LAT.	5°			6°			7°			8°			9°			LAT.
H.A.	Alt.	d	Az.	Alt.	d	Az.	Alt.	d	Az.	Alt.	d	Az.	Alt.	d	Az.	H.A.
°	° ′		°	° ′		°	° ′		°	° ′		°	° ′		°	°
45	42 11	−19	59	42 42	−18	60	43 11	−16	61	43 40	−15	61	44 09	−15	62	315
46	41 20	19	59	41 50	17	60	42 19	16	61	42 48	15	62	43 16	13	63	314
47	40 28	17	60	40 58	16	60	41 27	15	61	41 56	14	62	42 24	14	63	313
48	39 37	17	60	40 06	16	61	40 35	15	62	41 03	13	62	41 31	13	63	312
49	38 45	17	60	39 14	15	61	39 43	14	62	40 11	13	63	40 38	12	63	311
50	37 53	−16	61	38 22	−15	61	38 50	−13	62	39 18	−12	63	39 45	−11	64	310
51	37 01	16	61	37 29	14	62	37 57	12	62	38 25	12	63	38 52	11	64	309
52	36 08	14	61	36 37	14	62	37 05	13	63	37 32	11	63	37 59	10	64	308
53	35 16	14	62	35 44	13	62	36 12	12	63	36 39	11	63	37 05	9	64	307
54	34 23	13	62	34 51	12	62	35 19	11	63	35 46	10	64	36 12	9	64	306
55	33 31	−13	62	33 58	−11	63	34 26	−11	63	34 53	−10	64	35 19	−9	64	305
56	32 38	12	62	33 05	11	63	33 33	10	63	33 59	9	64	34 25	7	65	304
57	31 45	12	62	32 12	10	63	32 39	9	64	33 06	8	64	33 32	7	65	303
58	30 52	11	63	31 19	10	63	31 46	9	64	32 12	7	64	32 38	6	65	302
59	29 59	11	63	30 26	9	63	30 53	9	64	31 19	7	64	31 45	7	65	301
60	29 06	−10	63	29 33	−9	63	29 59	−7	64	30 25	−6	64	30 51	−6	65	300
61	28 13	10	63	28 39	8	64	29 06	7	64	29 32	6	65	29 57	5	65	299
62	27 19	9	63	27 46	8	64	28 12	6	64	28 38	6	65	29 04	5	65	298
63	26 26	8	63	26 53	8	64	27 19	6	64	27 44	5	65	28 10	4	65	297
64	25 32	7	64	25 59	7	64	26 25	6	64	26 51	5	65	27 16	4	65	296
65	24 39	−7	64	25 05	−6	64	25 31	−5	64	25 57	−4	65	26 22	−3	65	295
66	23 46	7	64	24 12	6	64	24 38	5	65	25 03	3	65	25 28	2	65	294
67	22 52	6	64	23 18	5	64	23 44	4	65	24 10	4	65	24 35	3	65	293
68	21 58	5	64	22 24	4	64	22 50	3	65	23 16	3	65	23 41	2	65	292
69	21 05	5	64	21 31	4	64	21 57	4	65	22 22	2	65	22 47	1	65	291
70	20 11	−5	64	20 37	−4	64	21 03	−3	65	21 28	−2	65	21 53	−1	66	290
71	19 17	4	64	19 43	3	64	20 09	2	65	20 34	−1	65	20 59	0	66	289
72	18 24	4	64	18 50	3	65	19 15	2	65	19 40	0	65	20 05	+1	66	288
73	17 30	3	64	17 56	2	65	18 21	1	65	18 47	−1	65	19 12	0	65	287
74	16 36	3	64	17 02	2	65	17 28	1	65	17 53	0	65	18 18	+1	65	286
75	15 43	−3	64	16 08	−1	65	16 34	−1	65	16 59	+1	65	17 24	+2	65	285
76	14 49	2	64	15 15	1	65	15 40	0	65	16 05	1	65	16 30	2	65	284
77	13 55	−1	64	14 21	−1	65	14 46	+1	65	15 12	1	65	15 37	2	65	283
78	13 01	0	64	13 27	0	65	13 53	1	65	14 18	2	65	14 43	3	65	282
79	12 08	−1	64	12 33	+1	65	12 59	1	65	13 24	3	65	13 49	4	65	281
80	11 14	0	64	11 40	+1	65	12 05	+2	65	12 31	+3	65	12 56	+4	65	280
81	10 21	0	64	10 46	+2	65	11 12	2	65	11 37	3	65	12 02	5	65	279
82	...			...			10 18	+3	65	10 44	+3	65	11 09	5	65	278
83	...			...			...			...			10 15	+6	65	277
84	...			...			...			...			...			276
85	...			...			...			...			...			275

In South Latitudes { For argument H.A. on the left, True Azimuth = 180° + Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = 180° − Tabulated Azimuth. } See p. 91.

LAT.	5°			6°			7°			8°			9°			LAT.
H.A.	Alt.	d	Az.	Alt.	d	Az.	Alt.	d	Az.	Alt.	d	Az.	Alt.	d	Az.	H.A.
°	° ′		°	° ′		°	° ′		°	° ′		°	° ′		°	°
0	59 00	−59	180	58 01	−60	180	57 01	−60	180	56 01	−60	180	55 01	−60	180	360
1	59 00	60	178	58 00	60	178	57 00	60	178	56 00	60	178	55 00	60	178	359
2	58 57	60	177	57 57	60	177	56 57	60	177	55 57	60	177	54 57	60	177	358
3	58 52	59	175	57 53	60	175	56 53	60	175	55 53	60	175	54 53	59	175	357
4	58 46	59	173	57 46	59	173	56 47	60	173	55 47	59	174	54 48	60	174	356
5	58 38	−59	171	57 39	−60	172	56 39	−59	172	55 40	−59	172	54 40	−59	172	355
6	58 28	59	170	57 29	59	170	56 30	59	170	55 31	59	170	54 32	59	171	354
7	58 16	58	168	57 18	59	168	56 19	59	169	55 20	59	169	54 21	58	169	353
8	58 03	58	166	57 05	58	167	56 06	58	167	55 08	58	167	54 09	58	168	352
9	57 48	57	165	56 50	57	165	55 52	57	166	54 54	58	166	53 56	58	166	351
10	57 32	−57	163	56 34	−57	164	55 37	−58	164	54 39	−57	164	53 41	−57	165	350
11	57 13	56	162	56 17	57	162	55 19	56	162	54 22	57	163	53 25	57	163	349
12	56 54	56	160	55 57	56	161	55 01	56	161	54 04	56	161	53 07	56	162	348
13	56 33	55	158	55 37	55	159	54 41	56	160	53 44	55	160	52 48	56	160	347
14	56 10	54	157	55 15	55	158	54 19	55	158	53 23	55	159	52 27	55	159	346
15	55 46	−53	156	54 51	−54	156	53 56	−54	157	53 01	−54	157	52 06	−55	158	345
16	55 21	53	154	54 26	53	155	53 32	53	155	52 37	53	156	51 43	54	156	344
17	54 54	52	153	54 00	52	153	53 07	53	154	52 13	53	155	51 18	53	155	343
18	54 26	51	151	53 33	51	152	52 40	52	153	51 47	53	153	50 53	53	154	342
19	53 57	50	150	53 05	51	151	52 12	51	151	51 19	51	152	50 26	52	153	341
20	53 27	−50	149	52 35	−50	150	51 43	−50	150	50 51	−51	151	49 58	−51	151	340
21	52 55	48	148	52 04	49	148	51 13	49	149	50 21	50	150	49 30	51	150	339
22	52 23	48	147	51 33	49	147	50 42	49	148	49 51	49	149	49 00	50	149	338
23	51 49	46	145	51 00	48	146	50 10	48	147	49 19	48	147	48 29	49	148	337
24	51 15	46	144	50 26	47	145	49 37	47	146	48 47	48	146	47 57	48	147	336
25	50 40	−46	143	49 51	−45	144	49 03	−47	145	48 14	−47	145	47 24	−47	146	335
26	50 03	44	142	49 16	45	143	48 28	46	144	47 39	46	144	46 50	46	145	334
27	49 26	43	141	48 39	44	142	47 52	45	143	47 04	45	143	46 16	46	144	333
28	48 48	42	140	48 02	43	141	47 15	43	142	46 28	44	142	45 41	46	143	332
29	48 10	42	139	47 24	42	140	46 38	43	141	45 51	43	141	45 04	44	142	331
30	47 30	−40	138	46 45	−41	139	46 00	−42	140	45 14	−43	140	44 28	−44	141	330
31	46 50	40	137	46 06	41	138	45 21	41	139	44 36	42	139	43 50	43	140	329
32	46 10	40	137	45 26	40	137	44 41	40	138	43 57	42	139	43 12	42	139	328
33	45 28	38	136	44 45	39	136	44 01	40	137	43 17	40	138	42 32	41	138	327
34	44 46	37	135	44 04	39	136	43 20	39	136	42 37	40	137	41 53	41	138	326
35	44 04	−37	134	43 22	−38	135	42 39	−38	136	41 56	−39	136	41 13	−40	137	325
36	43 21	36	133	42 39	37	134	41 57	37	135	41 15	39	135	40 32	39	136	324
37	42 37	35	133	41 56	36	133	41 15	37	134	40 33	38	135	39 50	38	135	323
38	41 53	35	132	41 12	35	133	40 31	36	133	39 50	37	134	39 08	37	134	322
39	41 08	33	131	40 28	34	132	39 48	35	133	39 07	36	133	38 26	37	134	321
40	40 23	−33	131	39 44	−34	131	39 04	−35	132	38 24	−36	133	37 43	−36	133	320
41	39 38	33	130	38 59	33	131	38 19	33	131	37 40	35	132	36 59	35	132	319
42	38 52	32	129	38 13	32	130	37 34	33	131	36 55	34	131	36 15	34	132	318
43	38 05	30	129	37 27	31	129	36 49	32	130	36 10	33	131	35 31	34	131	317
44	37 19	30	128	36 41	31	129	36 03	31	129	35 25	32	130	34 46	33	131	316
45	36 32	−30	128	35 55	−30	128	35 17	−31	129	34 39	−31	129	34 01	−33	130	315

In North Latitudes { For argument H.A. on the left, True Azimuth = 360° − Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = Tabulated Azimuth. } See p. 90.

LAT.	5°		6°		7°		8°		9°		LAT.
H.A.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	H.A.
°	° ′ d	°	° ′ d	°	° ′ d	°	° ′ d	°	° ′ d	°	°
45	36 32−30	128	35 55−30	128	35 17−31	129	34 39−31	129	34 01−33	130	315
46	35 44 28	127	35 08 30	128	34 31 31	128	33 53 31	129	33 15 31	129	314
47	34 56 27	127	34 20 28	127	33 44 30	128	33 07 31	128	32 29 31	129	313
48	34 08 27	126	33 33 28	127	32 57 29	127	32 20 30	128	31 43 30	128	312
49	33 20 26	126	32 45 28	126	32 09 28	127	31 33 29	127	30 56 29	128	311
50	32 31−25	125	31 57−27	126	31 21−27	126	30 46−29	127	30 10−30	127	310
51	31 43 26	125	31 08 26	125	30 33 27	126	29 58 28	126	29 22 28	127	309
52	30 53 24	124	30 19 25	125	29 45 26	125	29 10 27	126	28 35 28	126	308
53	30 04 24	124	29 30 25	124	28 56 26	125	28 22 27	125	27 47 28	126	307
54	29 14 23	124	28 41 24	124	28 07 25	124	27 33 26	125	26 59 27	125	306
55	28 24−22	123	27 51−23	124	27 18−24	124	26 44−25	124	26 10−26	125	305
56	27 34 22	123	27 02 23	123	26 29 24	124	25 55 24	124	25 22 26	124	304
57	26 44 21	122	26 12 23	123	25 39 23	123	25 06 24	124	24 33 25	124	303
58	25 54 21	122	25 22 22	123	24 49 22	123	24 17 24	123	23 43 24	124	302
59	25 03 20	122	24 31 21	122	23 59 22	123	23 27 23	123	22 54 24	123	301
60	24 12−20	121	23 41−21	122	23 09−22	122	22 37−22	123	22 05−24	123	300
61	23 21 19	121	22 50 20	121	22 19 21	122	21 47 22	122	21 15 23	123	299
62	22 30 19	121	21 59 19	121	21 28 20	122	20 57 22	122	20 25 22	122	298
63	21 39 18	121	21 08 19	121	20 37 20	121	20 06 21	122	19 35 22	122	297
64	20 47 17	120	20 17 19	121	19 46 19	121	19 15 20	121	18 44 21	121	296
65	19 56−17	120	19 26−18	120	18 55−19	121	18 25−20	121	17 54−21	121	295
66	19 04 17	120	18 34 17	120	18 04 18	120	17 34 19	121	17 03 20	121	294
67	18 12 16	119	17 42 16	120	17 13 18	120	16 43 19	120	16 12 19	121	293
68	17 20 15	119	16 51 17	119	16 21 17	120	15 51 18	120	15 21 19	120	292
69	16 28 15	119	15 59 16	119	15 29 16	119	15 00 18	120	14 30 18	120	291
70	15 36−15	119	15 07−15	119	14 38−16	119	14 08−16	119	13 39−18	120	290
71	14 43 13	119	14 15 15	119	13 46 16	119	13 17 17	119	12 48 18	119	289
72	13 51 13	118	13 23 14	119	12 54 15	119	12 25 16	119	11 56 17	119	288
73	12 59 13	118	12 30 13	118	12 02 15	119	11 33 15	119	11 05 17	119	287
74	12 06 12	118	11 38 13	118	11 10 14	118	10 42−15	118	10 13−16	119	286
75	11 14−12	118	10 46−13	118	10 18−14	118	...		...		285
76	10 21−11	118	...		...		...		...		284
77	...		...		...		...		...		283
78	...		...		...		...		...		282
79	...		...		...		...		...		281
80	...		...		...		...		...		280

In South Latitudes { For argument H.A. on the left, True Azimuth = 180° + Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = 180° − Tabulated Azimuth. } See p. 91.

LAT.	5°		6°		7°		8°		9°		LAT.
H.A.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	H.A.
°	° ′ d	°	° ′ d	°	° ′ d	°	° ′ d	°	° ′ d	°	°
0	68 00–60	0	69 00–60	0	70 00–60	0	71 00–60	0	72 00–60	0	360
1	67 59 60	2	68 59 60	2	69 59 60	3	70 59 60	3	71 59 60	3	359
2	67 55 59	5	68 55 60	5	69 55 60	5	70 55 60	5	71 54 59	6	358
3	67 49 59	7	68 49 60	7	69 48 59	8	70 48 60	8	71 47 59	9	357
4	67 41 59	9	68 40 59	10	69 39 59	10	70 38 59	11	71 37 59	11	356
5	67 30–59	12	68 28–58	12	69 27–58	13	70 25–58	13	71 24–58	14	355
6	67 16 57	14	68 15 58	15	69 13 58	15	70 10 57	16	71 08 57	17	354
7	67 01 57	16	67 58 56	17	68 56 57	18	69 53 57	18	70 50 56	19	353
8	66 43 56	18	67 40 56	19	68 37 56	20	69 33 55	21	70 29 55	22	352
9	66 23 55	20	67 20 56	21	68 15 54	22	69 11 55	23	70 06 54	24	351
10	66 02–55	22	66 57–54	23	67 52–54	24	68 46–53	25	69 40–52	26	350
11	65 38 54	24	66 32 53	25	67 26 52	26	68 20 52	27	69 13 51	29	349
12	65 12 52	26	66 06 52	27	66 59 51	28	67 52 51	29	68 44 50	31	348
13	64 45 51	28	65 38 51	29	66 30 50	30	67 22 50	31	68 12 48	33	347
14	64 16 50	30	65 08 49	31	65 59 48	32	66 50 48	33	67 40 47	35	346
15	63 46–49	31	64 37–49	33	65 27–48	34	66 17–47	35	67 05–45	36	345
16	63 14 48	33	64 04 47	34	64 53 46	35	65 42 46	37	66 30 45	38	344
17	62 41 47	35	63 30 46	36	64 18 45	37	65 06 44	38	65 52 43	40	343
18	62 06 45	36	62 54 44	37	63 42 44	38	64 28 42	40	65 14 42	41	342
19	61 31 45	37	62 18 44	39	63 04 42	40	63 50 42	41	64 35 41	42	341
20	60 54–44	39	61 40–42	40	62 26–42	41	63 10–40	42	63 54–39	44	340
21	60 16 42	40	61 01 41	41	61 46 40	42	62 30 39	44	63 13 38	45	339
22	59 37 41	41	60 21 40	42	61 05 39	44	61 48 38	45	62 30 36	46	338
23	58 57 40	42	59 41 39	44	60 24 38	45	61 06 37	46	61 47 35	47	337
24	58 16 39	44	58 59 38	45	59 41 36	46	60 23 36	47	61 03 34	48	336
25	57 35–38	45	58 17–37	46	58 58–35	47	59 39–34	48	60 18–33	49	335
26	56 52 36	46	57 34 36	47	58 14 34	48	58 54 33	49	59 33 32	50	334
27	56 09 35	47	56 50 34	48	57 30 33	49	58 09 32	50	58 47 31	51	333
28	55 25 34	47	56 06 34	49	56 45 32	50	57 23 31	51	58 00 29	52	332
29	54 41 33	48	55 21 33	49	55 59 31	51	56 37 30	52	57 13 28	53	331
30	53 56–32	49	54 35–31	50	55 13–30	51	55 50–29	52	56 26–28	54	330
31	53 11 32	50	53 49 30	51	54 26 29	52	55 03 28	53	55 38 27	54	329
32	52 25 31	51	53 02 29	52	53 39 28	53	54 15 27	54	54 50 26	55	328
33	51 38 29	51	52 15 28	52	52 51 27	53	53 27 26	55	54 01 25	56	327
34	50 51 28	52	51 28 28	53	52 03 26	54	52 38 25	55	53 12 24	56	326
35	50 04–28	53	50 40–27	54	51 15–26	55	51 49–24	56	52 22–23	57	325
36	49 16 27	53	49 52 26	54	50 26 24	55	51 00 23	56	51 33 22	57	324
37	48 28 26	54	49 03 25	55	49 37 24	56	50 10 22	57	50 43 22	58	323
38	47 40 26	55	48 14 24	55	48 48 23	56	49 20 21	57	49 52 20	58	322
39	46 51 25	55	47 25 24	56	47 58 22	57	48 30 21	58	49 02 20	59	321
40	46 02–24	56	46 35–22	56	47 08–21	57	47 40–20	58	48 11–19	59	320
41	45 12 23	56	45 45 21	57	46 18 21	58	46 49 19	59	47 20 18	60	319
42	44 23 23	57	44 55 21	57	45 27 20	58	45 59 19	59	46 29 17	60	318
43	43 33 22	57	44 05 20	58	44 37 19	59	45 08 18	59	45 38 17	60	317
44	42 42 20	57	43 14 19	58	43 46 19	59	44 16 17	60	44 46 16	61	316
45	41 52–20	58	42 24–19	59	42 55–18	59	43 25–17	60	43 54–15	61	315

In North Latitudes { For argument H.A. on the left, True Azimuth = 360° − Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = Tabulated Azimuth. } See p. 90.

LAT.	5°			6°			7°			8°			9°			LAT.
H.A.	Alt.	d	Az.	Alt.	d	Az.	Alt.	d	Az.	Alt.	d	Az.	Alt.	d	Az.	H.A.
°	° ′		°	° ′		°	° ′		°	° ′		°	° ′		°	°
45	41 52	−20	58	42 24	−19	59	42 55	−18	59	43 25	−17	60	43 54	−15	61	315
46	41 01	19	58	41 33	18	59	42 03	17	60	42 33	15	60	43 03	15	61	314
47	40 11	19	58	40 42	18	59	41 12	16	60	41 42	16	61	42 10	13	62	313
48	39 20	18	59	39 50	16	60	40 20	15	60	40 50	15	61	41 18	13	62	312
49	38 28	17	59	38 59	16	60	39 29	15	61	39 58	14	61	40 26	13	62	311
50	37 37	−17	59	38 07	−15	60	38 37	−15	61	39 06	−14	62	39 34	−12	62	310
51	36 45	15	60	37 15	14	60	37 45	14	61	38 13	12	62	38 41	11	62	309
52	35 54	16	60	36 23	14	61	36 52	13	61	37 21	12	62	37 49	11	63	308
53	35 02	15	60	35 31	13	61	36 00	12	62	36 28	11	62	36 56	10	63	307
54	34 10	14	61	34 39	13	61	35 08	12	62	35 36	11	62	36 03	9	63	306
55	33 18	−14	61	33 47	−12	61	34 15	−11	62	34 43	−10	63	35 10	−9	63	305
56	32 26	13	61	32 54	11	62	33 23	11	62	33 50	9	63	34 18	9	63	304
57	31 33	12	61	32 02	11	62	32 30	10	62	32 58	9	63	33 25	8	64	303
58	30 41	12	61	31 09	10	62	31 37	9	63	32 05	9	63	32 32	8	64	302
59	29 48	11	62	30 17	10	62	30 44	8	63	31 12	8	63	31 38	6	64	301
60	28 56	−11	62	29 24	−9	62	29 52	−9	63	30 19	−8	63	30 45	−6	64	300
61	28 03	10	62	28 31	9	62	28 59	8	63	29 26	7	63	29 52	6	64	299
62	27 10	9	62	27 38	8	63	28 06	8	63	28 32	6	64	28 59	5	64	298
63	26 18	9	62	26 45	7	63	27 13	7	63	27 39	5	64	28 06	5	64	297
64	25 25	9	62	25 52	7	63	26 19	6	63	26 46	5	64	27 12	4	64	296
65	24 32	−8	63	24 59	−6	63	25 26	−5	63	25 53	−5	64	26 19	−3	64	295
66	23 39	7	63	24 06	6	63	24 33	5	63	25 00	4	64	25 26	3	64	294
67	22 46	7	63	23 13	6	63	23 40	5	64	24 06	3	64	24 32	2	64	293
68	21 53	6	63	22 20	5	63	22 47	5	64	23 13	3	64	23 39	2	64	292
69	21 00	6	63	21 27	5	63	21 53	3	64	22 20	3	64	22 46	2	64	291
70	20 06	−5	63	20 33	−4	63	21 00	−3	64	21 26	−2	64	21 52	−1	64	290
71	19 13	4	63	19 40	4	63	20 07	3	64	20 33	2	64	20 59	−1	64	289
72	18 20	4	63	18 47	3	63	19 13	2	64	19 40	−1	64	20 06	0	64	288
73	17 27	4	63	17 54	3	64	18 20	2	64	18 46	0	64	19 12	+1	64	287
74	16 33	3	63	17 00	2	64	17 27	−1	64	17 53	0	64	18 19	1	64	286
75	15 40	−2	63	16 07	−2	64	16 33	0	64	17 00	0	64	17 26	+1	64	285
76	14 47	2	63	15 14	−1	64	15 40	0	64	16 06	+1	64	16 32	2	64	284
77	13 54	2	63	14 20	0	64	14 47	0	64	15 13	1	64	15 39	2	64	283
78	13 01	−2	63	13 27	0	64	13 54	0	64	14 20	2	64	14 46	3	64	282
79	12 07	0	63	12 34	0	64	13 00	+2	64	13 27	2	64	13 53	3	64	281
80	11 14	0	63	11 41	+1	64	12 07	+2	64	12 34	+2	64	13 00	+3	64	280
81	10 21	0	63	10 48	+1	64	11 14	2	64	11 40	4	64	12 07	4	64	279
82		...			...		10 21	+3	64	10 47	+4	64	11 14	4	64	278
83		...			...			...			...		10 21	+5	64	277
84		...			...			...			...			...		276
85		...			...			...			...			...		275

In South Latitudes { For argument H.A. on the left, True Azimuth = 180° + Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = 180° − Tabulated Azimuth. } See p. 91.

LAT.	5°		6°		7°		8°		9°		LAT.
H.A.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	H.A.
°	° ′ d	°	° ′ d	°	° ′ d	°	° ′ d	°	° ′ d	°	°
0	58 01–60	180	57 01–60	180	56 01–60	180	55 01–60	180	54 01–60	180	360
1	58 00 60	178	57 00 60	178	56 00 60	178	55 00 60	178	54 00 60	178	359
2	57 57 60	177	56 57 60	177	55 57 60	177	54 57 60	177	53 57 59	177	358
3	57 53 60	175	56 53 60	175	55 53 60	175	54 53 59	175	53 54 60	175	357
4	57 47 60	173	56 47 60	173	55 47 59	174	54 48 60	174	53 48 59	174	356
5	57 39–59	172	56 39–59	172	55 40–59	172	54 41–60	172	53 41–59	172	355
6	57 29 59	170	56 30 59	170	55 31 59	171	54 32 59	171	53 33 60	171	354
7	57 18 58	168	56 19 58	169	55 20 58	169	54 21 58	169	53 23 59	170	353
8	57 05 58	167	56 07 58	167	55 08 58	167	54 10 59	168	53 11 58	168	352
9	56 51 58	165	55 53 58	166	54 55 58	166	53 56 58	166	52 58 58	167	351
10	56 35–57	164	55 37–57	164	54 39–57	164	53 42–58	165	52 44–58	165	350
11	56 17 56	162	55 20 57	163	54 23 57	163	53 25 57	163	52 28 57	164	349
12	55 58 56	161	55 01 56	161	54 05 57	162	53 08 57	162	52 11 57	162	348
13	55 38 55	159	54 42 56	160	53 45 55	160	52 49 56	161	51 52 56	161	347
14	55 16 55	158	54 20 55	158	53 24 55	159	52 28 55	159	51 32 55	160	346
15	54 53–54	156	53 57–54	157	53 02–54	157	52 07–55	158	51 11–55	158	345
16	54 28 53	155	53 33 53	156	52 39 54	156	51 44 54	157	50 49 55	157	344
17	54 02 52	154	53 08 52	154	52 14 53	155	51 20 54	155	50 25 54	156	343
18	53 35 52	152	52 42 52	153	51 48 52	154	50 54 52	154	50 00 53	155	342
19	53 07 51	151	52 14 51	152	51 21 52	152	50 28 52	153	49 34 52	153	341
20	52 37–50	150	51 45–50	151	50 53–51	151	50 00–51	152	49 07–51	152	340
21	52 07 49	149	51 15 49	149	50 24 50	150	49 31 50	151	48 39 51	151	339
22	51 35 48	148	50 44 48	148	49 53 49	149	49 02 50	149	48 10 50	150	338
23	51 03 48	146	50 12 48	147	49 22 49	148	48 31 49	148	47 40 50	149	337
24	50 29 47	145	49 39 47	146	48 50 48	147	47 59 48	147	47 09 49	148	336
25	49 54–45	144	49 06–47	145	48 16–46	146	47 27–48	146	46 37–48	147	335
26	49 19 45	143	48 31 46	144	47 42 46	145	46 53 46	145	46 04 47	146	334
27	48 43 44	142	47 55 44	143	47 07 45	144	46 19 46	144	45 30 46	145	333
28	48 06 43	141	47 19 44	142	46 32 45	143	45 44 45	143	44 55 45	144	332
29	47 28 42	140	46 42 43	141	45 55 44	142	45 08 44	142	44 20 45	143	331
30	46 50–42	139	46 04–42	140	45 18–43	141	44 31–43	141	43 44–44	142	330
31	46 10 40	139	45 25 41	139	44 40 42	140	43 54 43	140	43 07 43	141	329
32	45 30 39	138	44 46 41	138	44 01 41	139	43 15 41	140	42 30 43	140	328
33	44 50 39	137	44 06 40	138	43 21 40	138	42 37 42	139	41 51 41	139	327
34	44 09 38	136	43 25 39	137	42 41 39	137	41 57 40	138	41 12 41	139	326
35	43 27–37	135	42 44–38	136	42 01–39	137	41 17–40	137	40 33–40	138	325
36	42 45 37	135	42 02 37	135	41 20 38	136	40 36 38	136	39 53 40	137	324
37	42 02 36	134	41 20 37	134	40 38 37	135	39 55 38	136	39 12 39	136	323
38	41 18 35	133	40 37 36	134	39 55 36	134	39 13 37	135	38 31 38	136	322
39	40 35 35	132	39 54 35	133	39 13 36	134	38 31 36	134	37 49 37	135	321
40	39 50–33	132	39 10–34	132	38 29–35	133	37 48–36	134	37 07–37	134	320
41	39 05 32	131	38 26 34	132	37 46 35	132	37 05 35	133	36 24 36	133	319
42	38 20 32	131	37 41 33	131	37 01 33	132	36 21 34	132	35 41 35	133	318
43	37 35 32	130	36 56 32	131	36 17 33	131	35 37 34	132	34 57 34	132	317
44	36 49 31	129	36 10 31	130	35 32 32	130	34 53 33	131	34 13 34	132	316
45	36 02–29	129	35 25–31	129	34 46–31	130	34 08–33	130	33 28–33	131	315

In North Latitudes { For argument H.A. on the left, True Azimuth = 360° − Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = Tabulated Azimuth. } See p. 90.

LAT.	5°			6°			7°			8°			9°			LAT.
H.A.	Alt.		Az.	Alt.		Az.	Alt.		Az.	Alt.		Az.	Alt.		Az.	H.A.
°	° ,	d	°	° ,	d	°	° ,	d	°	° ,	d	°	° ,	d	°	°
45	36 02	−29	129	35 25	−31	129	34 46	−31	130	34 08	−33	130	33 28	−33	131	315
46	35 16	29	128	34 38	30	129	34 00	30	129	33 22	31	130	32 44	33	130	314
47	34 29	29	128	33 52	30	128	33 14	30	129	32 36	30	129	31 58	31	130	313
48	33 41	27	127	33 05	29	128	32 28	30	128	31 50	30	129	31 13	31	129	312
49	32 54	27	127	32 17	27	127	31 41	29	128	31 04	30	128	30 27	31	129	311
50	32 06	−27	126	31 30	−27	127	30 54	−28	127	30 17	−29	128	29 40	−29	128	310
51	31 17	25	126	30 42	27	126	30 06	27	127	29 30	28	127	28 54	29	128	309
52	30 29	25	125	29 54	26	126	29 19	27	126	28 43	28	127	28 07	29	127	308
53	29 40	24	125	29 05	25	126	28 30	26	126	27 55	27	126	27 19	27	127	307
54	28 51	24	125	28 17	25	125	27 42	25	126	27 07	26	126	26 32	27	126	306
55	28 02	−23	124	27 28	−24	125	26 54	−25	125	26 19	−26	126	25 44	−27	126	305
56	27 12	22	124	26 39	24	124	26 05	24	125	25 31	26	125	24 56	26	125	304
57	26 23	22	123	25 49	22	124	25 16	24	124	24 42	25	125	24 08	26	125	303
58	25 33	21	123	25 00	22	124	24 27	23	124	23 53	24	124	23 19	25	125	302
59	24 43	21	123	24 10	21	123	23 37	22	124	23 04	23	124	22 30	24	124	301
60	23 52	−20	122	23 20	−21	123	22 47	−21	123	22 15	−23	124	21 41	−23	124	300
61	23 02	20	122	22 30	20	123	21 58	22	123	21 25	22	123	20 52	23	124	299
62	22 11	19	122	21 40	20	122	21 08	21	123	20 35	21	123	20 03	23	123	298
63	21 21	19	122	20 49	19	122	20 17	20	122	19 45	21	123	19 13	22	123	297
64	20 30	18	121	19 58	18	122	19 27	20	122	18 55	20	122	18 23	21	122	296
65	19 39	−18	121	19 08	−18	121	18 36	−19	122	18 05	−20	122	17 33	−21	122	295
66	18 47	16	121	18 17	18	121	17 46	19	121	17 15	20	122	16 43	20	122	294
67	17 56	16	120	17 26	17	121	16 55	18	121	16 24	19	121	15 53	20	122	293
68	17 05	16	120	16 34	16	120	16 04	17	121	15 33	18	121	15 02	19	121	292
69	16 13	15	120	15 43	16	120	15 13	17	120	14 42	17	121	14 12	19	121	291
70	15 21	−14	120	14 52	−16	120	14 22	−17	120	13 52	−18	120	13 21	−18	121	290
71	14 30	14	120	14 00	15	120	13 30	15	120	13 00	16	120	12 30	17	120	289
72	13 38	14	119	13 09	15	120	12 39	15	120	12 09	16	120	11 39	17	120	288
73	12 46	13	119	12 17	14	119	11 47	14	120	11 18	16	120	10 48	−16	120	287
74	11 54	12	119	11 25	13	119	10 56	14	119	10 27	−15	119	...			286
75	11 02	−12	119	10 33	−13	119	10 04	−13	119	...			...			285
76	10 10	−12	119	...			...			...			...			284
77	...			...			...			...			...			283
78	...			...			...			...			...			282
79	...			...			...			...			...			281
80	...			...			...			...			...			280

In South Latitudes { For argument H.A. on the left, True Azimuth = 180° + Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = 180° − Tabulated Azimuth. } See p. 91.

LAT.	5°		6°		7°		8°		9°		LAT.
H.A.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	Alt.	Az.	H.A.
°	° ′ d	°	° ′ d	°	° ′ d	°	° ′ d	°	° ′ d	°	°
0	67 00–60	0	68 00–60	0	69 00–60	0	70 00–60	0	71 00–60	0	360
1	66 59 60	2	67 59 60	2	68 59 60	2	69 59 60	3	70 59 60	3	359
2	66 56 60	5	67 55 59	5	68 55 60	5	69 55 60	5	70 55 60	5	358
3	66 50 60	7	67 49 59	7	68 49 60	7	69 48 59	8	70 48 60	8	357
4	66 42 59	9	67 41 59	9	68 40 59	10	69 39 59	10	70 38 59	11	356
5	66 31–58	11	67 30–58	12	68 29–59	12	69 27–58	13	70 26–58	13	355
6	66 19 58	13	67 17 58	14	68 15 58	14	69 13 57	15	70 11 57	16	354
7	66 04 58	15	67 02 58	16	67 59 57	17	68 56 56	17	69 54 57	18	353
8	65 47 57	17	66 44 56	18	67 41 56	19	68 38 56	20	69 34 56	21	352
9	65 28 56	19	66 24 55	20	67 21 55	21	68 16 54	22	69 12 54	23	351
10	65 07–55	21	66 03–55	22	66 58–54	23	67 53–53	24	68 48–53	25	350
11	64 44 53	23	65 39 53	24	66 34 53	25	67 28 52	26	68 22 52	27	349
12	64 20 53	25	65 14 52	26	66 08 52	27	67 01 51	28	67 54 51	29	348
13	63 54 52	27	64 47 51	28	65 40 51	29	66 32 50	30	67 24 49	31	347
14	63 26 51	29	64 19 51	30	65 11 50	31	66 02 49	32	66 53 49	33	346
15	62 57–50	30	63 48–49	31	64 39–48	32	65 30–48	33	66 20–47	35	345
16	62 26 49	32	63 17 48	33	64 07 47	34	64 56 46	35	65 45 45	36	344
17	61 54 47	33	62 44 47	34	63 33 46	35	64 22 45	37	65 09 44	38	343
18	61 21 47	35	62 10 46	36	62 58 45	37	63 46 44	38	64 32 42	39	342
19	60 46 45	36	61 34 44	37	62 22 44	38	63 08 42	40	63 54 41	41	341
20	60 10–44	37	60 58–44	38	61 44–42	40	62 30–41	41	63 15–40	42	340
21	59 34 43	39	60 20 42	40	61 06 41	41	61 51 40	42	62 35 39	43	339
22	58 56 42	40	59 41 41	41	60 26 40	42	61 10 38	43	61 54 38	45	338
23	58 17 41	41	59 02 40	42	59 46 39	43	60 29 37	44	61 12 37	46	337
24	57 37 39	42	58 21 38	43	59 05 38	44	59 47 36	46	60 29 36	47	336
25	56 57–39	43	57 40–37	44	58 23–37	45	59 05–36	47	59 45–34	48	335
26	56 16 38	44	56 58 36	45	57 40 35	46	58 21 34	48	59 01 33	49	334
27	55 34 37	45	56 16 36	46	56 57 35	47	57 37 33	48	58 16 32	50	333
28	54 51 36	46	55 32 34	47	56 13 34	48	56 52 32	49	57 31 31	50	332
29	54 08 35	47	54 48 33	48	55 28 32	49	56 07 31	50	56 45 30	51	331
30	53 24–34	48	54 04–33	49	54 43–31	50	55 21–30	51	55 58–28	52	330
31	52 39 32	49	53 19 32	50	53 57 30	51	54 35 29	52	55 11 27	53	329
32	51 54 31	49	52 33 31	50	53 11 30	51	53 48 28	52	54 24 27	53	328
33	51 09 31	50	51 47 30	51	52 24 28	52	53 01 28	53	53 36 26	54	327
34	50 23 30	51	51 00 28	52	51 37 27	53	52 13 26	54	52 48 25	55	326
35	49 36–29	51	50 13–27	52	50 49–26	53	51 25–25	54	51 59–24	55	325
36	48 49 28	52	49 26 27	53	50 02 26	54	50 37 25	55	51 11 24	56	324
37	48 02 27	53	48 38 26	54	49 13 24	54	49 48 24	55	50 21 22	56	323
38	47 14 26	53	47 50 25	54	48 25 24	55	48 59 23	56	49 32 22	57	322
39	46 26 25	54	47 01 24	55	47 36 23	55	48 09 21	56	48 42 20	57	321
40	45 38–25	54	46 13–24	55	46 47–23	56	47 20–21	57	47 52–20	58	320
41	44 49 23	55	45 24 23	56	45 57 21	56	46 30 20	57	47 02 19	58	319
42	44 00 23	55	44 34 22	56	45 07 20	57	45 40 20	58	46 12 19	59	318
43	43 11 22	56	43 45 21	56	44 18 20	57	44 50 19	58	45 21 18	59	317
44	42 22 22	56	42 55 20	57	43 27 19	58	43 59 18	58	44 30 17	59	316
45	41 32–21	56	42 05–20	57	42 37–19	58	43 08–17	59	43 39–16	60	315

In North Latitudes { For argument H.A. on the left, True Azimuth = 360° − Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = Tabulated Azimuth. } See p. 90.

LAT.	5°			6°			7°			8°			9°			LAT.
H.A.	Alt.	d	Az.	Alt.	d	Az.	Alt.	d	Az.	Alt.	d	Az.	Alt.	d	Az.	H.A.
°	° ′		°	° ′		°	° ′		°	° ′		°	° ′		°	°
45	41 32	−21	56	42 05	−20	57	42 37	−19	58	43 08	−17	59	43 39	−16	60	315
46	40 42	20	57	41 15	19	58	41 46	17	58	42 18	17	59	42 48	16	60	314
47	39 52	19	57	40 24	18	58	40 56	17	59	41 26	16	59	41 57	15	60	313
48	39 02	19	58	39 34	18	58	40 05	17	59	40 35	15	60	41 05	14	60	312
49	38 11	18	58	38 43	17	59	39 14	16	59	39 44	15	60	40 13	13	61	311
50	37 20	−17	58	37 52	−16	59	38 22	−15	60	38 52	−14	60	39 22	−13	61	310
51	36 30	17	59	37 01	16	59	37 31	14	60	38 01	14	61	38 30	12	61	309
52	35 38	15	59	36 09	15	59	36 39	13	60	37 09	13	61	37 38	12	61	308
53	34 47	15	59	35 18	14	60	35 48	13	60	36 17	12	61	36 46	11	62	307
54	33 56	15	59	34 26	13	60	34 56	13	61	35 25	11	61	35 54	11	62	306
55	33 04	−14	60	33 35	−13	60	34 04	−12	61	34 33	−11	61	35 01	−9	62	305
56	32 13	14	60	32 43	13	60	33 12	11	61	33 41	10	62	34 09	9	62	304
57	31 21	13	60	31 51	12	61	32 20	11	61	32 49	10	62	33 17	9	62	303
58	30 29	12	60	30 59	11	61	31 28	10	61	31 56	9	62	32 24	8	62	302
59	29 37	11	61	30 07	11	61	30 36	10	62	31 04	9	62	31 32	8	63	301
60	28 45	−11	61	29 15	−10	61	29 43	−9	62	30 11	−8	62	30 39	−7	63	300
61	27 53	10	61	28 22	9	61	28 51	9	62	29 19	7	62	29 46	6	63	299
62	27 01	10	61	27 30	9	61	27 58	8	62	28 26	7	62	28 54	6	63	298
63	26 09	9	61	26 38	9	62	27 06	7	62	27 34	7	63	28 01	5	63	297
64	25 16	8	61	25 45	8	62	26 13	7	62	26 41	6	63	27 08	4	63	296
65	24 24	−8	61	24 53	−8	62	25 21	−7	62	25 48	−5	63	26 16	−5	63	295
66	23 32	8	62	24 00	7	62	24 28	6	62	24 56	5	63	25 23	4	63	294
67	22 39	7	62	23 07	6	62	23 35	5	62	24 03	4	63	24 30	3	63	293
68	21 47	7	62	22 15	6	62	22 42	4	63	23 10	4	63	23 37	3	63	292
69	20 54	6	62	21 22	5	62	21 50	4	63	22 17	3	63	22 44	2	63	291
70	20 01	−5	62	20 29	−4	62	20 57	−4	63	21 24	−2	63	21 51	−1	63	290
71	19 09	5	62	19 36	3	62	20 04	3	63	20 31	2	63	20 58	1	63	289
72	18 16	5	62	18 44	4	62	19 11	2	63	19 39	2	63	20 06	−1	63	288
73	17 23	4	62	17 51	3	62	18 18	2	63	18 46	1	63	19 13	0	63	287
74	16 30	3	62	16 58	2	63	17 26	2	63	17 53	−1	63	18 20	0	63	286
75	15 38	−3	62	16 05	−2	63	16 33	−1	63	17 00	0	63	17 27	+1	63	285
76	14 45	2	62	15 13	2	63	15 40	0	63	16 07	+1	63	16 34	2	63	284
77	13 52	2	62	14 20	−1	63	14 47	0	63	15 14	1	63	15 41	2	63	283
78	12 59	1	62	13 27	0	63	13 54	+1	63	14 22	1	63	14 49	2	63	282
79	12 07	−1	62	12 34	0	63	13 02	1	63	13 29	2	63	13 56	3	63	281
80	11 14	0	62	11 42	0	63	12 09	+2	63	12 36	+3	63	13 03	+4	63	280
81	10 21	+1	62	10 49	+1	63	11 16	2	63	11 44	3	63	12 11	4	63	279
82		...			...		10 24	+2	63	10 51	+3	63	11 18	4	63	278
83		...			...			...			...		10 26	+4	63	277
84		...			...			...			...			...		276
85		...			...			...			...			...		275

In South Latitudes { For argument H.A. on the left, True Azimuth = 180° + Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = 180° − Tabulated Azimuth. } See p. 91.

LAT.	5°			6°			7°			8°			9°			LAT.
H.A.	Alt.		Az.	Alt.		Az.	Alt.		Az.	Alt.		Az.	Alt.		Az.	H.A.
°	° ′	d	°	° ′	d	°	° ′	d	°	° ′	d	°	° ′	d	°	°
0	57 01	−60	180	56 01	−60	180	55 01	−60	180	54 01	−60	180	53 01	−60	180	360
1	57 00	60	178	56 00	60	178	55 00	60	178	54 00	60	178	53 00	60	179	359
2	56 57	60	177	55 57	60	177	54 57	59	177	53 57	59	177	52 58	60	177	358
3	56 53	60	175	55 53	60	175	54 53	59	175	53 54	60	176	52 54	60	176	357
4	56 47	59	174	55 47	59	174	54 48	60	174	53 48	59	174	52 49	60	174	356
5	56 40	−60	172	55 40	−59	172	54 41	−60	172	53 41	−59	173	52 42	−60	173	355
6	56 30	59	170	55 31	59	171	54 32	59	171	53 33	59	171	52 33	59	171	354
7	56 20	59	169	55 21	59	169	54 22	59	169	53 23	59	170	52 24	59	170	353
8	56 07	58	167	55 09	59	168	54 10	58	168	53 11	58	168	52 13	59	168	352
9	55 53	57	166	54 55	58	166	53 57	58	166	52 58	58	167	52 00	58	167	351
10	55 38	−57	164	54 40	−57	165	53 42	−57	165	52 44	−57	165	51 46	−58	166	350
11	55 21	57	163	54 23	56	163	53 26	57	164	52 28	57	164	51 31	58	164	349
12	55 02	56	161	54 05	56	162	53 08	56	162	52 11	56	163	51 14	57	163	348
13	54 43	56	160	53 46	56	160	52 50	56	161	51 53	56	161	50 56	56	162	347
14	54 21	54	159	53 25	55	159	52 29	55	159	51 33	55	160	50 37	56	160	346
15	53 59	−54	157	53 03	−54	158	52 08	−55	158	51 12	−55	159	50 16	−55	159	345
16	53 35	53	156	52 40	54	156	51 45	54	157	50 50	54	157	49 54	54	158	344
17	53 10	53	154	52 16	53	155	51 21	53	156	50 26	53	156	49 31	53	157	343
18	52 43	51	153	51 50	52	154	50 56	53	154	50 02	53	155	49 07	53	155	342
19	52 16	51	152	51 23	52	153	50 29	51	153	49 36	52	154	48 42	53	154	341
20	51 47	−50	151	50 55	−51	151	50 02	−51	152	49 09	−51	153	48 16	−52	153	340
21	51 18	50	150	50 26	50	150	49 34	51	151	48 41	51	151	47 48	51	152	339
22	50 47	49	148	49 56	49	149	49 04	50	150	48 12	50	150	47 20	51	151	338
23	50 15	48	147	49 24	48	148	48 33	48	149	47 42	49	149	46 50	49	150	337
24	49 42	47	146	48 52	47	147	48 02	48	148	47 11	48	148	46 20	49	149	336
25	49 09	−46	145	48 19	−46	146	47 30	−48	146	46 39	−47	147	45 49	−48	148	335
26	48 34	45	144	47 45	45	145	46 56	46	145	46 07	47	146	45 17	48	147	334
27	47 59	45	143	47 11	45	144	46 22	46	144	45 33	46	145	44 44	47	146	333
28	47 23	44	142	46 35	44	143	45 47	45	144	44 59	46	144	44 10	46	145	332
29	46 46	43	141	45 59	44	142	45 11	44	143	44 24	45	143	43 35	45	144	331
30	46 08	−42	140	45 22	−43	141	44 35	−43	142	43 48	−44	142	43 00	−45	143	330
31	45 30	41	140	44 44	42	140	43 58	43	141	43 11	43	141	42 24	44	142	329
32	44 51	41	139	44 05	41	139	43 20	42	140	42 34	43	141	41 47	43	141	328
33	44 11	40	138	43 26	40	139	42 41	41	139	41 55	41	140	41 10	43	140	327
34	43 31	39	137	42 46	39	138	42 02	40	138	41 17	41	139	40 31	41	140	326
35	42 50	−38	136	42 06	−39	137	41 22	−39	138	40 37	−40	138	39 53	−41	139	325
36	42 08	37	136	41 25	38	136	40 42	39	137	39 58	40	137	39 13	40	138	324
37	41 26	36	135	40 43	37	135	40 01	38	136	39 17	38	137	38 33	39	137	323
38	40 43	35	134	40 01	36	135	39 19	37	135	38 36	38	136	37 53	39	136	322
39	40 00	34	134	39 19	36	134	38 37	36	135	37 55	38	135	37 12	38	136	321
40	39 17	−34	133	38 36	−35	133	37 54	−35	134	37 12	−36	135	36 30	−37	135	320
41	38 33	33	132	37 52	34	133	37 11	35	133	36 30	36	134	35 48	36	134	319
42	37 48	32	132	37 08	33	132	36 28	34	133	35 47	35	133	35 06	36	134	318
43	37 03	31	131	36 24	33	132	35 44	33	132	35 03	34	133	34 23	35	133	317
44	36 18	31	130	35 39	32	131	35 00	33	132	34 20	34	132	33 39	34	133	316
45	35 33	−31	130	34 54	−31	130	34 15	−32	131	33 35	−32	131	32 55	−33	132	315

In North Latitudes { For argument H.A. on the left, True Azimuth = 360° − Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = Tabulated Azimuth. } See p. 90.

LAT.	5°			6°			7°			8°			9°			LAT.
H.A.	Alt.	d	Az.	Alt.	d	Az.	Alt.	d	Az.	Alt.	d	Az.	Alt.	d	Az.	H.A.
°	° ′		°	° ′		°	° ′		°	° ′		°	° ′		°	°
45	35 33	−31	130	34 54	−31	130	34 15	−32	131	33 35	−32	131	32 55	−33	132	315
46	34 47	30	129	34 08	30	130	33 30	32	130	32 51	32	131	32 11	33	131	314
47	34 00	29	129	33 22	29	129	32 44	30	130	32 06	32	130	31 27	33	131	313
48	33 14	29	128	32 36	29	129	31 58	30	129	31 20	31	130	30 42	32	130	312
49	32 27	28	128	31 50	29	128	31 12	29	129	30 34	30	129	29 56	31	130	311
50	31 39	−27	127	31 03	−28	128	30 26	−29	128	29 48	−29	129	29 11	−31	129	310
51	30 52	26	127	30 15	27	127	29 39	28	128	29 02	29	128	28 25	30	129	309
52	30 04	26	127	29 28	26	127	28 52	27	127	28 15	28	128	27 38	29	128	308
53	29 16	25	126	28 40	26	127	28 04	26	127	27 28	27	127	26 52	29	128	307
54	28 27	24	126	27 52	25	126	27 17	26	127	26 41	27	127	26 05	28	127	306
55	27 39	−24	125	27 04	−25	126	26 29	−26	126	25 53	−26	127	25 17	−27	127	305
56	26 50	23	125	26 15	23	125	25 41	25	126	25 05	25	126	24 30	26	126	304
57	26 01	23	125	25 27	24	125	24 52	24	125	24 17	25	126	23 42	25	126	303
58	25 12	22	124	24 38	23	125	24 04	24	125	23 29	24	125	22 54	25	126	302
59	24 22	21	124	23 49	22	124	23 15	23	125	22 41	24	125	22 06	24	125	301
60	23 32	−20	124	22 59	−21	124	22 26	−23	124	21 52	−23	125	21 18	−24	125	300
61	22 42	19	123	22 10	21	124	21 36	21	124	21 03	23	124	20 29	23	124	299
62	21 52	19	123	21 20	20	123	20 47	21	124	20 14	22	124	19 40	23	124	298
63	21 02	18	123	20 30	20	123	19 57	20	123	19 24	21	124	18 51	22	124	297
64	20 12	18	122	19 40	19	123	19 07	20	123	18 35	21	123	18 02	22	123	296
65	19 21	−17	122	18 50	−19	122	18 17	−19	123	17 45	−20	123	17 12	−21	123	295
66	18 31	17	122	17 59	18	122	17 27	18	122	16 55	19	123	16 23	21	123	294
67	17 40	16	121	17 09	18	122	16 37	18	122	16 05	19	122	15 33	20	122	293
68	16 49	16	121	16 18	17	121	15 47	18	122	15 15	19	122	14 43	19	122	292
69	15 58	15	121	15 27	16	121	14 56	17	121	14 25	18	122	13 53	19	122	291
70	15 07	−15	121	14 36	−15	121	14 05	−16	121	13 34	−17	121	13 03	−18	122	290
71	14 16	15	121	13 45	15	121	13 15	16	121	12 44	17	121	12 13	18	121	289
72	13 24	13	120	12 54	14	121	12 24	16	121	11 53	16	121	11 22	17	121	288
73	12 33	13	120	12 03	14	120	11 33	15	121	11 02	15	121	10 32	−17	121	287
74	11 42	13	120	11 12	14	120	10 42	−15	120	10 12	−16	120	...			286
75	10 50	−12	120	10 20	−13	120	...			...			...			285

In South Latitudes { For argument H.A. on the left, True Azimuth = 180° + Tabulated Azimuth. / For argument H.A. on the right, True Azimuth = 180° − Tabulated Azimuth. } See p. 91.

EXPLANATION

By agreement with the Admiralty, the *Astronomical Navigation Tables* are produced by H.M. Nautical Almanac Office to the general requirements of the Air Ministry.

These tables are designed to give, in a simple and direct manner, the solution of the astronomical spherical triangle that occurs in navigational practice. They have been planned for use with the *Air Almanac* (Air Publication 1602) and are consequently designed primarily to meet the requirements of modern air navigation: their use can however be extended to surface navigation, as in the case of the *Air Almanac*, within the limitations of the precision of the tabulated altitude and azimuth.

The general object of the *Astronomical Navigation Tables* is to facilitate the calculation of the Altitude and Azimuth of an observed heavenly body, as seen from some position close to that of the observer. This information, together with the observed altitude, allows to be plotted on the chart a position line upon which the observer must lie; two such position lines serve in general to determine the position of the observer. The tables have been arranged with special relation to the determination of the altitude and azimuth when an assumed position is adopted such that the latitude and hour angle are both integral degrees; interpolation in this case is consequently restricted to interpolation to the declination of the body observed, and provision has been made for this to be done in a simple manner. The precision of the tabulated data is consistent with that adopted for the *Air Almanac*, namely that the altitudes are given to the nearest minute of arc, and so are correct to within 0'·5; this standard of precision is sufficient for all purposes of air navigation and, in fact, is at present (1938) considerably greater than the precision obtainable in an altitude observed with a bubble sextant. Although these tables have been prepared in conjunction with the *Air Almanac*, they are equally applicable for use with any other almanac from which the Greenwich Hour Angle and Declination of the body observed can be found for the time of observation; it is intended, however, that the two publications should provide, in the most convenient form, all the material for a rapid solution of the navigator's problem, for all practical observations.

The *Astronomical Navigation Tables* consist of main tables and auxiliary tables. The main tables give the Tabulated Altitude, to the nearest minute of arc, and the Tabulated Azimuth, to the nearest degree, with the three arguments:—

Latitude —each integral degree from S.69° to N.69°.

Declination—for 22 selected stars for the epoch 1940 and each integral degree from S.28° to N.28°.

Hour Angle—each integral degree for which the altitude is greater than 10°* and less than 80°.

Thus for every combination of an integral degree of latitude, declination and hour angle in the above ranges, the tables give immediately the quantities required.

* The limit is decreased for declinations appropriate to the Sun (0°–23°) in latitudes above 55°, where the Sun may be at low altitudes for long periods of each day, and in latitudes below 30°, where the Sun rises rapidly, and the azimuth at low altitudes is required for checking compasses.

EXPLANATION

In the case of the separate tabulations for the 22 stars, the values of the declinations used in the tables are those of the stars themselves at the middle of 1940; the declinations of the stars change slowly owing to precession and to other causes, but the effect of these changes can be allowed for by means of a simple correcting term, which although smaller, is catered for in a similar way to the interpolation for the declination of other bodies. The stars have been selected for their brightness and their distribution in the sky, and are the same in both name and number as stars Nos. 1-22 in the *Air Almanac*. The tables for integral degrees of declination are applicable to observations of the Sun, Moon and planets, as well as for all stars with declinations between S.29° and N.29°; a list of 13 such stars is given in the *Air Almanac* (Nos. 23-35). It is only for stars outside these limits of declination, in particular stars Nos. 36-50 in the *Air Almanac*, that these tables are not applicable; some other method of obtaining the altitude and azimuth must then be employed. The 22 stars catered for separately may however be regarded as generally sufficient for all practical purposes of air navigation; with the 13 additional stars to be used in exceptional circumstances, reference to other methods should be unnecessary.

The interpolation of tables with three arguments is both laborious and difficult, and should be avoided wherever possible; no provision has therefore been made for interpolation other than for declination, and the navigator should not interpolate for latitude and hour angle, but should use an assumed position so that this may be avoided. The arrangement of the tables, however, allows for interpolation for latitude and hour angle without, in general, the necessity for the comparison of figures on different pages, and the tables may therefore be interpolated for these arguments for the solution of special problems.

The tabulated altitude includes the effect of atmospheric refraction, and is thus directly comparable with the corrected sextant reading; it is in fact the altitude of the body as would be measured by an observer. The refraction included is based on the mean value of the refraction at a height of 5,000 feet in normal conditions, and it is unlikely that at heights in that neighbourhood the refraction will differ by more than 0'·5 from that used. Table VI on page 222 gives the adjustment necessary at heights that differ materially from the basic height adopted; the values in this table should only be applied in extreme cases, and where great accuracy is necessary.

The tabulated azimuth is measured from the elevated pole either to the east or to the west. This can be converted to true azimuth, measured always from the north through east, either by the rules given at the foot of each page, or by the use of Table III on pages 90 and 91.

For the greater convenience of the user, the tables are issued in fourteen volumes, each of which caters for a belt of latitude, 5° in width, in both the northern and southern hemispheres. In each volume tabulations are given for five integral degrees of latitude; working from an assumed position, whose latitude is taken to be the nearest integral degree to that of the D.R. (or estimated) position of the observer, each tabular latitude suffices to cover observations from positions within 0° 30' of the integral degree used. The Explanation and auxiliary tables are reprinted in each volume.

Each volume consists of two main parts, pages 2–89 giving the tabulations for the selected 22 stars and pages 94–209 those for declinations 0°–28°. Each part is

divided into sections of four pages, covering one star or one whole degree of declination; separate indexes on the margin enable immediate reference to be made to the first opening of each section. Throughout, the arrangement of the tabulations in each section is generally the same; the five values of latitude (LAT.) are given across the page and the values of the hour angle (H.A.) down the page. For the stars, the tabulations for NORTH latitudes precede those for SOUTH latitudes, and for the integral degrees of declination, those for the SAME name as the latitude precede those for CONTRARY name. The amount of tabulation varies in each case with different stars and declinations, and in some cases there are no tabulations either in north or in south latitudes, as the star or a body of the given declination does not reach an altitude which makes it suitable for observation in those latitudes; occasionally it has been necessary to continue the tabulation from one page on to the previous page, and for one or two stars, in south latitudes, on to two pages before.

For the stars, each column refers to a given latitude, and contains for all applicable values of the hour angle, the altitude (Alt.), its variation with time (*t*) and the azimuth (Az.). For the degrees of declination, the variation *t* is replaced by the difference (*d*) between the altitude given and that for the following degree. The procedure of entering and interpolating the tables is not appreciably different in the two cases.

An assumed position is taken close to the D.R. position so that the latitude is an integral degree, while the longitude is chosen so that the hour angle, formed by the combination of longitude (*added* if *east*, *subtracted* if *west*) with the G.H.A., taken from the *Air Almanac*, is also an integral degree. The appropriate part (star or degree of declination) is chosen, and the correct section obtained by the marginal index, using the star number, or the integral degree numerically *less* than the declination of the observed body as found from the *Air Almanac*. In this section, the column is chosen corresponding to the assumed latitude, care being taken to select the correct hemisphere. In this column, the values of Alt., *t*, and Az. can be read off for the stars, corresponding to the particular integral hour angle; for a degree of declination, the values of Alt., *d* and Az. are similarly found.

The tabulated altitude must now be corrected, in the case of the 22 stars, for the effect of precession, and for other bodies, interpolated to the true declination. Table I on the inside front cover gives the correction to be applied to the altitude of the stars for all years to 2000 for values of *t*; this correction must be added or subtracted according to the sign prefixed to *t*. For each star a limiting year is given before which this correction cannot exceed 1′, and there is therefore no need to apply it until after that date. Similarly, the inside back cover and its facing page contain Table XV, with arguments *d* and the minutes of the declination of the body, giving the correction to be applied to the tabulated altitude taken out for an integral degree; this correction is to be applied to the tabulated altitude with the same sign as that of *d*.

It is unnecessary to correct the tabulated azimuth in any way, but it must of course be converted to true azimuth before being used to plot a position line.

Having thus obtained the corrected tabulated altitude and the true azimuth, the position line is drawn in the usual manner. The intercept is obtained from the difference between the corrected sextant reading and the corrected tabulated altitude, and is set off from the assumed position either *towards* the direction given

by the true azimuth or in the opposite direction (*away* from), according to the following rules:

Corr. Tab. Alt. *less* than Corr. Sext. Rdg., intercept *towards*;
Corr. Tab. Alt. *greater* than Corr. Sext. Rdg., intercept *away*.

The position line is then drawn at right angles to the intercept through the point so obtained. The expression corrected sextant reading is used conveniently for the observed altitude to emphasize that this quantity is the altitude as measured by the sextant, corrected only for sextant errors and for dome refraction if applicable. As the atmospheric refraction is catered for in the tabulated altitude, no correction for this should be applied to the sextant reading.

If the assumed position is close to the true position, a slight inaccuracy in plotting the tabulated azimuth is unimportant; when the tabulated azimuth is near 0° or 180° advantage may be taken of this to draw the position line simply as part of a parallel of latitude. A double border rule, given when the azimuth is within a few degrees of the meridian, indicates the portions of the tables where this can be done without great error; the limit of azimuth has been varied slightly in different volumes, according to the latitude, so as to reduce the error due to this simplified procedure. The accuracy of this method depends upon the error in the assumed longitude; for an error of 20 miles in the D.R. longitude, the maximum error introduced into the deduced latitude is about 2 miles, while the remaining error (due to the use of an assumed position) may reach a maximum of 2 miles in the worst case. This method should therefore only be adopted either when errors up to about 4 miles can be tolerated, or when the D.R. longitude is known to be fairly accurate; if the D.R. position is liable to much greater error than 20 miles, this method should not be used. An assumed position is taken and the tables entered in exactly the same way (whether for stars or other bodies) as for an ordinary observation, but there is now no necessity to take out the azimuth or to convert to true azimuth. The tabulated altitude is corrected by Table I or Table XV as necessary, and the intercept formed by the usual rules. The intercept is then set off from the assumed position *towards* or *away* from the direction of the object observed, this direction being taken as true north or true south; the position line is thus drawn in as a parallel of latitude. Although the procedure of entering the tables is exactly the same, this method saves a considerable amount of work in the plotting of the position line.

A list of the auxiliary tables is given in the list of contents; in general the titles of these tables are self-explanatory and their use either self-evident or explained on the page concerned.

Tables VII, VIII, IX, X, XI and XIII are arranged as critical tables, so that the result is obtained immediately without interpolation. The argument is divided into intervals, successive intervals corresponding to successive values of the result; for any values of the argument, inside one of these intervals, the corresponding result is the quantity opposite that interval and has in general a maximum error of less than half a unit in the last figure given; when successive values of the result are not consecutive integers, this error can rise to half the difference between successive values. The tabulated values of the argument correspond to half-way values of the result, and these are always chosen so that when the argument is exactly equal to one of the tabulated values, the nearest value of the result is the one corresponding to the previous interval. Thus the rule to be followed is:

When the argument is an exact tabulated value, the *upper* of the two possible values of the result should be taken.

ILLUSTRATIONS

Example 1.—On 1941 September 30, local date, about two hours after sunset, in dead reckoning position latitude 8° 17′ N., longitude 125° 30′ W., star number 22 (Vega) was observed to obtain a position line. Corrected sextant reading 48° 42′; G.M.T. of observation $04^h\ 18^m\ 14^s$.

From Table IV, page 92 :

Long. 120° W. (approx.)

Approx.	Hrs.	Date
L.M.T.	2000	Sept. 30
G.M.T.	0400	Oct. 1

From page 86 :
Lat. of ass. position 8° NORTH

	°	′
Tab. Alt.	49	08
Correction		—
Corr. Tab. Alt.	49	08
Corr. Sext. Rdg.	48	42
Intercept	26′	*away*

From *Air Almanac*, 1941 Oct. 1 :

		°	′
G.H.A. ♈	($04^h\ 10^m$)	72	00
Increment	($8^m\ 14^s$)	2	04
S.H.A.	(No. 22)	81	16
G.H.A. of star		155	20
Long. of ass. position		−125	20

Star No. 22 — H.A. 30°

No correction for date is necessary in 1941.

Tab. Az. 37°

Assumed position :
Lat. 8° N.
Long. 125° 20′ W.

From Table III, page 90 :
True Az. 323° T.

Example 2.—On 1950 August 17, Greenwich date, in dead reckoning position latitude 5° 52′ S., longitude 26° 29′ E., star number 4 (Alpheratz) was observed to obtain a position line. From the *Almanac* of that date it was found that the G.H.A. of the star corresponding to the G.M.T. of observation was 355° 14′. Corrected sextant reading 49° 26′.

		°	′
G.H.A. of star		355	14
Long. of ass. position		+26	46
		382	00
		−360	

From page 16 :
Lat. of ass. position 6° SOUTH

	°	′
Tab. Alt.	49	18
Correction (Table I)	−	3
Corr. Tab. Alt.	49	15
Corr. Sext. Rdg.	49	26
Intercept	11′	*towards*

Star No. 4 — H.A. 22°

t . . −16 — Tab. Az. 150°

Year . . 1950

Assumed position :
Lat. 6° S.
Long. 26° 46′ E.

From Table III, page 91 :
True Az. 330° T.

Example 3.—On 1941 October 1, local date, at approximate local noon, in dead reckoning position latitude 8° 40′ N., longitude 21° 07′ W., the Sun was observed to obtain a position line. Corrected sextant reading 78° 05′; G.M.T. of observation $13^h\ 11^m\ 27^s$.

From Table IV, page 92:

Long. 15° W. (approx.)

	Hrs.	Date
Approx. L.M.T.	1200	Oct. 1
G.M.T.	1300	Oct. 1

From *Air Almanac*, 1941 Oct. 1:

		°	′
G.H.A.	($13^h\ 10^m$)	20	04
Increment	($1^m\ 27^s$)	0	22
G.H.A. of Sun		20	26
Long. of ass. position		− 21	26
		− 1	00
		+360	

From page 108:

Lat. of ass. position 9° N. Dec. 3° 10′ S. CONTRARY name H.A. 359°

Tab. Alt.	77° 58′	*d* −60	Tab. Az. 175°
Correction (Table XV)	− 10	Minutes of dec. 10	
Corr. Tab. Alt.	77 48		
Corr. Sext. Rdg.	78 05	Assumed position:	From Table III, page 90:
Intercept	17′ *towards*	Lat. 9° N. Long. 21° 26′ W.	True Az. 175° T.

Since there is a double border rule opposite the entry on page 108, this observation may be reduced by the method described on page 213. In this case the intercept is set off from the assumed position *towards* the Sun (i.e. southwards), and the position line drawn as a parallel of latitude. There is then no necessity to take out the tabulated azimuth.

Example 4.—On 1941 October 2, local date, about one hour before sunrise, in dead reckoning position latitude 4° 38′ S., longitude 147° 58′ E., star number 35 (Wezen) was observed to obtain a position line. Corrected sextant reading 58° 27′; G.M.T. of observation $18^h\ 58^m\ 19^s$.

From Table IV, page 93:

Long. 150° E. (approx.)

	Hrs.	Date
Approx. L.M.T.	0500	Oct. 2
G.M.T.	*1900*	*Oct. 1*

From *Air Almanac*, 1941 Oct. 1:

		°	′
G.H.A. ♈	($18^h\ 50^m$)	292	36
Increment	($8^m\ 19^s$)	2	05
S.H.A.	(No. 35)	253	29
G.H.A. of star		548	10
Long. of ass. position		+147	50
		696	00
		−360	

From page 198:

Lat. of ass. position 5° S. Dec. 26° 18′ S. SAME name H.A. 336°

Tab. Alt.	58° 54′	*d* −38	Tab. Az. 45°
Correction (Table XV)	− 11	Minutes of dec. 18	
Corr. Tab. Alt.	58 43		
Corr. Sext. Rdg.	58 27	Assumed position:	From Table III, page 91:
Intercept	16′ *away*	Lat. 5° S. Long. 147° 50′ E.	True Az. 135° T.

IVa.—CHANGE OF SEXTANT READING WITH TIME

Due to motion of body observed

True Azimuth of body	Latitude 5°	Latitude 7°	Latitude 9°	True Azimuth of body
°	′	′	′	°
090	+45	+45	+44	090
095	45	44	44	085
100	44	44	44	080
105	43	43	43	075
110	42	42	42	070
115	41	40	40	065
120	+39	+39	+38	060
125	37	37	36	055
130	34	34	34	050
135	32	32	31	045
140	29	29	29	040
145	26	26	25	035
150	+22	+22	+22	030
155	19	19	19	025
160	15	15	15	020
165	12	12	12	015
170	8	8	8	010
175	+4	+4	+4	005
180	0	0	0	000
185	−4	−4	−4	355
190	8	8	8	350
195	12	12	12	345
200	15	15	15	340
205	19	19	19	335
210	−22	−22	−22	330
215	26	26	25	325
220	29	29	29	320
225	32	32	31	315
230	34	34	34	310
235	37	37	36	305
240	−39	−39	−38	300
245	41	40	40	295
250	42	42	42	290
255	43	43	43	285
260	44	44	44	280
265	45	44	44	275
270	−45	−45	−44	270

Due to motion of observer

Difference between True Az. of body and Track	Ground speed in m.p.h. 100	130	160	190	220	250	280	310	340	Difference between True Az. of body and Track
°	′	′	′	′	′	′	′	′	′	°
000	+4	+6	+7	+8	+10	+11	+12	+13	+15	360
005	4	6	7	8	10	11	12	13	15	355
010	4	6	7	8	9	11	12	13	15	350
015	4	5	7	8	9	10	12	13	14	345
020	4	5	7	8	9	10	11	13	14	340
025	4	5	6	7	9	10	11	12	13	335
030	+4	+5	+6	+7	+8	+9	+11	+12	+13	330
035	4	5	6	7	8	9	10	11	12	325
040	3	4	5	6	7	8	9	10	11	320
045	3	4	5	6	7	8	9	10	10	315
050	3	4	4	5	6	7	8	9	9	310
055	2	3	4	5	5	6	7	8	8	305
060	+2	+3	+3	+4	+5	+5	+6	+7	+7	300
065	2	2	3	3	4	5	5	6	6	295
070	1	2	2	3	3	4	4	5	5	290
075	1	1	2	2	2	3	3	3	4	285
080	+1	+1	1	1	2	2	2	2	3	280
085	0	0	+1	+1	+1	+1	+1	+1	+1	275
090	0	0	0	0	0	0	0	0	0	270
095	0	0	−1	−1	−1	−1	−1	−1	−1	265
100	−1	−1	1	1	2	2	2	2	3	260
105	1	1	2	2	2	3	3	3	4	255
110	1	2	2	3	3	4	4	5	5	250
115	2	2	3	3	4	5	5	6	6	245
120	−2	−3	−3	−4	−5	−5	−6	−7	−7	240
125	2	3	4	5	5	6	7	8	8	235
130	3	4	4	5	6	7	8	9	9	230
135	3	4	5	6	7	8	9	10	10	225
140	3	4	5	6	7	8	9	10	11	220
145	4	5	6	7	8	9	10	11	12	215
150	−4	−5	−6	−7	−8	−9	−11	−12	−13	210
155	4	5	6	7	9	10	11	12	13	205
160	4	5	7	8	9	10	11	13	14	200
165	4	5	7	8	9	10	12	13	14	195
170	4	6	7	8	9	11	12	13	15	190
175	4	6	7	8	10	11	12	13	15	185
180	−4	−6	−7	−8	−10	−11	−12	−13	−15	180

The theoretical change of sextant reading in any interval of time depends partly on the motion of the body observed across the sky and partly on the motion of the observer over the Earth's surface.

The two tables above give this change, in an interval of three minutes of time, due to each of these causes; a + sign denotes that the sextant reading is increasing, and a − sign that it is decreasing. The theoretical change of sextant reading in three minutes of time is obtained by combining the appropriate entries from each table.

IVb.—CHANGE OF SEXTANT READING WITH TIME

Interval of time	Change in 3m (from Table IVa)																								Interval of time
	0′	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	0 00
05	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	2	2	2	05
10	0	0	0	0	1	1	1	1	1	2	2	2	2	2	2	2	3	3	3	3	3	10
15	0	0	0	1	1	1	2	2	2	2	2	3	3	3	4	4	4	4	4	5	5	15
20	0	0	1	1	1	2	2	2	3	3	3	4	4	4	5	5	5	6	6	6	7	20
25	0	0	1	1	2	2	2	3	3	4	4	5	5	5	6	6	7	7	8	8	8	25
0 30	0	0	1	2	2	2	3	4	4	4	5	6	6	6	7	8	8	8	9	10	10	0 30
35	0	1	1	2	2	3	4	4	5	5	6	6	7	8	8	9	9	10	10	11	12	35
40	0	1	1	2	3	3	4	5	5	6	7	7	8	9	9	10	11	11	12	13	13	40
45	0	1	2	2	3	4	4	5	6	7	8	8	9	10	10	11	12	13	14	14	15	45
50	0	1	2	2	3	4	5	6	7	8	8	9	10	11	12	12	13	14	15	16	17	50
0 55	0	1	2	3	4	5	6	6	7	8	9	10	11	12	13	14	15	16	16	17	18	0 55
1 00	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	1 00
05	0	1	2	3	4	5	6	8	9	10	11	12	13	14	15	16	17	18	20	21	22	05
10	0	1	2	4	5	6	7	8	9	10	12	13	14	15	16	18	19	20	21	22	23	10
15	0	1	2	4	5	6	8	9	10	11	12	14	15	16	18	19	20	21	22	24	25	15
20	0	1	3	4	5	7	8	9	11	12	13	15	16	17	19	20	21	23	24	25	27	20
25	0	1	3	4	6	7	8	10	11	13	14	16	17	18	20	21	23	24	26	27	28	25
1 30	0	2	3	4	6	8	9	10	12	14	15	16	18	20	21	22	24	26	27	28	30	1 30
35	0	2	3	5	6	8	10	11	13	14	16	17	19	21	22	24	25	27	28	30	32	35
40	0	2	3	5	7	8	10	12	13	15	17	18	20	22	23	25	27	28	30	32	33	40
45	0	2	4	5	7	9	10	12	14	16	18	19	21	23	24	26	28	30	32	33	35	45
50	0	2	4	6	7	9	11	13	15	16	18	20	22	24	26	28	29	31	33	35	37	50
1 55	0	2	4	6	8	10	12	13	15	17	19	21	23	25	27	29	31	33	34	36	38	1 55
2 00	0	2	4	6	8	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	2 00
05	0	2	4	6	8	10	12	15	17	19	21	23	25	27	29	31	33	35	38	40	42	05
10	0	2	4	6	9	11	13	15	17	20	22	24	26	28	30	32	35	37	39	41	43	10
15	0	2	4	7	9	11	14	16	18	20	22	25	27	29	32	34	36	38	40	43	45	15
20	0	2	5	7	9	12	14	16	19	21	23	26	28	30	33	35	37	40	42	44	47	20
25	0	2	5	7	10	12	14	17	19	22	24	27	29	31	34	36	39	41	44	46	48	25
2 30	0	2	5	8	10	12	15	18	20	22	25	28	30	32	35	38	40	42	45	48	50	2 30
35	0	3	5	8	10	13	16	18	21	23	26	28	31	34	36	39	41	44	46	49	52	35
40	0	3	5	8	11	13	16	19	21	24	27	29	32	35	37	40	43	45	48	51	53	40
45	0	3	6	8	11	14	16	19	22	25	28	30	33	36	38	41	44	47	50	52	55	45
50	0	3	6	8	11	14	17	20	23	26	28	31	34	37	40	42	45	48	51	54	57	50
2 55	0	3	6	9	12	15	18	20	23	26	29	32	35	38	41	44	47	50	52	55	58	2 55
3 00	0	3	6	9	12	15	18	21	24	27	30	33	36	39	42	45	48	51	54	57	60	3 00

This table gives the theoretical change of sextant reading in any interval of time up to 3m, in terms of the change in 3m obtained from the tables on the opposite page. If the interval is greater than 3m, it may be split into multiples of 3m and a residue, and the corresponding entries from the table added together.

A knowledge of this change enables sights on different objects taken at slightly different times to be adjusted to a specified exact time, which may be either the exact time of one of them or a moment when a fix is required for a particular reason.

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V.—DIFFERENCE BETWEEN RHUMB LINE AND GREAT CIRCLE DISTANCES

N. 5°-9° **S. 5°-9°**

Latitude of Destination	Change of Longitude																		Latitude of Destination
	5°	10°	15°	20°	25°	30°	35°	40°	45°	50°	55°	60°	65°	70°	75°	80°	85°	90°	
N. 60°	0	1	3	6	9	14	20	27	35	46	58	72	88	108	130	155	184	217	S. 60°
55	0	1	3	5	8	11	16	22	29	38	48	60	75	91	111	134	160	190	55
50	0	1	2	4	6	9	13	17	23	31	39	50	62	77	94	114	137	163	50
45	0	1	1	3	4	7	10	14	19	25	32	41	51	63	78	95	115	138	45
40	0	0	1	2	3	5	8	11	14	19	25	32	41	51	64	78	95	114	40
N. 35	0	0	1	1	2	4	6	8	11	15	20	25	32	41	51	62	76	92	S. 35
30	0	0	0	1	2	3	4	6	8	11	15	19	25	31	39	49	60	72	30
25	0	0	0	1	1	2	3	4	6	8	11	14	19	23	29	37	45	55	25
20	0	0	0	0	1	1	2	3	4	6	8	10	13	17	21	26	32	39	20
15	0	0	0	0	0	1	1	2	3	4	5	7	9	11	14	17	21	26	15
N. 10	0	0	0	0	0	0	1	1	2	2	3	4	5	7	8	10	13	16	S. 10
N. 5	0	0	0	0	0	0	0	0	1	1	1	2	3	3	4	5	6	8	S. 5
0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	2	2	2	3	0
S. 5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	N. 5
10	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	10
S. 15	0	0	0	0	0	0	0	0	1	1	1	1	2	2	3	4	4	5	N. 15
20	0	0	0	0	0	0	1	1	1	2	3	3	4	5	7	8	10	12	20
25	0	0	0	0	1	1	1	2	3	4	5	6	8	10	12	15	19	22	25
30	0	0	0	1	1	2	2	3	5	6	8	10	13	16	20	24	30	36	30
35	0	0	1	1	2	3	4	5	7	9	12	15	19	24	30	36	44	53	35
S. 40	0	0	1	2	3	4	5	8	10	13	17	22	27	34	42	51	61	74	N. 40
45	0	1	1	2	4	5	8	11	14	18	24	30	37	46	56	68	81	97	45
50	0	1	2	3	5	7	11	14	19	25	31	39	49	60	72	87	104	124	50
55	0	1	2	4	7	10	14	19	25	32	40	50	62	76	91	109	130	154	55
S. 60	0	1	3	5	9	13	18	24	32	41	51	63	77	94	112	134	159	187	N. 60

This table gives the difference, in nautical miles, between the distance from one place to another by the Rhumb Line track and the distance by the Great Circle track. It is based on a *Latitude of Departure* of 7°, but may be used for any place of departure between latitudes 5° and 9°. Of the two argument columns headed *Latitude of Destination*, the one on the left is to be used when the place of departure lies between N. 5° and N. 9°, and the one on the rigbt when the place of departure lies between S. 5° and S. 9°.

The table is intended to give only the approximate difference of distance between the two tracks. For intermediate values of the arguments *Latitude of Destination* and *Change of Longitude*, the figures in the table should be interpolated by inspection. If the *Latitude of Departure* differs by the maximum of 2½° from that on which the table is based, the error in the result will not exceed 2 miles up to a *Change of Longitude* of 50°, but may reach 4 miles for a change of 70°, and 8 miles for a change of 90°.

Example.—Required the difference in distance between the Rhumb Line track and the Great Circle track from Colombo (Lat. 6° 55′ N., Long. 79° 55′ E.) to Newcastle-on-Tyne (Lat. 55° 00′ N., Long. 1° 35′ W.).

Entering the argument column on the left with the *Latitude of Destination* of 55° 00′ N., and interpolating by inspection for the *Change of Longitude* of 81° 30′, it will be seen that the difference in distance is about 142 nautical miles.

VI.—ADJUSTMENT TO REFRACTION IN SPECIAL CONDITIONS

Height in feet	Observed Altitude									Height in metres
	4°	6°	8°	10°	15°	20°	30°	45°	60°	
	′	′	′	′	′	′	′	′	′	
0	−2	−1	−1	−1	0	0	0	0	0	0
5000	0	0	0	0	0	0	0	0	0	1500
10000	+1	+1	+1	+1	0	0	0	0	0	3000
15000	2	2	2	1	+1	+1	0	0	0	4600
20000	3	2	2	2	1	1	+1	0	0	6100
25000	4	3	2	2	1	1	1	0	0	7600
30000	4	3	3	3	2	1	1	0	0	9100
35000	5	4	3	3	2	1	1	+1	0	10700
40000	+5	+4	+3	+3	+2	+2	+1	+1	0	12200

This table gives the additional correction for refraction to be applied to the *observed* altitude beyond that already included in the altitude tabulated in the main tables. It is only intended for use by an observer at great heights, and when special accuracy is required.

VII.—TRUE AZIMUTH OF THE POLE STAR

1940–1960		1960–1980		1980–2000	
L.H.A. ♈	True Azimuth	L.H.A. ♈	True Azimuth	L.H.A. ♈	True Azimuth
°	°	°	°	°	°
0	000	0	000	0	000
57	359	65	359	74	359
176	000	176	000	175	000
237	001	245	001	254	001
356	000	356	000	355	000
360		360		360	

These tables give the True Azimuth of the Pole Star, over various periods of time, for an observer between latitudes N. 5° and N. 9°. The argument L.H.A. ♈ is obtained from G.H.A. ♈ by *subtracting west* longitude or *adding east* longitude.

VIII.—DIP OF THE SEA HORIZON

Height in feet	Dip	Height in metres	Height in feet	Dip	Height in metres	Height in feet	Dip	Height in metres	Height in feet	Dip	Height in metres	Height in feet	Dip	Height in metres
	′			′			′			′			′	
0	1	0	437	21	133	1700	41	520	3810	61	1160	6740	81	2050
2			481		146	1790		546	3930		1200	6910		2100
6	2	1	527	22	160	1880	42	573	4060	62	1230	7080	82	2160
12	3	3	575	23	175	1970	43	600	4190	63	1270	7250	83	2210
21	4	6	625	24	190	2060	44	628	4330	64	1320	7430	84	2260
31	5	9	677	25	206	2150	45	657	4460	65	1360	7610	85	2320
43	6	13	731	26	222	2250	46	686	4600	66	1400	7790	86	2370
58	7	17	787	27	240	2340	47	716	4740	67	1440	7970	87	2420
75	8	22	845	28	257	2440	48	746	4880	68	1480	8150	88	2480
93	9	28	906	29	276	2550	49	777	5020	69	1530	8340	89	2540
114	10	34	968	30	295	2650	50	809	5170	70	1570	8520	90	2590
137	11	41	1030	31	314	2760	51	841	5320	71	1620	8710	91	2650
162	12	49	1090	32	335	2860	52	874	5470	72	1660	8900	92	2710
189	13	57	1160	33	356	2980	53	908	5620	73	1710	9100	93	2770
218	14	66	1230	34	377	3090	54	942	5770	74	1760	9290	94	2830
250	15	76	1310	35	399	3200	55	977	5930	75	1800	9490	95	2890
283	16	86	1380	36	422	3320	56	1010	6090	76	1850	9690	96	2950
318	17	97	1460	37	446	3440	57	1040	6250	77	1900	9890	97	3010
356	18	108	1540	38	470	3560	58	1080	6410	78	1950	10100	98	3070
395	19	120	1620	39	495	3680	59	1120	6580	79	2000	10300	99	3140
437	20	133	1700	40	520	3810	60	1160	6740	80	2050	10500	100	3200

This table gives the dip of the sea horizon, in minutes of arc, with argument height of eye of the observer in feet or in metres. It is only required when the altitude is measured from the sea horizon. The dip is to be *subtracted* from the observed altitude.

IX.—DISTANCE TO THE SEA HORIZON IN NAUTICAL MILES

Height in feet	Dist.	Height in metres	Height in feet	Dist.	Height in metres	Height in feet	Dist.	Height in metres	Height in feet	Dist.	Height in metres	Height in feet	Dist.	Height in metres	Height in feet	Dist.	Height in metres
0		0	287		87	1120		341	2500		762	4420		1340	6890		2100
1	1		317	20	96	1170	39	359	2580	58	788	4540	77	1380	7040	96	2140
4	2	1	349	21	106	1240	40	378	2670	59	815	4650	78	1420	7180	97	2190
9	3	2	382	22	116	1300	41	396	2760	60	843	4770	79	1450	7330	98	2230
15	4	4	417	23	127	1360	42	416	2850	61	871	4900	80	1490	7480	99	2280
22	5	6	453	24	138	1430	43	436	2950	62	900	5020	81	1530	7630	100	2320
31	6	9	491	25	149	1490	44	456	3040	63	929	5140	82	1560	7780	101	2370
42	7	12	531	26	161	1560	45	477	3140	64	958	5270	83	1600	7940	102	2420
54	8	16	571	27	174	1630	46	498	3240	65	988	5390	84	1640	8100	103	2460
68	9	20	614	28	187	1700	47	520	3340	66	1010	5520	85	1680	8250	104	2510
83	10	25	658	29	200	1770	48	542	3440	67	1050	5650	86	1720	8410	105	2560
100	11	30	703	30	214	1850	49	564	3540	68	1080	5780	87	1760	8570	106	2610
118	12	36	750	31	228	1920	50	587	3650	69	1110	5920	88	1800	8730	107	2660
137	13	42	798	32	243	2000	51	611	3750	70	1140	6050	89	1840	8900	108	2710
158	14	48	848	33	258	2080	52	635	3860	71	1170	6190	90	1880	9060	109	2760
181	15	55	900	34	274	2160	53	659	3970	72	1210	6330	91	1920	9230	110	2810
205	16	62	953	35	290	2240	54	684	4080	73	1240	6460	92	1970	9400	111	2860
231	17	70	1000	36	307	2320	55	709	4190	74	1270	6610	93	2010	9560	112	2910
258	18	78	1060	37	324	2410	56	735	4310	75	1310	6750	94	2050	9740	113	2960
287	19	87	1120	38	341	2500	57	762	4420	76	1340	6890	95	2100	9910	114	3020

IX.—DISTANCE TO THE SEA HORIZON IN STATUTE MILES

Height in feet	Dist.	Height in metres	Height in feet	Dist.	Height in metres	Height in feet	Dist.	Height in metres	Height in feet	Dist.	Height in metres	Height in feet	Dist.	Height in metres	Height in feet	Dist.	Height in metres
0		0	288		87	1120		344	2520		768	4460		1360	6960		2120
1	1		314	23	95	1180	45	359	2590	67	791	4560	89	1390	7080	111	2160
3	2	1	342	24	104	1230	46	375	2670	68	815	4670	90	1420	7210	112	2190
6	3	2	370	25	113	1280	47	392	2750	69	839	4770	91	1450	7340	113	2230
11	4	3	400	26	122	1340	48	408	2830	70	863	4870	92	1480	7470	114	2270
17	5	5	431	27	131	1390	49	425	2910	71	888	4980	93	1510	7600	115	2310
24	6	7	463	28	141	1450	50	443	2990	72	913	5090	94	1550	7730	116	2350
32	7	9	496	29	151	1510	51	460	3080	73	938	5200	95	1580	7870	117	2390
41	8	12	530	30	161	1570	52	479	3160	74	964	5310	96	1610	8000	118	2440
51	9	15	565	31	172	1630	53	497	3250	75	990	5420	97	1650	8140	119	2480
62	10	19	602	32	183	1690	54	516	3330	76	1010	5530	98	1680	8280	120	2520
75	11	22	639	33	195	1750	55	535	3420	77	1040	5640	99	1720	8410	121	2560
89	12	27	678	34	206	1820	56	554	3510	78	1070	5750	100	1750	8550	122	2600
103	13	31	718	35	219	1880	57	574	3600	79	1090	5870	101	1790	8690	123	2650
119	14	36	759	36	231	1950	58	594	3690	80	1120	5990	102	1820	8830	124	2690
137	15	41	801	37	244	2010	59	615	3780	81	1150	6100	103	1860	8980	125	2730
155	16	47	845	38	257	2080	60	636	3880	82	1180	6220	104	1890	9120	126	2780
174	17	53	889	39	271	2150	61	657	3970	83	1210	6340	105	1930	9270	127	2820
195	18	59	935	40	285	2220	62	678	4070	84	1240	6460	106	1970	9410	128	2870
216	19	66	982	41	299	2290	63	700	4160	85	1270	6580	107	2000	9560	129	2910
239	20	73	1030	42	313	2370	64	723	4260	86	1300	6710	108	2040	9710	130	2960
263	21	80	1070	43	328	2440	65	745	4360	87	1330	6830	109	2080	9860	131	3000
288	22	87	1120	44	344	2520	66	768	4460	88	1360	6960	110	2120	10000	132	3050

These tables give the distance to the sea horizon, in nautical miles and in statute miles, with argument height of eye of the observer in feet or in metres.

At the moment when an object of known height is just appearing or disappearing over the sea horizon, its distance may be found by adding the distance corresponding to its height to the distance corresponding to the height of eye of the observer.

X.—TABLE OF RANGES IN NAUTICAL MILES

The tables below and on the opposite page give the distance, to the nearest 5 nautical miles, of an object, whose height is known and is *greater* than the height of the observer. The arguments of the table are the observed *angle of elevation* to the object, and the *difference in height* between the object and the observer, expressed in feet or in metres.

Example.—An observer, whose height is 1,500 feet, finds that the angle of elevation to the summit of a mountain, whose height is known to be 7,000 feet, is 0° 48′. Required the distance away of the mountain.

The difference in height between the mountain and the observer is 7,000 − 1,500 = 5,500 feet. Entering on the opposite page the column headed 0° 50′ (the nearest tabulated value to 0° 48′), and choosing the left-hand of the two argument columns since the height is measured in feet, it is seen that 5,500 lies in the interval between 5,130 and 5,910, so that the distance of the mountain, to the nearest 5 miles, is 45 nautical miles.

The tables on pages 226 to 228 give the distance of an object, whose height is known, and is *less* than the height of the observer. The arguments of the table are the observed *angle of depression* to the object, and the *difference in height* between the observer and the object, expressed in feet or in metres. The distance is given to the nearest mile up to 10 nautical miles, and to the nearest 5 miles from 10 to 60 nautical miles.

Example.—An observer, whose height is 1,500 metres, finds that the angle of depression to a ship is 5° 37′. Required the distance away of the ship.

Entering on page 228 the column headed 5° 30′, and choosing the right-hand of the two argument columns, it is seen that 1,500 is an exact tabulated value, so that the distance away of the ship is 8 nautical miles.

On page 226, figures in *italics* represent the difference in height, *when the object observed is beyond the sea horizon.* If it is uncertain whether the object is beyond the horizon or not, and the two parts of the table give widely different results, there should be no doubt which is the correct one, while in doubtful cases the error will not be serious.

These tables are intended to give only the approximate range. They should prove a more reliable guide for large angles of elevation and depression than for small ones.

Height of object *greater* than height of observer

Angle of elevation												
4° 00′			3° 40′			3° 20′			3° 00′			
Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	
0	0	0	0	0	0	0	0	0	0	0	0	
1060	5	325	978	5	298	890	5	271	801	5	244	
3230	10	985	2960	10	904	2690	10	822	2430	10	741	
5430	15	1650	4990	15	1520	4540	15	1380	4100	15	1250	
7670	20	2330	7050	20	2140	6430	20	1960	5810	20	1770	
9950	25	3030	9150	25	2790	8350	25	2540	7550	25	2300	
12200	30	3740	11200	30	3440	10300	30	3140	9340	30	2840	
14600	35	4450	13400	35	4100	12300	35	3750	11100	35	3400	
17000	40	5180	15600	40	4780	14300	40	4370	13000	40	3960	
19400	45	5920	17900	45	5460	16400	45	5000	14900	45	4540	
21900	50	6680	20200	50	6160	18500	50	5650	16800	50	5130	
24400	55	7440	22500	55	6870	20600	55	6300	18800	55	5730	
26900	60	8210	24900	60	7590	22800	60	6970	20800	60	6350	
29500		9000	27300		8320	25100		7650	22800		6970	

2° 40′			2° 20′		
Height in feet	Range	Height in metres	Height in feet	Range	Height in metres
0	0	0	0	0	0
712	5	217	624	5	190
2160	10	660	1900	10	579
3650	15	1110	3210	15	980
5190	20	1580	4570	20	1390
6750	25	2050	5960	25	1810
8360	30	2540	7390	30	2250
10000	35	3050	8850	35	2690
11600	40	3560	10300	40	3150
13400	45	4080	11900	45	3620
15100	50	4620	13400	50	4110
16900	55	5170	15100	55	4600
18800	60	5730	16700	60	5100
20600		6300	18400		5620

X.—TABLE OF RANGES IN NAUTICAL MILES

Height of object *greater* than height of observer

Angle of elevation

2° 00′			1° 50′			1° 40′			1° 30′			1° 20′			1° 10′		
Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
535	5	163	491	5	149	447	5	136	402	5	122	358	5	109	314	5	95
1630	10	498	1500	10	458	1370	10	417	1230	10	377	1100	10	336	971	10	296
2770	15	845	2550	15	777	2330	15	710	2100	15	643	1880	15	575	1660	15	508
3940	20	1200	3630	20	1100	3320	20	1010	3020	20	920	2710	20	826	2400	20	731
5160	25	1570	4760	25	1450	4360	25	1330	3960	25	1200	3570	25	1080	3170	25	966
6410	30	1950	5920	30	1800	5440	30	1650	4950	30	1510	4460	30	1360	3980	30	1210
7700	35	2340	7130	35	2170	6550	35	1990	5970	35	1820	5400	35	1640	4820	35	1470
9030	40	2750	8360	40	2550	7700	40	2340	7040	40	2140	6370	40	1940	5710	40	1740
10400	45	3160	9640	45	2940	8890	45	2710	8140	45	2480	7390	45	2250	6630	45	2020
11800	50	3590	10900	50	3340	10100	50	3080	9280	50	2820	8440	50	2570	7590	50	2310
13200	55	4030	12300	55	3750	11300	55	3470	10400	55	3180	9520	55	2900	8590	55	2620
14700	60	4480	13700	60	4170	12600	60	3860	11600	60	3550	10600	60	3240	9630	60	2930
16200		4950	15100		4610	14000		4270	12900		3930	11800		3600	10700		3260

Angle of elevation

1° 00′			0° 55′			0° 50′			0° 45′			0° 40′			0° 35′		
Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
270	5	82	247	5	75	225	5	68	203	5	62	181	5	55	159	5	48
839	10	255	772	10	235	706	10	215	640	10	195	573	10	174	507	10	154
1440	15	440	1330	15	406	1220	15	373	1110	15	339	1000	15	305	893	15	272
2090	20	637	1930	20	590	1780	20	542	1620	20	495	1470	20	448	1310	20	401
2770	25	845	2570	25	784	2370	25	724	2170	25	663	1970	25	602	1770	25	542
3490	30	1060	3250	30	991	3000	30	916	2760	30	842	2520	30	768	2270	30	694
4250	35	1290	3960	35	1200	3670	35	1120	3390	35	1030	3100	35	945	2810	35	858
5050	40	1530	4710	40	1430	4380	40	1330	4050	40	1230	3720	40	1130	3390	40	1030
5880	45	1790	5500	45	1670	5130	45	1560	4750	45	1450	4380	45	1330	4000	45	1220
6750	50	2060	6330	50	1930	5910	50	1800	5490	50	1670	5070	50	1540	4650	50	1410
7670	55	2330	7200	55	2190	6740	55	2050	6270	55	1910	5810	55	1770	5340	55	1620
8610	60	2620	8100	60	2470	7600	60	2310	7090	60	2160	6580	60	2000	6070	60	1850
9600		2920	9050		2750	8500		2590	7940		2420	7390		2250	6840		2080

Angle of elevation

0° 30′			0° 25′			0° 20′			0° 15′			0° 10′			0° 05′		
Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
137	5	41	115	5	35	93	5	28	71	5	21	48	5	14	26	5	8
440	10	134	374	10	114	308	10	93	241	10	73	175	10	53	109	10	33
782	15	238	671	15	204	561	15	171	450	15	137	339	15	103	229	15	69
1160	20	354	1000	20	306	852	20	259	697	20	212	542	20	165	387	20	118
1570	25	481	1380	25	420	1180	25	360	982	25	299	783	25	238	584	25	178
2030	30	620	1790	30	546	1540	30	471	1300	30	397	1060	30	323	818	30	249
2520	35	770	2240	35	683	1950	35	595	1660	35	507	1370	35	420	1090	35	332
3060	40	932	2720	40	831	2360	40	720	2060	40	629	1730	40	528	1400	40	427
3620	45	1100	3250	45	991	2870	45	877	2500	45	762	2120	45	648	1750	45	533
4230	50	1290	3810	50	1160	3390	50	1030	2970	50	907	2550	50	779	2130	50	651
4880	55	1480	4410	55	1340	3950	55	1200	3480	55	1060	3020	55	922	2560	55	780
5560	60	1690	5050	60	1540	4540	60	1380	4040	60	1230	3530	60	1070	3020	60	921
6280		1910	5730		1740	5180		1570	4620		1410	4070		1240	3520		1070

X.—TABLE OF RANGES IN NAUTICAL MILES

Height of object *less* than height of observer

Angle of depression												
0° 05′			0° 10′			0° 15′			0° 20′			
Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	
0	0	0	0	0	0	0	0	0	0	0	0	
4	1	1	9	1	2	13	1	4	17	1	5	
11	2	3	24	2	7	38	2	11	51	2	15	
17	3	5	39	3	12	61	3	18	83	3	25	
21	4	6	52	4	15	83	4	25	114	4	34	
24	5	7	64	5	19	103	5	31	143	5	43	
25	6	8	74	6	22	122	6	37	171	6	52	
26	7		82	7	25	140	7	42	197	7	60	
24	8	7	89	8	27	156	8	47	222	8	67	
21	9	5	95	9	29	170	9	52	245	9	74	
16	10	0	99	10	30	183	10	55	267	10	81	
0			103	15	32	212	15	64	323	15	98	
			77	20	24	231	20	70	386	20	117	
			13	25	4	213	25	65	411	25	125	
			0		0	155	30	48	398	30	122	
						59	35	18	346	35	106	
						0		0	258	40	79	
									130	45	40	
									0		0	

Angle of depression												
0° 25′			0° 30′			0° 35′			0° 40′			
Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	
0	0	0	0	0	0	0	0	0	0	0	0	
21	1	6	26	1	8	30	1	9	35	1	10	
64	2	19	77	2	23	91	2	27	104	2	31	
106	3	32	127	3	39	150	3	45	172	3	52	
145	4	44	176	4	53	207	4	63	238	4	72	
183	5	55	223	5	68	263	5	80	302	5	92	
220	6	67	268	6	81	317	6	96	366	6	111	
255	7	77	312	7	95	370	7	112	427	7	130	
288	8	88	355	8	108	421	8	128	488	8	148	
320	9	97	396	9	120	471	9	143	546	9	166	
351	10	107	435	10	132	519	10	158	603	10	183	
434	15	132	544	15	166	655	15	199	765	15	233	
541	20	164	695	20	212	850	20	259	1000	20	306	
609	25	185	808	25	246	1000	25	307	1200	25	367	
640	30	195	884	30	269	1120	30	343	1370	30	417	
634	35	194	921	35	280	1200	35	368	1490	35	456	
590	40	180	921	40	281	1250	40	381	1580	40	482	
506	45	155	882	45	269	1260	45	384	1630	45	497	
385	50	118	805	50	246	1230	50	374	1650	50	502	
226	55	69	690	55	211	1160	55	352	1620	55	494	
28	60	9	537	60	164	1050	60	319	1560	60	474	
0		0	346		106	899		274	1460		443	

Angle of depression												
0° 45′			0° 50′			0° 55′			1° 00′			
Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	
0	0	0	0	0	0	0	0	0	0	0	0	
39	1	12	44	1	13	48	1	14	52	1	16	
117	2	35	130	2	39	144	2	43	157	2	47	
194	3	59	216	3	65	238	3	72	260	3	79	
269	4	82	300	4	91	331	4	100	362	4	110	
342	5	104	382	5	116	422	5	128	462	5	140	
414	6	126	463	6	141	512	6	156	560	6	170	
485	7	147	542	7	165	600	7	182	657	7	200	
554	8	168	620	8	189	687	8	209	753	8	229	
621	9	189	696	9	212	772	9	235	847	9	258	
687	10	209	771	10	235	855	10	260	939	10	286	
876	15	267	986	15	300	1090	15	334	1200	15	368	
1160	20	353	1310	20	400	1470	20	448	1620	20	495	
1400	25	428	1600	25	489	1800	25	549	2000	25	610	
1610	30	491	1850	30	566	2100	30	640	2340	30	714	
1780	35	543	2070	35	631	2350	35	719	2640	35	806	
1910	40	583	2240	40	685	2570	40	786	2910	40	887	
2000	45	612	2380	45	727	2760	45	841	3130	45	956	
2060	50	629	2480	50	757	2900	50	885	3320	50	1010	
2080	55	634	2540	55	776	3010	55	918	3470	55	1050	
2070	60	629	2570	60	783	3080	60	938	3580	60	1090	
2010		611	2560		780	3110		947	3660		1110	

For explanation, see page 224.

X.—TABLE OF RANGES IN NAUTICAL MILES

Height of object *less* than height of observer

Angle of depression

1° 10′			1° 20′			1° 30′			1° 40′			1° 50′			2° 00′		
Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
61		18	70		21	79		24	88		26	97		29	106		32
183	1	56	210	1	64	237	1	72	263	1	80	290	1	88	316	1	96
305	2	92	349	2	106	393	2	119	437	2	133	481	2	146	526	2	160
424	3	129	486	3	148	548	3	167	610	3	185	672	3	204	734	3	223
541	4	165	621	4	189	701	4	213	780	4	238	860	4	262	940	4	286
658	5	200	755	5	230	852	5	259	950	5	289	1040	5	319	1140	5	349
772	6	235	887	6	270	1000	6	305	1110	6	340	1230	6	375	1340	6	410
886	7	270	1010	7	310	1150	7	351	1280	7	391	1410	7	432	1550	7	472
997	8	304	1140	8	350	1290	8	395	1440	8	441	1590	8	487	1750	8	533
1100	9	337	1270	9	388	1440	9	440	1610	9	491	1780	9	542	1940	9	594
1430	10	435	1650	10	503	1870	10	570	2090	10	638	2310	10	705	2530	10	772
1930	15	589	2240	15	684	2550	15	778	2860	15	872	3170	15	967	3480	15	1060
2400	20	732	2790	20	853	3190	20	974	3590	20	1090	3990	20	1210	4390	20	1330
2830	25	862	3310	25	1010	3800	25	1150	4290	25	1300	4770	25	1450	5260	25	1600
3220	30	982	3790	30	1150	4370	30	1330	4940	30	1500	5520	30	1680	6090	30	1850
3570	35	1080	4230	35	1290	4900	35	1490	5560	35	1690	6230	35	1890	6890	35	2100
3880	40	1180	4640	40	1410	5390	40	1640	6140	40	1870	6890	40	2100	7650	40	2330
4160	45	1270	5000	45	1520	5840	45	1780	6680	45	2030	7530	45	2290	8370	45	2550
4400	50	1340	5330	50	1620	6260	50	1900	7190	50	2190	8120	50	2470	9050	50	2750
4600	55	1400	5620	55	1710	6640	55	2020	7660	55	2330	8670	55	2640	9690	55	2950
4760	60	1450	5870	60	1790	6980	60	2120	8080	60	2460	9190	60	2800	10300	60	3140

Angle of depression

2° 20′			2° 40′			3° 00′			3° 20′			3° 40′			4° 00′		
Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
123		37	141		43	159		48	176		53	194		59	212		64
369	1	112	422	1	128	476	1	145	529	1	161	582	1	177	636	1	193
614	2	187	703	2	214	792	2	241	880	2	268	969	2	295	1050	2	322
858	3	261	982	3	299	1100	3	337	1230	3	375	1350	3	412	1470	3	450
1090	4	335	1250	4	383	1410	4	432	1570	4	481	1730	4	529	1890	4	578
1340	5	408	1530	5	467	1730	5	527	1920	5	586	2120	5	646	2310	5	706
1570	6	481	1800	6	551	2040	6	621	2270	6	692	2500	6	762	2730	6	832
1810	7	553	2080	7	634	2340	7	715	2610	7	796	2880	7	877	3140	7	959
2050	8	625	2350	8	717	2650	8	809	2950	8	901	3250	8	993	3560	8	1080
2280	9	696	2620	9	799	2950	9	902	3290	9	1000	3630	9	1100	3970	9	1210
2970	10	908	3420	10	1040	3860	10	1170	4300	10	1310	4750	10	1440	5190	10	1580
4100	15	1250	4720	15	1430	5340	15	1620	5960	15	1810	6580	15	2000	7200	15	2190
5190	20	1580	5980	20	1820	6780	20	2060	7580	20	2310	8380	20	2550	9180	20	2790
6230	25	1900	7210	25	2190	8180	25	2490	9160	25	2790	10100	25	3090	11100	25	3380
7250	30	2210	8400	30	2560	9550	30	2910	10700	30	3260	11800	30	3610	13000	30	3960
8220	35	2500	9550	35	2910	10800	35	3310	12200	35	3720	13500	35	4120	14800	35	4530
9150	40	2790	10600	40	3250	12100	40	3710	13600	40	4170	15100	40	4620	16700	40	5090
10000	45	3060	11700	45	3590	13400	45	4090	15100	45	4600	16700	45	5120	18400	45	5630
10900	50	3320	12700	50	3890	14600	50	4460	16400	50	5020	18300	50	5590	20200	50	6160
11700	55	3570	13700	55	4190	15800	55	4810	17800	55	5440	19900	55	6060	21900	55	6680
12500	60	3810	14700	60	4490	16900	60	5160	19100	60	5840	21300	60	6510	23600	60	7190

For explanation, see page 224.

X.—TABLE OF RANGES IN NAUTICAL MILES

Height of object *less* than height of observer

Angle of depression

4° 30′			5° 00′			5° 30′			6° 00′			6° 30′			7° 00′		
Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres
0		0	0		0	0		0	0		0	0		0	0		0
238	0	72	265	0	81	292	0	89	319	0	97	346	0	105	373	0	113
716	1	218	796	1	242	876	1	267	956	1	291	1030	1	316	1110	1	340
1190	2	363	1320	2	404	1450	2	444	1590	2	485	1720	2	526	1860	2	567
1660	3	507	1850	3	564	2040	3	621	2220	3	679	2410	3	736	2600	3	793
2130	4	651	2370	4	725	2610	4	798	2860	4	872	3100	4	945	3340	4	1010
2600	5	795	2900	5	885	3190	5	974	3490	5	1060	3780	5	1150	4080	5	1240
3070	6	938	3420	6	1040	3770	6	1150	4120	6	1250	4470	6	1360	4820	6	1460
3540	7	1080	3940	7	1200	4340	7	1320	4750	7	1449	5150	7	1570	5550	7	1690
4010	8	1220	4460	8	1360	4920	8	1500	5370	8	1630	5830	8	1770	6290	8	1910
4470	9	1360	4980	9	1510	5490	9	1670	6000	9	1830	6510	9	1980	7020	9	2140
5860	10	1780	6530	10	1990	7200	10	2190	7870	10	2390	8540	10	2600	9210	10	2800
8140	15	2480	9070	15	2760	10000	15	3050	10900	15	3330	11800	15	3620	12800	15	3910
10300	20	3160	11500	20	3530	12700	20	3890	14000	20	4260	15200	20	4630	16400	20	5000
12500	25	3830	14000	25	4280	15500	25	4730	16900	25	5180	18400	25	5630	19900	25	6080
14700	30	4490	16400	30	5020	18200	30	5550	19900	30	6080	21700	30	6620	23400	30	7150
16800	35	5140	18800	35	5750	20800	35	6360	22800	35	6980	24900	35	7590	26900	35	8210
18900	40	5780	21200	40	6470	23500	40	7160	25800	40	7860	28000	40	8550	30300	40	9250
21000	45	6400	23500	45	7180	26000	45	7950	28600	45	8730	31100	45	9510	33700	45	10200
23000	50	7020	25800	50	7870	28600	50	8730	31400	50	9590	34200	50	10400	37100	50	11300
25000	55	7620	28000	55	8550	31100	55	9490	34200	55	10400	37300	55	11300	40400	55	12300
26900	60	8210	30200	60	9230	33600	60	10200	36900	60	11200	40300	60	12200	43600	60	13300

Angle of depression

7° 30′			8° 00′			8° 30′			9° 00′			9° 30′			10° 00′		
Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres	Height in feet	Range	Height in metres
0		0	0		0	0		0	0		0	0		0	0		0
399	0	121	427	0	130	454	0	138	481	0	146	508	0	154	535	0	163
1190	1	365	1270	1	390	1360	1	415	1440	1	439	1520	1	464	1600	1	489
1990	2	608	2130	2	649	2260	2	691	2400	2	732	2540	2	774	2670	2	815
2790	3	851	2980	3	909	3170	3	966	3360	3	1020	3550	3	1080	3740	3	1140
3580	4	1090	3830	4	1160	4070	4	1240	4310	4	1310	4560	4	1390	4810	4	1460
4380	5	1330	4670	5	1420	4970	5	1510	5270	5	1600	5570	5	1690	5870	5	1790
5170	6	1570	5520	6	1680	5870	6	1790	6220	6	1890	6580	6	2000	6930	6	2110
5960	7	1810	6360	7	1940	6770	7	2060	7180	7	2180	7580	7	2310	8000	7	2430
6750	8	2050	7210	8	2190	7670	8	2330	8130	8	2470	8590	8	2610	9060	8	2760
7530	9	2290	8050	9	2450	8560	9	2610	9080	9	2760	9600	9	2920	10100	9	3080
9880	10	3010	10500	10	3220	11200	10	3420	11900	10	3630	12600	10	3840	13200	10	4050
13700	15	4200	14700	15	4480	15600	15	4770	16600	15	5060	17500	15	5350	18500	15	5640
17600	20	5370	18800	20	5740	20000	20	6110	21200	20	6480	22500	20	6860	23700	20	7230
21400	25	6530	22900	25	6980	24400	25	7440	25900	25	7890	27400	25	8350	28900	25	8810
25200	30	7680	26900	30	8220	28700	30	8760	30500	30	9290	32200	30	9830	34000	30	10300
28900	35	8820	30900	35	9440	33000	35	10000	35000	35	10600	37000	35	11300	39100	35	11900
32600	40	9950	34900	40	10600	37200	40	11300	39500	40	12000	41800	40	12700	44200	40	13400
36300	45	11000	38800	45	11800	41400	45	12600	44000	45	13400	46600	45	14200	49200	45	15000
39900	50	12100	42700	50	13000	45600	50	13900	48400	50	14700	51300	50	15600	54200	50	16500
43500	55	13200	46600	55	14200	49700	55	15100	52800	55	16100	56000	55	17000	59100	55	18000
47000	60	14300	50400	60	15300	53800	60	16400	57200	60	17400	60600	60	18400	64000	60	19500

For explanation, see page 224.

XI.—TEMPERATURE CONVERSION

FAHRENHEIT AND CENTIGRADE

°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C
−52	−46	−14	−25	+23	−4	+61	+17	+99	+38	+137	+59	+175	+80
50	45	13	24	25	3	63	18	101	39	139	60	176	81
49	44	11	23	27	2	65	19	103	40	140	61	178	82
47	43	9	22	29	−1	67	20	104	41	142	62	180	83
45	42	7	21	31	0	68	21	106	42	144	63	182	84
43	41	5	20	32	+1	70	22	108	43	146	64	184	85
41	40	4	19	34	2	72	23	110	44	148	65	185	86
40	39	−2	18	36	3	74	24	112	45	149	66	187	87
38	38	0	17	38	4	76	25	113	46	151	67	189	88
36	37	+2	16	40	5	77	26	115	47	153	68	191	89
34	36	4	15	41	6	79	27	117	48	155	69	193	90
32	35	5	14	43	7	81	28	119	49	157	70	194	91
31	34	7	13	45	8	83	29	121	50	158	71	196	92
29	33	9	12	47	9	85	30	122	51	160	72	198	93
27	32	11	11	49	10	86	31	124	52	162	73	200	94
25	31	13	10	50	11	88	32	126	53	164	74	202	95
23	30	14	9	52	12	90	33	128	54	166	75	203	96
22	29	16	8	54	13	92	34	130	55	167	76	205	97
20	28	18	7	56	14	94	35	131	56	169	77	207	98
18	27	20	6	58	15	95	36	133	57	171	78	209	99
16	−26	22	−5	59	+16	97	+37	135	+58	173	+79	211	+100
−14		+23		+61		+99		+137		+175		+212	

XII.—CONVERSION FACTORS

Conversion	Ratio	Factor	Reciprocal
DISTANCE			
Statute Miles to Nautical Miles ...	66 to 76	0·8684	1·1515
Statute Miles „ Kilometres	66 „ 41	1·6093	0·6214
Nautical Miles „ Kilometres	76 „ 41	1·8531	0·5396
Feet „ Metres	25 „ 82	0·3048	3·2808
Yards „ Metres	32 „ 35	0·9144	1·0936
Fathoms „ Feet	6 „ 1	6·0	0·1667
SPEED			
Miles per hour to Knots	66 to 76	0·8684	1·1515
Miles per hour „ Metres per second ...	38 „ 85	0·4470	2·2369
Knots „ Metres per second ...	35 „ 68	0·5148	1·9426
Miles per hour „ Feet per second ...	22 „ 15	1·4667	0·6818
LIQUID MEASURE			
Gallons to Litres	50 to 11	4·5460	0·2200
WEIGHT			
Pounds to Kilograms ...	44 to 97	0·4536	2·2046
PRESSURE			
Inches of Mercury to Millibars ...	2100 to 62	33·87	0·02953

XIII.—CONVERSION OF TIME TO ARC

For Intervals of 10m

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

Interpolation Table

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

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

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

When the argument is an exact tabulated value, the *upper* of the two possible values of the result should be taken.

XIV.—CONVERSION OF ARC TO TIME

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

XV.—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	d ′
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	00
01	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	01
02	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	02
03	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	03
04	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	04
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XV.—CORRECTION TO TABULATED ALTITUDE FOR MINUTES OF DECLINATION

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