	39	38	38	37	36	35	33	32	30	27	25	22	19	16	13	10	7	3	040
145	34	34	34	33	32	31	30	28	26	24	22	20	17	15	12	9	6	3	035
150	+30	+30	+30	+29	+28	+27	+26	+25	+23	+21	+19	+17	+15	+13	+10	+8	+5	+3	030
155	25	25	25	24	24	23	22	21	19	18	16	15	13	11	9	7	4	2	025
160	21	20	20	20	19	19	18	17	16	15	13	12	10	9	7	5	4	2	020
165	16	15	15	15	15	14	13	13	12	11	10	9	8	7	5	4	3	1	015
170	10	10	10	10	10	9	9	9	8	7	7	6	5	4	4	3	2	1	010
175	+5	+5	+5	+5	+5	+5	+5	+4	+4	+4	+3	+3	+3	+2	+2	+1	+1	+0	005
180	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	000
185	−5	−5	−5	−5	−5	−5	−5	−4	−4	−4	−3	−3	−3	−2	−2	−1	−1	−0	355
190	10	10	10	10	10	9	9	9	8	7	7	6	5	4	4	3	2	1	350
195	16	15	15	15	15	14	13	13	12	11	10	9	8	7	5	4	3	1	345
200	21	20	20	20	19	19	18	17	16	15	13	12	10	9	7	5	4	2	340
205	25	25	25	24	24	23	22	21	19	18	16	15	13	11	9	7	4	2	335
210	30	30	30	29	28	27	26	25	23	21	19	17	15	13	10	8	5	3	330
215	−34	−34	−34	−33	−32	−31	−30	−28	−26	−24	−22	−20	−17	−15	−12	−9	−6	−3	325
220	39	38	38	37	36	35	33	32	30	27	25	22	19	16	13	10	7	3	320
225	42	42	42	41	40	38	37	35	33	30	27	24	21	18	15	11	7	4	315
230	46	46	45	44	43	42	40	38	35	33	30	26	23	19	16	12	8	4	310
235	49	49	48	47	46	45	43	40	38	35	32	28	25	21	17	13	9	4	305
240	52	52	51	50	49	47	45	43	40	37	33	30	26	22	18	13	9	5	300
245	−54	−54	−54	−53	−51	−49	−47	−45	−42	−38	−35	−31	−27	−23	−19	−14	−9	−5	295
250	56	56	56	54	53	51	49	46	43	40	36	32	28	24	19	15	10	5	290
255	58	58	57	56	54	53	50	47	44	41	37	33	29	24	20	15	10	5	285
260	59	59	58	57	56	54	51	48	45	42	38	34	30	25	20	15	10	5	280
265	60	60	59	58	56	54	52	49	46	42	38	34	30	25	20	15	10	5	275
270	−60	−60	−59	−58	−56	−54	−52	−49	−46	−42	−39	−34	−30	−25	−21	−16	−10	−5	270

Interpolation for Altitude Correction for Less Than 4 Minutes of Time

Interval of Time	Value from Tables 1 and 2 (For values less than 60′ see opposite page)																				Interval of Time
m s	63	66	69	72	75	78	81	84	87	90	93	96	99	102	105	108	111	114	117	120	m s
	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	
0 00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 00
10	3	3	3	3	3	3	3	4	4	4	4	4	4	4	4	5	5	5	5	5	10
20	5	6	6	6	6	7	7	7	7	8	8	8	8	9	9	9	9	10	10	10	20
30	8	8	9	9	9	10	10	11	11	11	12	12	12	13	13	14	14	14	15	15	30
40	11	11	12	12	13	13	14	14	15	15	16	16	17	17	18	18	19	19	20	20	40
0 50	13	14	14	15	16	16	17	18	18	19	19	20	21	21	22	23	23	24	24	25	0 50
1 00	16	17	17	18	19	20	20	21	22	23	23	24	25	26	26	27	28	29	29	30	1 00
10	18	19	20	21	22	23	24	25	25	26	27	28	29	30	31	32	32	33	34	35	10
20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	20
30	24	25	26	27	28	29	30	32	33	34	35	36	37	38	39	41	42	43	44	45	30
40	26	28	29	30	31	33	34	35	36	38	39	40	41	43	44	45	46	48	49	50	40
1 50	29	30	32	33	34	36	37	39	40	41	43	44	45	47	48	50	51	52	54	55	1 50
2 00	32	33	35	36	38	39	41	42	44	45	47	48	50	51	53	54	56	57	59	60	2 00
10	34	36	37	39	41	42	44	46	47	49	50	52	54	55	57	59	60	62	63	65	10
20	37	39	40	42	44	46	47	49	51	53	54	56	58	60	61	63	65	67	68	70	20
30	39	41	43	45	47	49	51	53	54	56	58	60	62	64	66	68	69	71	73	75	30
40	42	44	46	48	50	52	54	56	58	60	62	64	66	68	70	72	74	76	78	80	40
2 50	45	47	49	51	53	55	57	60	62	64	66	68	70	72	74	77	79	81	83	85	2 50
3 00	47	50	52	54	56	59	61	63	65	68	70	72	74	77	79	81	83	86	88	90	3 00
10	50	52	55	57	59	62	64	67	69	71	74	76	78	81	83	86	88	90	93	95	10
20	53	55	58	60	63	65	68	70	73	75	78	80	83	85	88	90	93	95	98	100	20
30	55	58	60	63	66	68	71	74	76	79	81	84	87	89	92	95	97	100	102	105	30
40	58	61	63	66	69	72	74	77	80	83	85	88	91	94	96	99	102	105	107	110	40
3 50	60	63	66	69	72	75	78	81	83	86	89	92	95	98	101	104	106	109	112	115	3 50
4 00	63	66	69	72	75	78	81	84	87	90	93	96	99	102	105	108	111	114	117	120	4 00

Time of fix (tab 1) or computation (tab 2)	Sign from 4-min. Table	To observed altitude	To tabulated altitude	To intercept
Later than observation	+	Add	Subtract	Toward
	−	Subtract	Add	Away
Earlier than observation	+	Subtract	Add	Away
	−	Add	Subtract	Toward

Altitude Correction for Change in Position of Observer

Correction for 4 Minutes of Time

Rel. Zn	Ground Speed in Knots																		Rel. Zn
	50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	
°	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	°
000	+3	+7	+10	+13	+17	+20	+23	+27	+30	+33	+37	+40	+43	+47	+50	+53	+57	+60	000
005	3	7	10	13	17	20	23	27	30	33	37	40	43	46	50	53	56	60	355
010	3	7	10	13	16	20	23	26	30	33	36	39	43	46	49	53	56	59	350
015	3	6	10	13	16	19	23	26	29	32	35	39	42	45	48	52	55	58	345
020	3	6	9	13	16	19	22	25	28	31	34	38	41	44	47	50	53	56	340
025	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	335
030	+3	+6	+9	+12	+14	+17	+20	+23	+26	+29	+32	+35	+38	+40	+43	+46	+49	+52	330
035	3	5	8	11	14	16	19	22	25	27	30	33	35	38	41	44	46	49	325
040	3	5	8	10	13	15	18	20	23	26	28	31	33	36	38	41	43	46	320
045	2	5	7	9	12	14	16	19	21	24	26	28	31	33	35	38	40	42	315
050	2	4	6	9	11	13	15	17	19	21	24	26	28	30	32	34	36	39	310
055	2	4	6	8	10	11	13	15	17	19	21	23	25	27	29	31	33	34	305
060	+2	+3	+5	+7	+8	+10	+12	+13	+15	+17	+18	+20	+22	+23	+25	+27	+28	+30	300
065	1	3	4	6	7	8	10	11	13	14	15	17	18	20	21	23	24	25	295
070	1	2	3	5	6	7	8	9	10	11	13	14	15	16	17	18	19	21	290
075	1	2	3	3	4	5	6	7	8	9	9	10	11	12	13	14	15	16	285
080	1	1	2	2	3	3	4	5	5	6	6	7	8	8	9	9	10	10	280
085	+0	+1	+1	+1	+1	+2	+2	+2	+3	+3	+3	+3	+4	+4	+4	+5	+5	+5	275
090	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	270
095	−0	−1	−1	−1	−1	−2	−2	−2	−3	−3	−3	−3	−4	−4	−4	−5	−5	−5	265
100	1	1	2	2	3	3	4	5	5	6	6	7	8	8	9	9	10	10	260
105	1	2	3	3	4	5	6	7	8	9	9	10	11	12	13	14	15	16	255
110	1	2	3	5	6	7	8	9	10	11	13	14	15	16	17	18	19	21	250
115	1	3	4	6	7	8	10	11	13	14	15	17	18	20	21	23	24	25	245
120	2	3	5	7	8	10	12	13	15	17	18	20	22	23	25	27	28	30	240
125	−2	−4	−6	−8	−10	−11	−13	−15	−17	−19	−21	−23	−25	−27	−29	−31	−33	−34	235
130	2	4	6	9	11	13	15	17	19	21	24	26	28	30	32	34	36	39	230
135	2	5	7	9	12	14	16	19	21	24	26	28	31	33	35	38	40	42	225
140	3	5	8	10	13	15	18	20	23	26	28	31	33	36	38	41	43	46	220
145	3	5	8	11	14	16	19	22	25	27	30	33	35	38	41	44	46	49	215
150	3	6	9	12	14	17	20	23	26	29	32	35	38	40	43	46	49	52	210
155	−3	−6	−9	−12	−15	−18	−21	−24	−27	−30	−33	−36	−39	−42	−45	−48	−51	−54	205
160	3	6	9	13	16	19	22	25	28	31	34	38	41	44	47	50	53	56	200
165	3	6	10	13	16	19	23	26	29	32	35	39	42	45	48	52	55	58	195
170	3	7	10	13	16	20	23	26	30	33	36	39	43	46	49	53	56	59	190
175	3	7	10	13	17	20	23	27	30	33	37	40	43	46	50	53	56	60	185
180	−3	−7	−10	−13	−17	−20	−23	−27	−30	−33	−37	−40	−43	−47	−50	−53	−57	−60	180

Interpolation for Altitude Correction for Less Than 4 Minutes of Time

Interval of Time	Value from Tables 1 and 2 (For values greater than 60′ see opposite page)																				Interval of Time
	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	
m s	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	m s
0 00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0 00
10	0	0	0	1	1	1	1	1	1	1	1	2	2	2	2	2	2	2	2	3	10
20	0	1	1	1	1	2	2	2	2	3	3	3	3	4	4	4	4	5	5	5	20
30	0	1	1	2	2	2	3	3	3	4	4	5	5	5	6	6	6	7	7	8	30
40	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10	10	40
0 50	1	1	2	3	3	4	4	5	6	6	7	8	8	9	9	10	11	11	12	13	0 50
1 00	1	2	2	3	4	5	5	6	7	8	8	9	10	11	11	12	13	14	14	15	1 00
10	1	2	3	4	4	5	6	7	8	9	10	11	11	12	13	14	15	16	17	18	10
20	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	20
30	1	2	3	5	6	7	8	9	10	11	12	14	15	16	17	18	19	20	21	23	30
40	1	3	4	5	6	8	9	10	11	13	14	15	16	18	19	20	21	23	24	25	40
1 50	1	3	4	6	7	8	10	11	12	14	15	17	18	19	21	22	23	25	26	28	1 50
2 00	2	3	5	6	8	9	11	12	14	15	17	18	20	21	23	24	26	27	29	30	2 00
10	2	3	5	7	8	10	11	13	15	16	18	20	21	23	24	26	28	29	31	33	10
20	2	4	5	7	9	11	12	14	16	18	19	21	23	25	26	28	30	32	33	35	20
30	2	4	6	8	9	11	13	15	17	19	21	23	24	26	28	30	32	34	36	38	30
40	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	40
2 50	2	4	6	9	11	13	15	17	19	21	23	26	28	30	32	34	36	38	40	43	2 50
3 00	2	5	7	9	11	14	16	18	20	23	25	27	29	32	34	36	38	41	43	45	3 00
10	2	5	7	10	12	14	17	19	21	24	26	29	31	33	36	38	40	43	45	48	10
20	3	5	8	10	13	15	18	20	23	25	28	30	33	35	38	40	43	45	48	50	20
30	3	5	8	11	13	16	18	21	24	26	29	32	34	37	39	42	45	47	50	53	30
40	3	6	8	11	14	17	19	22	25	28	30	33	36	39	41	44	47	50	52	55	40
3 50	3	6	9	12	14	17	20	23	26	29	32	35	37	40	43	46	49	52	55	58	3 50
4 00	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	4 00

Time of fix (tab 1) or computation (tab 2)	Sign from 4-min. Table	To observed altitude	To tabulated altitude	To intercept
Later than observation	+	Add	Subtract	Toward
	−	Subtract	Add	Away
Earlier than observation	+	Subtract	Add	Away
	−	Add	Subtract	Toward

Altitude Correction for Change in Position of Observer M.O.O.

To facilitate use of Pub. No. 249, Volumes 1, 2, and 3.

CORRECTION FOR 1 MINUTE OF TIME

Rel. Zn	GROUND SPEED IN KNOTS 50	100	150	200	250	300	350	400	450	500	550	600	650	700	750	800	850	900	Rel. Zn
°	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	°
000	+ 0.8	+ 1.7	+ 2.5	+ 3.3	+ 4.2	+ 5.0	+ 5.8	+ 6.7	+ 7.5	+ 8.3	+ 9.2	+ 10.0	+ 10.8	+ 11.7	+ 12.5	+ 13.3	+ 14.2	+ 15.0	000
002	0.8	1.7	2.5	3.3	4.2	5.0	5.8	6.7	7.5	8.3	9.2	10.0	10.8	11.7	12.5	13.3	14.2	15.0	358
004	0.8	1.7	2.5	3.3	4.2	5.0	5.8	6.7	7.5	8.3	9.1	10.0	10.8	11.6	12.5	13.3	14.1	15.0	356
006	0.8	1.7	2.5	3.3	4.1	5.0	5.8	6.6	7.5	8.3	9.1	9.9	10.8	11.6	12.4	13.3	14.1	14.9	354
008	0.8	1.7	2.5	3.3	4.1	5.0	5.8	6.6	7.4	8.3	9.1	9.9	10.7	11.6	12.4	13.2	14.0	14.9	352
010	+ 0.8	+ 1.6	+ 2.5	+ 3.3	+ 4.1	+ 4.9	+ 5.7	+ 6.6	+ 7.4	+ 8.2	+ 9.0	+ 9.8	+ 10.7	+ 11.5	+ 12.3	+ 13.1	+ 14.0	+ 14.8	350
012	0.8	1.6	2.4	3.3	4.1	4.9	5.7	6.5	7.3	8.2	9.0	9.8	10.6	11.4	12.2	13.0	13.9	14.7	348
014	0.8	1.6	2.4	3.2	4.0	4.9	5.7	6.5	7.3	8.1	8.9	9.7	10.5	11.3	12.1	12.9	13.7	14.6	346
016	0.8	1.6	2.4	3.2	4.0	4.8	5.6	6.4	7.2	8.0	8.8	9.6	10.4	11.2	12.0	12.8	13.6	14.4	344
018	0.8	1.6	2.4	3.2	4.0	4.8	5.5	6.3	7.1	7.9	8.7	9.5	10.3	11.1	11.9	12.7	13.5	14.3	342
020	+ 0.8	+ 1.6	+ 2.3	+ 3.1	+ 3.9	+ 4.7	+ 5.5	+ 6.3	+ 7.0	+ 7.8	+ 8.6	+ 9.4	+ 10.2	+ 11.0	+ 11.7	+ 12.5	+ 13.3	+ 14.1	340
022	0.8	1.5	2.3	3.1	3.9	4.6	5.4	6.2	7.0	7.7	8.5	9.3	10.0	10.8	11.6	12.4	13.1	13.9	338
024	0.8	1.5	2.3	3.0	3.8	4.6	5.3	6.1	6.9	7.6	8.4	9.1	9.9	10.7	11.4	12.2	12.9	13.7	336
026	0.7	1.5	2.2	3.0	3.7	4.5	5.2	6.0	6.7	7.5	8.2	9.0	9.7	10.5	11.2	12.0	12.7	13.5	334
028	0.7	1.5	2.2	2.9	3.7	4.4	5.2	5.9	6.6	7.4	8.1	8.8	9.6	10.3	11.0	11.8	12.5	13.2	332
030	+ 0.7	+ 1.4	+ 2.2	+ 2.9	+ 3.6	+ 4.3	+ 5.1	+ 5.8	+ 6.5	+ 7.2	+ 7.9	+ 8.7	+ 9.4	+ 10.1	+ 10.8	+ 11.5	+ 12.3	+ 13.0	330
032	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.7	6.4	7.1	7.8	8.5	9.2	9.9	10.6	11.3	12.0	12.7	328
034	0.7	1.4	2.1	2.8	3.5	4.1	4.8	5.5	6.2	6.9	7.6	8.3	9.0	9.7	10.4	11.1	11.7	12.4	326
036	0.7	1.3	2.0	2.7	3.4	4.0	4.7	5.4	6.1	6.7	7.4	8.1	8.8	9.4	10.1	10.8	11.5	12.1	324
038	0.7	1.3	2.0	2.6	3.3	3.9	4.6	5.3	5.9	6.6	7.2	7.9	8.5	9.2	9.9	10.5	11.2	11.8	322
040	+ 0.6	+ 1.3	+ 1.9	+ 2.6	+ 3.2	+ 3.8	+ 4.5	+ 5.1	+ 5.7	+ 6.4	+ 7.0	+ 7.7	+ 8.3	+ 8.9	+ 9.6	+ 10.2	+ 10.9	+ 11.5	320
042	0.6	1.2	1.9	2.5	3.1	3.7	4.3	5.0	5.6	6.2	6.8	7.4	8.1	8.7	9.3	9.9	10.5	11.1	318
044	0.6	1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0	6.6	7.2	7.8	8.4	9.0	9.6	10.2	10.8	316
046	0.6	1.2	1.7	2.3	2.9	3.5	4.1	4.6	5.2	5.8	6.4	6.9	7.5	8.1	8.7	9.3	9.8	10.4	314
048	0.6	1.1	1.7	2.2	2.8	3.3	3.9	4.5	5.0	5.6	6.1	6.7	7.2	7.8	8.4	8.9	9.5	10.0	312
050	+ 0.5	+ 1.1	+ 1.6	+ 2.1	+ 2.7	+ 3.2	+ 3.7	+ 4.3	+ 4.8	+ 5.4	+ 5.9	+ 6.4	+ 7.0	+ 7.5	+ 8.0	+ 8.6	+ 9.1	+ 9.6	310
052	0.5	1.0	1.5	2.1	2.6	3.1	3.6	4.1	4.6	5.1	5.6	6.2	6.7	7.2	7.7	8.2	8.7	9.2	308
054	0.5	1.0	1.5	2.0	2.4	2.9	3.4	3.9	4.4	4.9	5.4	5.9	6.4	6.9	7.3	7.8	8.3	8.8	306
056	0.5	0.9	1.4	1.9	2.3	2.8	3.3	3.7	4.2	4.7	5.1	5.6	6.1	6.5	7.0	7.5	7.9	8.4	304
058	0.4	0.9	1.3	1.8	2.2	2.6	3.1	3.5	4.0	4.4	4.9	5.3	5.7	6.2	6.6	7.1	7.5	7.9	302
060	+ 0.4	+ 0.8	+ 1.3	+ 1.7	+ 2.1	+ 2.5	+ 2.9	+ 3.3	+ 3.8	+ 4.2	+ 4.6	+ 5.0	+ 5.4	+ 5.8	+ 6.3	+ 6.7	+ 7.1	+ 7.5	300
062	0.4	0.8	1.2	1.6	2.0	2.3	2.7	3.1	3.5	3.9	4.3	4.7	5.1	5.5	5.9	6.3	6.7	7.0	298
064	0.4	0.7	1.1	1.5	1.8	2.2	2.6	2.9	3.3	3.7	4.0	4.4	4.7	5.1	5.5	5.8	6.2	6.6	296
066	0.3	0.7	1.0	1.4	1.7	2.0	2.4	2.7	3.1	3.4	3.7	4.1	4.4	4.7	5.1	5.4	5.8	6.1	294
068	0.3	0.6	0.9	1.2	1.6	1.9	2.2	2.5	2.8	3.1	3.4	3.7	4.1	4.4	4.7	5.0	5.3	5.6	292
070	+ 0.3	+ 0.6	+ 0.9	+ 1.1	+ 1.4	+ 1.7	+ 2.0	+ 2.3	+ 2.6	+ 2.9	+ 3.1	+ 3.4	+ 3.7	+ 4.0	+ 4.3	+ 4.6	+ 4.8	+ 5.1	290
072	0.3	0.5	0.8	1.0	1.3	1.5	1.8	2.1	2.3	2.6	2.8	3.1	3.3	3.6	3.9	4.1	4.4	4.6	288
074	0.2	0.5	0.7	0.9	1.1	1.4	1.6	1.8	2.1	2.3	2.5	2.8	3.0	3.2	3.4	3.7	3.9	4.1	286
076	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	284
078	0.2	0.3	0.5	0.7	0.9	1.0	1.2	1.4	1.6	1.7	1.9	2.1	2.3	2.4	2.6	2.8	2.9	3.1	282
080	+ 0.1	+ 0.3	+ 0.4	+ 0.6	+ 0.7	+ 0.9	+ 1.0	+ 1.2	+ 1.3	+ 1.4	+ 1.6	+ 1.7	+ 1.9	+ 2.0	+ 2.2	+ 2.3	+ 2.5	+ 2.6	280
082	0.1	0.2	0.3	0.5	0.6	0.7	0.8	0.9	1.0	1.2	1.3	1.4	1.5	1.6	1.7	1.9	2.0	2.1	278
084	0.1	0.2	0.3	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.0	1.1	1.2	1.3	1.4	1.5	1.6	276
086	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.5	0.5	0.6	0.6	0.7	0.8	0.8	0.9	0.9	1.0	1.0	274
088	0.0	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.5	0.5	0.5	272
090	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	270
092	− 0.0	− 0.1	− 0.1	− 0.1	− 0.1	− 0.2	− 0.2	− 0.2	− 0.3	− 0.3	− 0.3	− 0.3	− 0.4	− 0.4	− 0.4	− 0.5	− 0.5	− 0.5	268
094	0.1	0.1	0.2	0.2	0.3	0.3	0.4	0.5	0.5	0.6	0.6	0.7	0.8	0.8	0.9	0.9	1.0	1.0	266
096	0.1	0.2	0.3	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	1.0	1.1	1.2	1.3	1.4	1.5	1.6	264
098	0.1	0.2	0.3	0.5	0.6	0.7	0.8	0.9	1.0	1.2	1.3	1.4	1.5	1.6	1.7	1.9	2.0	2.1	262
100	0.1	0.3	0.4	0.6	0.7	0.9	1.0	1.2	1.3	1.4	1.6	1.7	1.9	2.0	2.2	2.3	2.5	2.6	260
102	− 0.2	− 0.3	− 0.5	− 0.7	− 0.9	− 1.0	− 1.2	− 1.4	− 1.6	− 1.7	− 1.9	− 2.1	− 2.3	− 2.4	− 2.6	− 2.8	− 2.9	− 3.1	258
104	0.2	0.4	0.6	0.8	1.0	1.2	1.4	1.6	1.8	2.0	2.2	2.4	2.6	2.8	3.0	3.2	3.4	3.6	256
106	0.2	0.5	0.7	0.9	1.1	1.4	1.6	1.8	2.1	2.3	2.5	2.8	3.0	3.2	3.4	3.7	3.9	4.1	254
108	0.3	0.5	0.8	1.0	1.3	1.5	1.8	2.1	2.3	2.6	2.8	3.1	3.3	3.6	3.9	4.1	4.4	4.6	252
110	0.3	0.6	0.9	1.1	1.4	1.7	2.0	2.3	2.6	2.9	3.1	3.4	3.7	4.0	4.3	4.6	4.8	5.1	250
112	− 0.3	− 0.6	− 0.9	− 1.2	− 1.6	− 1.9	− 2.2	− 2.5	− 2.8	− 3.1	− 3.4	− 3.7	− 4.1	− 4.4	− 4.7	− 5.0	− 5.3	− 5.6	248
114	0.3	0.7	1.0	1.4	1.7	2.0	2.4	2.7	3.1	3.4	3.7	4.1	4.4	4.7	5.1	5.4	5.8	6.1	246
116	0.4	0.7	1.1	1.5	1.8	2.2	2.6	2.9	3.3	3.7	4.0	4.4	4.7	5.1	5.5	5.8	6.2	6.6	244
118	0.4	0.8	1.2	1.6	2.0	2.3	2.7	3.1	3.5	3.9	4.3	4.7	5.1	5.5	5.9	6.3	6.7	7.0	242
120	0.4	0.8	1.3	1.7	2.1	2.5	2.9	3.3	3.8	4.2	4.6	5.0	5.4	5.8	6.3	6.7	7.1	7.5	240
122	− 0.4	− 0.9	− 1.3	− 1.8	− 2.2	− 2.6	− 3.1	− 3.5	− 4.0	− 4.4	− 4.9	− 5.3	− 5.7	− 6.2	− 6.6	− 7.1	− 7.5	− 7.9	238
124	0.5	0.9	1.4	1.9	2.3	2.8	3.3	3.7	4.2	4.7	5.1	5.6	6.1	6.5	7.0	7.5	7.9	8.4	236
126	0.5	1.0	1.5	2.0	2.4	2.9	3.4	3.9	4.4	4.9	5.4	5.9	6.4	6.9	7.3	7.8	8.3	8.8	234
128	0.5	1.0	1.5	2.1	2.6	3.1	3.6	4.1	4.6	5.1	5.6	6.2	6.7	7.2	7.7	8.2	8.7	9.2	232
130	0.5	1.1	1.6	2.1	2.7	3.2	3.7	4.3	4.8	5.4	5.9	6.4	7.0	7.5	8.0	8.6	9.1	9.6	230
132	− 0.6	− 1.1	− 1.7	− 2.2	− 2.8	− 3.3	− 3.9	− 4.5	− 5.0	− 5.6	− 6.1	− 6.7	− 7.2	− 7.8	− 8.4	− 8.9	− 9.5	− 10.0	228
134	0.6	1.2	1.7	2.3	2.9	3.5	4.1	4.6	5.2	5.8	6.4	6.9	7.5	8.1	8.7	9.3	9.8	10.4	226
136	0.6	1.2	1.8	2.4	3.0	3.6	4.2	4.8	5.4	6.0	6.6	7.2	7.8	8.4	9.0	9.6	10.2	10.8	224
138	0.6	1.2	1.9	2.5	3.1	3.7	4.3	5.0	5.6	6.2	6.8	7.4	8.1	8.7	9.3	9.9	10.5	11.1	222
140	0.6	1.3	1.9	2.6	3.2	3.8	4.5	5.1	5.7	6.4	7.0	7.7	8.3	8.9	9.6	10.2	10.9	11.5	220
142	− 0.7	− 1.3	− 2.0	− 2.6	− 3.3	− 3.9	− 4.6	− 5.3	− 5.9	− 6.6	− 7.2	− 7.9	− 8.5	− 9.2	− 9.9	− 10.5	− 11.2	− 11.8	218
144	0.7	1.3	2.0	2.7	3.4	4.0	4.7	5.4	6.1	6.7	7.4	8.1	8.8	9.4	10.1	10.8	11.5	12.1	216
146	0.7	1.4	2.1	2.8	3.5	4.1	4.8	5.5	6.2	6.9	7.6	8.3	9.0	9.7	10.4	11.1	11.7	12.4	214
148	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.7	6.4	7.1	7.8	8.5	9.2	9.9	10.6	11.3	12.0	12.7	212
150	0.7	1.4	2.2	2.9	3.6	4.3	5.1	5.8	6.5	7.2	7.9	8.7	9.4	10.1	10.8	11.5	12.3	13.0	210
152	− 0.7	− 1.5	− 2.2	− 2.9	− 3.7	− 4.4	− 5.2	− 5.9	− 6.6	− 7.4	− 8.1	− 8.8	− 9.6	− 10.3	− 11.0	− 11.8	− 12.5	− 13.2	208
154	0.7	1.5	2.2	3.0	3.7	4.5	5.2	6.0	6.7	7.5	8.2	9.0	9.7	10.5	11.2	12.0	12.7	13.5	206
156	0.8	1.5	2.3	3.0	3.8	4.6	5.3	6.1	6.9	7.6	8.4	9.1	9.9	10.7	11.4	12.2	12.9	13.7	204
158	0.8	1.5	2.3	3.1	3.9	4.6	5.4	6.2	7.0	7.7	8.5	9.3	10.0	10.8	11.6	12.4	13.1	13.9	202
160	0.8	1.6	2.3	3.1	3.9	4.7	5.5	6.3	7.0	7.8	8.6	9.4	10.2	11.0	11.7	12.5	13.3	14.1	200
162	− 0.8	− 1.6	− 2.4	− 3.2	− 4.0	− 4.8	− 5.5	− 6.3	− 7.1	− 7.9	− 8.7	− 9.5	− 10.3	− 11.1	− 11.9	− 12.7	− 13.5	− 14.3	198
164	0.8	1.6	2.4	3.2	4.0	4.8	5.6	6.4	7.2	8.0	8.8	9.6	10.4	11.2	12.0	12.8	13.6	14.4	196
166	0.8	1.6	2.4	3.2	4.0	4.9	5.7	6.5	7.3	8.1	8.9	9.7	10.5	11.3	12.1	12.9	13.7	14.6	194
168	0.8	1.6	2.4	3.3	4.1	4.9	5.7	6.5	7.3	8.2	9.0	9.8	10.6	11.4	12.2	13.0	13.9	14.7	192
170	0.8	1.6	2.5	3.3	4.1	4.9	5.7	6.6	7.4	8.2	9.0	9.8	10.7	11.5	12.3	13.1	14.0	14.8	190
172	− 0.8	− 1.7	− 2.5	− 3.3	− 4.1	− 5.0	− 5.8	− 6.6	− 7.4	− 8.3	− 9.1	− 9.9	− 10.7	− 11.6	− 12.4	− 13.2	− 14.0	− 14.9	188
174	0.8	1.7	2.5	3.3	4.1	5.0	5.8	6.6	7.5	8.3	9.1	9.9	10.8	11.6	12.4	13.3	14.1	14.9	186
176	0.8	1.7	2.5	3.3	4.2	5.0	5.8	6.7	7.5	8.3	9.1	10.0	10.8	11.6	12.5	13.3	14.1	15.0	184
178	0.8	1.7	2.5	3.3	4.2	5.0	5.8	6.7	7.5	8.3	9.2	10.0	10.8	11.7	12.5	13.3	14.2	15.0	182
180	0.8	1.7	2.5	3.3	4.2	5.0	5.8	6.7	7.5	8.3	9.2	10.0	10.8	11.7	12.5	13.3	14.2	15.0	180

Time of fix or computation	Sign from 1-min Table	To observed altitude	To tabulated altitude	To intercept
Later than observation	+	Add	Subtract	Toward
	−	Subtract	Add	Away
Earlier than observation	+	Subtract	Add	Away
	−	Add	Subtract	Toward

Altitude Correction for Change in Position of Body (M.O.B.)

To facilitate use of Pub. No. 249, Volumes 1, 2, and 3.

CORRECTION FOR 1 MINUTE OF TIME

TRUE Zn	LATITUDE IN DEGREES																		TRUE Zn
	0	5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	
°	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	′	°
090	+15.0	+14.9	+14.8	+14.5	+14.1	+13.6	+13.0	+12.3	+11.5	+10.6	+ 9.6	+ 8.6	+ 7.5	+ 6.3	+ 5.1	+ 3.9	+ 2.6	+ 1.3	090
092	15.0	14.9	14.8	14.5	14.1	13.6	13.0	12.3	11.5	10.6	9.6	8.6	7.5	6.3	5.1	3.9	2.6	1.3	088
094	15.0	14.9	14.7	14.5	14.1	13.6	13.0	12.3	11.5	10.6	9.6	8.6	7.5	6.3	5.1	3.9	2.6	1.3	086
096	14.9	14.9	14.7	14.4	14.0	13.5	12.9	12.2	11.4	10.5	9.6	8.6	7.5	6.3	5.1	3.9	2.6	1.3	084
098	14.9	14.8	14.6	14.3	14.0	13.5	12.9	12.2	11.4	10.5	9.5	8.5	7.4	6.3	5.1	3.8	2.6	1.3	082
100	+14.8	+14.7	+14.5	+14.3	+13.9	+13.4	+12.8	+12.1	+11.3	+10.4	+ 9.5	+ 8.5	+ 7.4	+ 6.2	+ 5.1	+ 3.8	+ 2.6	+ 1.3	080
102	14.7	14.6	14.4	14.2	13.8	13.3	12.7	12.0	11.2	10.4	9.4	8.4	7.3	6.2	5.0	3.8	2.5	1.3	078
104	14.6	14.5	14.3	14.1	13.7	13.2	12.6	11.9	11.1	10.3	9.4	8.3	7.3	6.2	5.0	3.8	2.5	1.3	076
106	14.4	14.4	14.2	13.9	13.5	13.1	12.5	11.8	11.0	10.2	9.3	8.3	7.2	6.1	4.9	3.7	2.5	1.3	074
108	14.3	14.2	14.0	13.8	13.4	12.9	12.4	11.7	10.9	10.1	9.2	8.2	7.1	6.0	4.9	3.7	2.5	1.2	072
110	+14.1	+14.0	+13.9	+13.6	+13.2	+12.8	+12.2	+11.5	+10.8	+10.0	+ 9.1	+ 8.1	+ 7.0	+ 6.0	+ 4.8	+ 3.6	+ 2.4	+ 1.2	070
112	13.9	13.9	13.7	13.4	13.1	12.6	12.0	11.4	10.7	9.8	8.9	8.0	7.0	5.9	4.8	3.6	2.4	1.2	068
114	13.7	13.7	13.5	13.2	12.9	12.4	11.9	11.2	10.5	9.7	8.8	7.9	6.9	5.8	4.7	3.5	2.4	1.2	066
116	13.5	13.4	13.3	13.0	12.7	12.2	11.7	11.0	10.3	9.5	8.7	7.7	6.7	5.7	4.6	3.5	2.3	1.2	064
118	13.2	13.2	13.0	12.8	12.4	12.0	11.5	10.8	10.1	9.4	8.5	7.6	6.6	5.6	4.5	3.4	2.3	1.2	062
120	+13.0	+12.9	+12.8	+12.5	+12.2	+11.8	+11.3	+10.6	+10.0	+ 9.2	+ 8.4	+ 7.5	+ 6.5	+ 5.5	+ 4.4	+ 3.4	+ 2.3	+ 1.1	060
122	12.7	12.7	12.5	12.3	12.0	11.5	11.0	10.4	9.7	9.0	8.2	7.3	6.4	5.4	4.4	3.3	2.2	1.1	058
124	12.4	12.4	12.2	12.0	11.7	11.3	10.8	10.2	9.5	8.8	8.0	7.1	6.2	5.3	4.3	3.2	2.2	1.1	056
126	12.1	12.1	12.0	11.7	11.4	11.0	10.5	9.9	9.3	8.6	7.8	7.0	6.1	5.1	4.2	3.1	2.1	1.1	054
128	11.8	11.8	11.6	11.4	11.1	10.7	10.2	9.7	9.1	8.4	7.6	6.8	5.9	5.0	4.0	3.1	2.1	1.0	052
130	+11.5	+11.4	+11.3	+11.1	+10.8	+10.4	+10.0	+ 9.4	+ 8.8	+ 8.1	+ 7.4	+ 6.6	+ 5.7	+ 4.9	+ 3.9	+ 3.0	+ 2.0	+ 1.0	050
132	11.1	11.1	11.0	10.8	10.5	10.1	9.7	9.1	8.5	7.9	7.2	6.4	5.6	4.7	3.8	2.9	1.9	1.0	048
134	10.8	10.8	10.6	10.4	10.1	9.8	9.3	8.8	8.3	7.6	6.9	6.2	5.4	4.6	3.7	2.8	1.9	0.9	046
136	10.4	10.4	10.3	10.1	9.8	9.4	9.0	8.5	8.0	7.4	6.7	6.0	5.2	4.4	3.6	2.7	1.8	0.9	044
138	10.0	10.0	9.9	9.7	9.4	9.1	8.7	8.2	7.7	7.1	6.5	5.8	5.0	4.2	3.4	2.6	1.7	0.9	042
140	+ 9.6	+ 9.6	+ 9.5	+ 9.3	+ 9.1	+ 8.7	+ 8.4	+ 7.9	+ 7.4	+ 6.8	+ 6.2	+ 5.5	+ 4.8	+ 4.1	+ 3.3	+ 2.5	+ 1.7	+ 0.8	040
142	9.2	9.2	9.1	8.9	8.7	8.4	8.0	7.6	7.1	6.5	5.9	5.3	4.6	3.9	3.2	2.4	1.6	0.8	038
144	8.8	8.8	8.7	8.5	8.3	8.0	7.6	7.2	6.8	6.2	5.7	5.1	4.4	3.7	3.0	2.3	1.5	0.8	036
146	8.4	8.4	8.3	8.1	7.9	7.6	7.3	6.9	6.4	5.9	5.4	4.8	4.2	3.5	2.9	2.2	1.5	0.7	034
148	7.9	7.9	7.8	7.7	7.5	7.2	6.9	6.5	6.1	5.6	5.1	4.6	4.0	3.4	2.7	2.1	1.4	0.7	032
150	+ 7.5	+ 7.5	+ 7.4	+ 7.2	+ 7.0	+ 6.8	+ 6.5	+ 6.1	+ 5.7	+ 5.3	+ 4.8	+ 4.3	+ 3.8	+ 3.2	+ 2.6	+ 1.9	+ 1.3	+ 0.7	030
152	7.0	7.0	6.9	6.8	6.6	6.4	6.1	5.8	5.4	5.0	4.5	4.0	3.5	3.0	2.4	1.8	1.2	0.6	028
154	6.6	6.6	6.5	6.4	6.2	6.0	5.7	5.4	5.0	4.6	4.2	3.8	3.3	2.8	2.2	1.7	1.1	0.6	026
156	6.1	6.1	6.0	5.9	5.7	5.5	5.3	5.0	4.7	4.3	3.9	3.5	3.1	2.6	2.1	1.6	1.1	0.5	024
158	5.6	5.6	5.5	5.4	5.3	5.1	4.9	4.6	4.3	4.0	3.6	3.2	2.8	2.4	1.9	1.5	1.0	0.5	022
160	+ 5.1	+ 5.1	+ 5.1	+ 5.0	+ 4.8	+ 4.6	+ 4.4	+ 4.2	+ 3.9	+ 3.6	+ 3.3	+ 2.9	+ 2.6	+ 2.2	+ 1.8	+ 1.3	+ 0.9	+ 0.4	020
162	4.6	4.6	4.6	4.5	4.4	4.2	4.0	3.8	3.6	3.3	3.0	2.7	2.3	2.0	1.6	1.2	0.8	0.4	018
164	4.1	4.1	4.1	4.0	3.9	3.7	3.6	3.4	3.2	2.9	2.7	2.4	2.1	1.7	1.4	1.1	0.7	0.4	016
166	3.6	3.6	3.6	3.5	3.4	3.3	3.1	3.0	2.8	2.6	2.3	2.1	1.8	1.5	1.2	0.9	0.6	0.3	014
168	3.1	3.1	3.1	3.0	2.9	2.8	2.7	2.6	2.4	2.2	2.0	1.8	1.6	1.3	1.1	0.8	0.5	0.3	012
170	+ 2.6	+ 2.6	+ 2.6	+ 2.5	+ 2.4	+ 2.4	+ 2.3	+ 2.1	+ 2.0	+ 1.8	+ 1.7	+ 1.5	+ 1.3	+ 1.1	+ 0.9	+ 0.7	+ 0.5	+ 0.2	010
172	2.1	2.1	2.1	2.0	2.0	1.9	1.8	1.7	1.6	1.5	1.3	1.2	1.0	0.9	0.7	0.5	0.4	0.2	008
174	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.3	1.2	1.1	1.0	0.9	0.8	0.7	0.5	0.4	0.3	0.1	006
176	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.8	0.7	0.7	0.6	0.5	0.4	0.4	0.3	0.2	0.1	004
178	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.4	0.3	0.3	0.3	0.2	0.2	0.1	0.1	0.0	002
180	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	000
182	− 0.5	− 0.5	− 0.5	− 0.5	− 0.5	− 0.5	− 0.5	− 0.5	− 0.4	− 0.4	− 0.3	− 0.3	− 0.3	− 0.2	− 0.2	− 0.1	− 0.1	− 0.0	358
184	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.9	0.8	0.7	0.7	0.6	0.5	0.4	0.4	0.3	0.2	0.1	356
186	1.6	1.6	1.5	1.5	1.5	1.4	1.4	1.3	1.2	1.1	1.0	0.9	0.8	0.7	0.5	0.4	0.3	0.1	354
188	2.1	2.1	2.1	2.0	2.0	1.9	1.8	1.7	1.6	1.5	1.3	1.2	1.0	0.9	0.7	0.5	0.4	0.2	352
190	2.6	2.6	2.6	2.5	2.4	2.4	2.3	2.1	2.0	1.8	1.7	1.5	1.3	1.1	0.9	0.7	0.5	0.2	350
192	− 3.1	− 3.1	− 3.1	− 3.0	− 2.9	− 2.8	− 2.7	− 2.6	− 2.4	− 2.2	− 2.0	− 1.8	− 1.6	− 1.3	− 1.1	− 0.8	− 0.5	− 0.3	348
194	3.6	3.6	3.6	3.5	3.4	3.3	3.1	3.0	2.8	2.6	2.3	2.1	1.8	1.5	1.2	0.9	0.6	0.3	346
196	4.1	4.1	4.1	4.0	3.9	3.7	3.6	3.4	3.2	2.9	2.7	2.4	2.1	1.7	1.4	1.1	0.7	0.4	344
198	4.6	4.6	4.6	4.5	4.4	4.2	4.0	3.8	3.6	3.3	3.0	2.7	2.3	2.0	1.6	1.2	0.8	0.4	342
200	5.1	5.1	5.1	5.0	4.8	4.6	4.4	4.2	3.9	3.6	3.3	2.9	2.6	2.2	1.8	1.3	0.9	0.4	340
202	− 5.6	− 5.6	− 5.5	− 5.4	− 5.3	− 5.1	− 4.9	− 4.6	− 4.3	− 4.0	− 3.6	− 3.2	− 2.8	− 2.4	− 1.9	− 1.5	− 1.0	− 0.5	338
204	6.1	6.1	6.0	5.9	5.7	5.5	5.3	5.0	4.7	4.3	3.9	3.5	3.1	2.6	2.1	1.6	1.1	0.5	336
206	6.6	6.6	6.5	6.4	6.2	6.0	5.7	5.4	5.0	4.6	4.2	3.8	3.3	2.8	2.2	1.7	1.1	0.6	334
208	7.0	7.0	6.9	6.8	6.6	6.4	6.1	5.8	5.4	5.0	4.5	4.0	3.5	3.0	2.4	1.8	1.2	0.6	332
210	7.5	7.5	7.4	7.2	7.0	6.8	6.5	6.1	5.7	5.3	4.8	4.3	3.8	3.2	2.6	1.9	1.3	0.7	330
212	− 7.9	− 7.9	− 7.8	− 7.7	− 7.5	− 7.2	− 6.9	− 6.5	− 6.1	− 5.6	− 5.1	− 4.6	− 4.0	− 3.4	− 2.7	− 2.1	− 1.4	− 0.7	328
214	8.4	8.4	8.3	8.1	7.9	7.6	7.3	6.9	6.4	5.9	5.4	4.8	4.2	3.5	2.9	2.2	1.5	0.7	326
216	8.8	8.8	8.7	8.5	8.3	8.0	7.6	7.2	6.8	6.2	5.7	5.1	4.4	3.7	3.0	2.3	1.5	0.8	324
218	9.2	9.2	9.1	8.9	8.7	8.4	8.0	7.6	7.1	6.5	5.9	5.3	4.6	3.9	3.2	2.4	1.6	0.8	322
220	9.6	9.6	9.5	9.3	9.1	8.7	8.4	7.9	7.4	6.8	6.2	5.5	4.8	4.1	3.3	2.5	1.7	0.8	320
222	−10.0	−10.0	− 9.9	− 9.7	− 9.4	− 9.1	− 8.7	− 8.2	− 7.7	− 7.1	− 6.5	− 5.8	− 5.0	− 4.2	− 3.4	− 2.6	− 1.7	− 0.9	318
224	10.4	10.4	10.3	10.1	9.8	9.4	9.0	8.5	8.0	7.4	6.7	6.0	5.2	4.4	3.6	2.7	1.8	0.9	316
226	10.8	10.8	10.6	10.4	10.1	9.8	9.3	8.8	8.3	7.6	6.9	6.2	5.4	4.6	3.7	2.8	1.9	0.9	314
228	11.1	11.1	11.0	10.8	10.5	10.1	9.7	9.1	8.5	7.9	7.2	6.4	5.6	4.7	3.8	2.9	1.9	1.0	312
230	11.5	11.4	11.3	11.1	10.8	10.4	10.0	9.4	8.8	8.1	7.4	6.6	5.7	4.9	3.9	3.0	2.0	1.0	310
232	−11.8	−11.8	−11.6	−11.4	−11.1	−10.7	−10.2	− 9.7	− 9.1	− 8.4	− 7.6	− 6.8	− 5.9	− 5.0	− 4.0	− 3.1	− 2.1	− 1.0	308
234	12.1	12.1	12.0	11.7	11.4	11.0	10.5	9.9	9.3	8.6	7.8	7.0	6.1	5.1	4.2	3.1	2.1	1.1	306
236	12.4	12.4	12.2	12.0	11.7	11.3	10.8	10.2	9.5	8.8	8.0	7.1	6.2	5.3	4.3	3.2	2.2	1.1	304
238	12.7	12.7	12.5	12.3	12.0	11.5	11.0	10.4	9.7	9.0	8.2	7.3	6.4	5.4	4.4	3.3	2.2	1.1	302
240	13.0	12.9	12.8	12.5	12.2	11.8	11.3	10.6	10.0	9.2	8.4	7.5	6.5	5.5	4.4	3.4	2.3	1.1	300
242	−13.2	−13.2	−13.0	−12.8	−12.4	−12.0	−11.5	−10.8	−10.1	− 9.4	− 8.5	− 7.6	− 6.6	− 5.6	− 4.5	− 3.4	− 2.3	− 1.2	298
244	13.5	13.4	13.3	13.0	12.7	12.2	11.7	11.0	10.3	9.5	8.7	7.7	6.7	5.7	4.6	3.5	2.3	1.2	296
246	13.7	13.7	13.5	13.2	12.9	12.4	11.9	11.2	10.5	9.7	8.8	7.9	6.9	5.8	4.7	3.5	2.4	1.2	294
248	13.9	13.9	13.7	13.4	13.1	12.6	12.0	11.4	10.7	9.8	8.9	8.0	7.0	5.9	4.8	3.6	2.4	1.2	292
250	14.1	14.0	13.9	13.6	13.2	12.8	12.2	11.5	10.8	10.0	9.1	8.1	7.0	6.0	4.8	3.6	2.4	1.2	290
252	−14.3	−14.2	−14.0	−13.8	−13.4	−12.9	−12.4	−11.7	−10.9	−10.1	− 9.2	− 8.2	− 7.1	− 6.0	− 4.9	− 3.7	− 2.5	− 1.2	288
254	14.4	14.4	14.2	13.9	13.5	13.1	12.5	11.8	11.0	10.2	9.3	8.3	7.2	6.1	4.9	3.7	2.5	1.3	286
256	14.6	14.5	14.3	14.1	13.7	13.2	12.6	11.9	11.1	10.3	9.4	8.3	7.3	6.2	5.0	3.8	2.5	1.3	284
258	14.7	14.6	14.4	14.2	13.8	13.3	12.7	12.0	11.2	10.4	9.4	8.4	7.3	6.2	5.0	3.8	2.5	1.3	282
260	14.8	14.7	14.5	14.3	13.9	13.4	12.8	12.1	11.3	10.4	9.5	8.5	7.4	6.2	5.1	3.8	2.6	1.3	280
262	−14.9	−14.8	−14.6	−14.3	−14.0	−13.5	−12.9	−12.2	−11.4	−10.5	− 9.5	− 8.5	− 7.4	− 6.3	− 5.1	− 3.8	− 2.6	− 1.3	278
264	14.9	14.9	14.7	14.4	14.0	13.5	12.9	12.2	11.4	10.5	9.6	8.6	7.5	6.3	5.1	3.9	2.6	1.3	276
266	15.0	14.9	14.7	14.5	14.1	13.6	13.0	12.3	11.5	10.6	9.6	8.6	7.5	6.3	5.1	3.9	2.6	1.3	274
268	15.0	14.9	14.8	14.5	14.1	13.6	13.0	12.3	11.5	10.6	9.6	8.6	7.5	6.3	5.1	3.9	2.6	1.3	272
270	15.0	14.9	14.8	14.5	14.1	13.6	13.0	12.3	11.5	10.6	9.6	8.6	7.5	6.3	5.1	3.9	2.6	1.3	270

Time of fix or computation	Sign from 1-min table	To observed altitude	To tabulated altitude	To intercept
Later than observation	+	Add	Subtract	Toward
	−	Subtract	Add	Away
Earlier than observation	+	Subtract	Add	Away
	−	Add	Subtract	Toward

Conversion of Arc to Time

°	h m	°	h m	°	h m	°	h m	°	h m	°	h m
0	0 00	60	4 00	120	8 00	180	12 00	240	16 00	300	20 00
1	0 04	61	4 04	121	8 04	181	12 04	241	16 04	301	20 04
2	0 08	62	4 08	122	8 08	182	12 08	242	16 08	302	20 08
3	0 12	63	4 12	123	8 12	183	12 12	243	16 12	303	20 12
4	0 16	64	4 16	124	8 16	184	12 16	244	16 16	304	20 16
5	0 20	65	4 20	125	8 20	185	12 20	245	16 20	305	20 20
6	0 24	66	4 24	126	8 24	186	12 24	246	16 24	306	20 24
7	0 28	67	4 28	127	8 28	187	12 28	247	16 28	307	20 28
8	0 32	68	4 32	128	8 32	188	12 32	248	16 32	308	20 32
9	0 36	69	4 36	129	8 36	189	12 36	249	16 36	309	20 36
10	0 40	70	4 40	130	8 40	190	12 40	250	16 40	310	20 40
11	0 44	71	4 44	131	8 44	191	12 44	251	16 44	311	20 44
12	0 48	72	4 48	132	8 48	192	12 48	252	16 48	312	20 48
13	0 52	73	4 52	133	8 52	193	12 52	253	16 52	313	20 52
14	0 56	74	4 56	134	8 56	194	12 56	254	16 56	314	20 56
15	1 00	75	5 00	135	9 00	195	13 00	255	17 00	315	21 00
16	1 04	76	5 04	136	9 04	196	13 04	256	17 04	316	21 04
17	1 08	77	5 08	137	9 08	197	13 08	257	17 08	317	21 08
18	1 12	78	5 12	138	9 12	198	13 12	258	17 12	318	21 12
19	1 16	79	5 16	139	9 16	199	13 16	259	17 16	319	21 16
20	1 20	80	5 20	140	9 20	200	13 20	260	17 20	320	21 20
21	1 24	81	5 24	141	9 24	201	13 24	261	17 24	321	21 24
22	1 28	82	5 28	142	9 28	202	13 28	262	17 28	322	21 28
23	1 32	83	5 32	143	9 32	203	13 32	263	17 32	323	21 32
24	1 36	84	5 36	144	9 36	204	13 36	264	17 36	324	21 36
25	1 40	85	5 40	145	9 40	205	13 40	265	17 40	325	21 40
26	1 44	86	5 44	146	9 44	206	13 44	266	17 44	326	21 44
27	1 48	87	5 48	147	9 48	207	13 48	267	17 48	327	21 48
28	1 52	88	5 52	148	9 52	208	13 52	268	17 52	328	21 52
29	1 56	89	5 56	149	9 56	209	13 56	269	17 56	329	21 56
30	2 00	90	6 00	150	10 00	210	14 00	270	18 00	330	22 00
31	2 04	91	6 04	151	10 04	211	14 04	271	18 04	331	22 04
32	2 08	92	6 08	152	10 08	212	14 08	272	18 08	332	22 08
33	2 12	93	6 12	153	10 12	213	14 12	273	18 12	333	22 12
34	2 16	94	6 16	154	10 16	214	14 16	274	18 16	334	22 16
35	2 20	95	6 20	155	10 20	215	14 20	275	18 20	335	22 20
36	2 24	96	6 24	156	10 24	216	14 24	276	18 24	336	22 24
37	2 28	97	6 28	157	10 28	217	14 28	277	18 28	337	22 28
38	2 32	98	6 32	158	10 32	218	14 32	278	18 32	338	22 32
39	2 36	99	6 36	159	10 36	219	14 36	279	18 36	339	22 36
40	2 40	100	6 40	160	10 40	220	14 40	280	18 40	340	22 40
41	2 44	101	6 44	161	10 44	221	14 44	281	18 44	341	22 44
42	2 48	102	6 48	162	10 48	222	14 48	282	18 48	342	22 48
43	2 52	103	6 52	163	10 52	223	14 52	283	18 52	343	22 52
44	2 56	104	6 56	164	10 56	224	14 56	284	18 56	344	22 56
45	3 00	105	7 00	165	11 00	225	15 00	285	19 00	345	23 00
46	3 04	106	7 04	166	11 04	226	15 04	286	19 04	346	23 04
47	3 08	107	7 08	167	11 08	227	15 08	287	19 08	347	23 08
48	3 12	108	7 12	168	11 12	228	15 12	288	19 12	348	23 12
49	3 16	109	7 16	169	11 16	229	15 16	289	19 16	349	23 16
50	3 20	110	7 20	170	11 20	230	15 20	290	19 20	350	23 20
51	3 24	111	7 24	171	11 24	231	15 24	291	19 24	351	23 24
52	3 28	112	7 28	172	11 28	232	15 28	292	19 28	352	23 28
53	3 32	113	7 32	173	11 32	233	15 32	293	19 32	353	23 32
54	3 36	114	7 36	174	11 36	234	15 36	294	19 36	354	23 36
55	3 40	115	7 40	175	11 40	235	15 40	295	19 40	355	23 40
56	3 44	116	7 44	176	11 44	236	15 44	296	19 44	356	23 44
57	3 48	117	7 48	177	11 48	237	15 48	297	19 48	357	23 48
58	3 52	118	7 52	178	11 52	238	15 52	298	19 52	358	23 52
59	3 56	119	7 56	179	11 56	239	15 56	299	19 56	359	23 56

′	m s
0	0 00
1	0 04
2	0 08
3	0 12
4	0 16
5	0 20
6	0 24
7	0 28
8	0 32
9	0 36
10	0 40
11	0 44
12	0 48
13	0 52
14	0 56
15	1 00
16	1 04
17	1 08
18	1 12
19	1 16
20	1 20
21	1 24
22	1 28
23	1 32
24	1 36
25	1 40
26	1 44
27	1 48
28	1 52
29	1 56
30	2 00
31	2 04
32	2 08
33	2 12
34	2 16
35	2 20
36	2 24
37	2 28
38	2 32
39	2 36
40	2 40
41	2 44
42	2 48
43	2 52
44	2 56
45	3 00
46	3 04
47	3 08
48	3 12
49	3 16
50	3 20
51	3 24
52	3 28
53	3 32
54	3 36
55	3 40
56	3 44
57	3 48
58	3 52
59	3 56

″	s
0	0.00
1	0.07
2	0.13
3	0.20
4	0.27
5	0.33
6	0.40
7	0.47
8	0.53
9	0.60
10	0.67
11	0.73
12	0.80
13	0.87
14	0.93
15	1.00
16	1.07
17	1.13
18	1.20
19	1.27
20	1.33
21	1.40
22	1.47
23	1.53
24	1.60
25	1.67
26	1.73
27	1.80
28	1.87
29	1.93
30	2.00
31	2.07
32	2.13
33	2.20
34	2.27
35	2.33
36	2.40
37	2.47
38	2.53
39	2.60
40	2.67
41	2.73
42	2.80
43	2.87
44	2.93
45	3.00
46	3.07
47	3.13
48	3.20
49	3.27
50	3.33
51	3.40
52	3.47
53	3.53
54	3.60
55	3.67
56	3.73
57	3.80
58	3.87
59	3.93

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