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PREFACE

This manual is a compilation of tables and charts which are used in field computations of astronomical observations by the field artillery. These tables and charts are compiled and provided by the Nautical Almanac Office, US Naval Observatory; H. M. Nautical Almanac Office, Royal Greenwich Observatory; and National Oceanic Atmospheric Administration.

This manual reflects the update of data to encompass the years 1988 through 1992. It is designed to be used in conjunction with FM 6-2, Field Artillery Survey.

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CHAPTER 1

INTRODUCTION

1-1. PURPOSE AND SCOPE

a. This manual is a compilation of tables and charts for use in computing astronomical azimuths for the field artillery. These tables and charts are used for computing azimuth of the Sun or selected stars by either the altitude or the hour-angle method. Special tables (tables 12 through 12e), which are tabular methods of computing Polaris, are included for a rapid computation of a Polaris azimuth. The secant tables accompanying these tables are permanent. Tables and charts are also included to correct astronomic azimuth to grid azimuth, to extend azimuth by simultaneous observation, and to perform zone-to-zone transformation of azimuth.

b. Data contained in tables 2a, 2b, 2c, 2d, 2e, 10a(1), 10a(2), 10a(3), 10a(4), 10a(5), 10b(1), 10b(2), 10b(3), 10b(4), 10b(5), 11a, 11b, 11c, 11d, 11e, 12a, 12b, 12c, 12d, and 12e are current only for the years in which the manual is effective.

1-2. DESCRIPTION OF TABLES AND CHARTS

This manual is intended to be used as a companion publication to FM 6-2, *Field Artillery Survey*. Details on the computation of astronomical azimuth and the use of these tables and charts are contained in FM 6-2.

CHAPTER 2

ASTRONOMICAL TABLES AND CHARTS

Table 1a. Astronomic Refraction Corrected for Temperature (Degrees)

TO BE SUBTRACTED FROM OBSERVED ALTITUDE OF SUN OR STAR

(Use values of observed altitude and temperature nearest the values tabulated as arguments.)

Observed altitude	Temperature °F.																
	−30	−20	−10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120	+130
° ′	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″
00 00	40-43	39-45	38-53	38-02	37-15	36-27	35-44	35-01	34-20	33-40	33-01	32-26	31-51	31-36	30-43	30-14	29-46
20	35-57	35-06	34-20	33-35	32-53	32-11	31-33	30-55	30-18	29-44	29-09	28-38	28-07	27-37	27-07	26-42	26-17
40	32-00	31-15	30-34	29-54	29-16	28-39	28-05	27-31	26-59	26-28	25-57	25-30	25-02	24-35	24-09	23-46	23-23
01 00	28-42	28-01	27-25	26-49	26-15	25-42	25-12	24-41	24-12	23-44	23-17	22-52	22-27	22-03	21-40	21-19	20-59
20	25-55	25-19	24-46	24-13	23-43	23-13	22-45	22-18	21-51	21-26	21-02	20-39	20-17	19-55	19-44	19-15	18-57
40	23-34	23-00	22-31	22-01	21-33	21-06	20-41	20-16	19-52	19-29	19-07	18-46	18-26	18-06	17-47	17-30	17-13
02 00	21-32	21-02	20-35	20-07	19-42	19-17	18-54	18-31	18-10	17-49	17-28	17-10	16-51	16-33	16-15	16-00	15-45
20	19-48	19-20	18-54	18-29	18-06	17-43	17-22	17-01	16-41	16-22	16-03	15-46	15-29	15-12	14-56	14-42	14-28
40	18-17	17-51	17-28	17-05	16-43	16-22	16-03	15-43	15-25	15-07	14-50	14-34	14-18	14-02	13-48	13-35	13-22
03 00	16-57	16-33	16-12	15-50	15-30	15-11	14-53	14-35	14-18	14-01	13-45	13-30	13-16	13-01	12-48	12-36	12-24
20	15-47	15-25	15-05	14-45	14-27	14-08	13-51	13-35	13-19	13-04	12-48	12-35	12-21	12-08	11-55	11-44	11-32
40	14-45	14-25	14-06	13-47	13-30	13-13	12-57	12-42	12-27	12-12	11-58	11-46	11-33	11-20	11-08	10-58	10-47
04 00	13-50	13-31	13-13	12-56	12-40	12-24	12-09	11-54	11-40	11-27	11-14	11-02	10-50	10-38	10-27	10-17	10-07
20	13-01	12-43	12-26	12-10	11-55	11-40	11-26	11-12	10-59	10-46	10-34	10-23	10-11	10-00	09-50	09-40	09-31
40	12-17	12-00	11-44	11-29	11-14	11-00	10-47	10-34	10-22	10-10	09-58	09-47	09-37	09-26	09-16	09-08	08-59
05 00	11-38	11-21	11-07	10-52	10-38	10-25	10-13	10-00	09-48	09-37	09-26	09-16	09-06	08-56	08-47	08-38	08-30
20	11-02	10-46	10-32	10-18	10-05	09-53	09-41	09-29	09-18	09-07	08-57	08-47	08-38	08-28	08-19	08-12	08-04
40	10-29	10-14	10-01	09-48	09-35	09-23	09-12	09-01	08-50	08-40	08-30	08-21	08-12	08-03	07-55	07-47	07-40
06 00	09-59	09-45	09-32	09-20	09-08	08-56	08-46	08-35	08-25	08-16	08-06	07-57	07-49	07-40	07-32	07-25	07-18
20	09-32	09-18	09-06	08-54	08-43	08-32	08-22	08-12	08-02	07-53	07-44	07-35	07-27	07-19	07-11	07-05	06-58
40	09-07	08-54	08-42	08-31	08-20	08-09	08-00	07-50	07-41	07-32	07-23	07-16	07-08	07-00	06-53	06-46	06-40
07 00	08-43	08-31	08-20	08-09	07-59	07-49	07-39	07-30	07-21	07-13	07-05	06-57	06-50	06-42	06-35	06-29	06-23
20	08-22	08-10	08-00	07-49	07-39	07-30	07-21	07-12	07-03	06-55	06-47	06-40	06-33	06-26	06-19	06-13	06-07
40	08-02	07-51	07-41	07-31	07-21	07-12	07-03	06-55	06-47	06-39	06-31	06-24	06-17	06-10	06-04	05-58	05-53
08 00	07-44	07-33	07-23	07-13	07-04	06-55	06-47	06-39	06-31	06-24	06-16	06-10	06-03	05-56	05-50	05-45	05-39
20	07-27	07-16	07-07	06-57	06-49	06-40	06-32	06-24	06-17	06-09	06-02	05-56	05-49	05-43	05-37	05-32	05-27
40	07-11	07-01	06-52	06-42	06-34	06-26	06-18	06-10	06-03	05-56	05-49	05-43	05-37	05-31	05-25	05-20	05-15
09 00	06-56	06-46	06-37	06-28	06-20	06-12	06-05	05-58	05-51	05-44	05-37	05-31	05-25	05-19	05-14	05-09	05-04
20	06-42	06-32	06-24	06-15	06-08	06-00	05-53	05-46	05-39	05-32	05-26	05-20	05-14	05-08	05-03	04-58	04-54
40	06-29	06-19	06-11	06-03	05-56	05-48	05-41	05-34	05-28	05-21	05-15	05-10	05-04	04-59	04-53	04-49	04-44
10 00	06-16	06-07	06-00	05-52	05-44	05-37	05-30	05-24	05-17	05-11	05-05	05-00	04-54	04-49	04-44	04-40	04-35
20	06-05	05-56	05-48	05-41	05-34	05-27	05-20	05-14	05-08	05-02	04-56	04-51	04-45	04-40	04-35	04-31	04-27
40	05-54	05-45	05-38	05-30	05-24	05-17	05-10	05-04	04-58	04-53	04-47	04-42	04-37	04-32	04-27	04-23	04-19
11 00	05-43	05-35	05-28	05-21	05-14	05-07	05-01	04-55	04-50	04-44	04-39	04-34	04-29	04-24	04-19	04-15	04-11
20	05-34	05-26	05-19	05-12	05-05	04-59	04-53	04-47	04-41	04-36	04-31	04-26	04-21	04-16	04-12	04-08	04-04
40	05-24	05-17	05-10	05-03	04-57	04-50	04-45	04-39	04-33	04-28	04-23	04-18	04-14	04-09	04-05	04-01	03-57
12 00	05-15	05-08	05-01	04-55	04-49	04-42	04-37	04-31	04-26	04-21	04-16	04-11	04-07	04-02	03-58	03-54	03-51
20	05-07	05-00	04-53	04-47	04-41	04-35	04-30	04-24	04-19	04-14	04-09	04-05	04-00	03-56	03-52	03-48	03-44
40	04-59	04-52	04-46	04-39	04-34	04-28	04-21	04-17	04-12	04-07	04-03	03-58	03-54	03-50	03-46	03-42	03-39

Table 1a. Astronomic Refraction Corrected for Temperature (Degrees)—Continued

Observed altitude	Temperature °F.																
	−30	−20	−10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120	+130
° ′	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″
13 00	04-51	04-45	04-38	04-32	04-27	04-21	04-16	04-11	04-06	04-01	03-56	03-52	03-48	03-44	03-40	03-36	03-33
20	04-44	04-37	04-31	04-25	04-20	04-14	04-09	04-04	04-00	03-55	03-50	03-46	03-42	03-38	03-34	03-31	03-27
40	04-37	04-31	04-25	04-19	04-14	04-08	04-03	03-58	03-54	03-49	03-45	03-41	03-37	03-33	03-29	03-26	03-23
14 00	04-31	04-24	04-19	04-13	04-08	04-02	03-58	03-53	03-48	03-44	03-40	03-36	03-32	03-28	03-24	03-21	03-19
20	04-24	04-18	04-12	04-07	04-02	03-57	03-52	03-47	03-43	03-39	03-34	03-31	03-27	03-23	03-19	03-16	03-13
40	04-18	04-12	04-07	04-01	03-56	03-51	03-47	03-41	03-38	03-34	03-29	03-26	03-22	03-18	03-15	03-12	03-09
15 00	04-12	04-06	04-01	03-56	03-51	03-46	03-42	03-37	03-33	03-29	03-25	03-21	03-17	03-14	03-10	03-07	03-04
20	04-07	04-01	03-56	03-51	03-46	03-41	03-37	03-32	03-28	03-24	03-20	03-17	03-13	03-10	03-06	03-03	03-00
40	04-01	03-56	03-51	03-46	03-41	03-36	03-32	03-28	03-24	03-20	03-16	03-12	03-09	03-05	03-02	02-59	02-57
16 00	03-56	03-51	03-46	03-41	03-36	03-32	03-27	03-23	03-19	03-15	03-12	03-08	03-05	03-01	02-58	02-55	02-53
20	03-51	03-46	03-41	03-36	03-32	03-27	03-23	03-19	03-15	03-12	03-08	03-04	03-01	02-58	02-55	02-52	02-49
40	03-47	03-41	03-36	03-32	03-27	03-23	03-19	03-15	03-11	03-07	03-04	03-00	02-57	02-54	02-51	02-48	02-46
17 00	03-42	03-37	03-32	03-27	03-23	03-19	03-15	03-11	03-07	03-04	03-00	02-57	02-54	02-51	02-48	02-45	02-42
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20	03-25	03-20	03-16	03-12	03-08	03-04	03-00	02-56	02-53	02-50	02-46	02-43	02-41	02-38	02-35	02-32	02-30
40	03-21	03-17	03-12	03-08	03-04	03-00	02-57	02-53	02-50	02-46	02-43	02-40	02-37	02-35	02-32	02-30	02-27
19 00	03-18	03-13	03-09	03-05	03-01	02-57	02-53	02-50	02-47	02-43	02-40	02-37	02-35	02-32	02-29	02-27	02-24
20	03-14	03-09	03-05	03-01	02-58	02-54	02-50	02-47	02-44	02-40	02-37	02-35	02-32	02-29	02-26	02-24	02-22
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20 00	03-07	03-03	02-59	02-55	02-51	02-48	02-44	02-41	02-38	02-35	02-32	02-29	02-26	02-24	02-21	02-19	02-17
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40	03-01	02-56	02-53	02-49	02-45	02-42	02-39	02-35	02-32	02-29	02-27	02-24	02-21	02-19	02-16	02-14	02-12
21 00	02-58	02-53	02-50	02-46	02-42	02-39	02-36	02-33	02-30	02-27	02-24	02-21	02-19	02-16	02-14	02-12	02-10
20	02-55	02-50	02-47	02-43	02-40	02-36	02-33	02-30	02-27	02-24	02-22	02-19	02-17	02-14	02-12	02-10	02-08
40	02-52	02-48	02-44	02-40	02-37	02-34	02-31	02-28	02-25	02-22	02-19	02-17	02-14	02-12	02-10	02-07	02-05
22 00	02-49	02-45	02-41	02-38	02-34	02-31	02-28	02-25	02-22	02-20	02-17	02-14	02-12	02-10	02-07	02-05	02-03
20	02-46	02-42	02-39	02-35	02-32	02-29	02-26	02-23	02-20	02-17	02-15	02-12	02-10	02-08	02-05	02-03	02-01
40	02-43	02-40	02-36	02-33	02-30	02-26	02-23	02-21	02-18	02-15	02-13	02-10	02-08	02-06	02-03	02-01	01-59
23 00	02-41	02-37	02-34	02-30	02-27	02-24	02-21	02-18	02-16	02-13	02-10	02-08	02-06	02-04	02-01	01-59	01-58
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20	02-31	02-28	02-24	02-21	02-18	02-15	02-13	02-10	02-07	02-05	02-03	02-00	01-58	01-56	01-54	01-52	01-50
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25 00	02-26	02-23	02-20	02-17	02-14	02-11	02-09	02-06	02-04	02-01	01-59	01-57	01-55	01-53	01-51	01-49	01-47
20	02-24	02-21	02-18	02-15	02-12	02-09	02-07	02-04	02-02	02-00	01-57	01-55	01-53	01-51	01-49	01-47	01-46
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26 00	02-20	02-17	02-14	02-11	02-08	02-06	02-03	02-01	01-58	01-56	01-54	01-52	01-50	01-48	01-46	01-44	01-42
20	02-18	02-15	02-12	02-09	02-06	02-04	02-01	01-59	01-56	01-54	01-52	01-50	01-48	01-46	01-44	01-43	01-41
40	02-16	02-13	02-10	02-07	02-05	02-02	02-00	01-57	01-55	01-53	01-50	01-48	01-47	01-45	01-43	01-41	01-40
27 00	02-14	02-11	02-08	02-05	02-03	02-00	01-58	01-55	01-53	01-51	01-49	01-47	01-45	01-43	01-41	01-40	01-38
20	02-12	02-09	02-06	02-04	02-01	01-59	01-56	01-54	01-52	01-49	01-47	01-45	01-44	01-42	01-40	01-38	01-37
40	02-10	02-07	02-05	02-02	01-59	01-57	01-55	01-52	01-50	01-48	01-46	01-44	01-42	01-40	01-38	01-37	01-35

Table 1a. Astronomic Refraction Corrected for Temperature (Degrees)—Continued

Observed altitude	Temperature °F.																
	−30	−20	−10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120	+130
° ′	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″
28 00	02-09	02-06	02-03	02-00	01-58	01-55	01-53	01-51	01-48	01-46	01-44	01-43	01-41	01-39	01-37	01-36	01-34
20	02-07	02-04	02-01	01-59	01-56	01-54	01-51	01-49	01-47	01-45	01-43	01-41	01-39	01-37	01-36	01-34	01-33
40	02-05	02-02	02-00	01-57	01-54	01-52	01-50	01-48	01-46	01-43	01-41	01-40	01-38	01-36	01-34	01-33	01-31
29 00	02-03	02-01	01-58	01-55	01-53	01-51	01-48	01-46	01-44	01-42	01-40	01-38	01-37	01-35	01-33	01-32	01-30
20	02-02	01-59	01-56	01-54	01-51	01-49	01-47	01-45	01-43	01-41	01-39	01-37	01-35	01-34	01-32	01-30	01-29
40	02-00	01-57	01-55	01-52	01-50	01-48	01-45	01-43	01-41	01-39	01-37	01-36	01-34	01-32	01-31	01-29	01-28
30 00	01-59	01-56	01-53	01-51	01-48	01-46	01-44	01-42	01-40	01-38	01-36	01-34	01-33	01-31	01-30	01-28	01-27
20	01-57	01-54	01-52	01-49	01-47	01-45	01-43	01-41	01-39	01-37	01-35	01-33	01-32	01-30	01-28	01-27	01-25
40	01-56	01-53	01-50	01-48	01-46	01-43	01-41	01-39	01-37	01-36	01-34	01-32	01-30	01-29	01-27	01-26	01-24
31 00	01-54	01-51	01-49	01-46	01-44	01-42	01-40	01-38	01-36	01-34	01-32	01-31	01-29	01-28	01-26	01-25	01-23
20	01-52	01-50	01-47	01-45	01-43	01-41	01-39	01-37	01-35	01-33	01-31	01-30	01-28	01-26	01-25	01-24	01-22
40	01-51	01-48	01-46	01-44	01-42	01-39	01-37	01-35	01-34	01-32	01-30	01-28	01-27	01-25	01-24	01-22	01-21
32 00	01-50	01-47	01-45	01-42	01-40	01-38	01-36	01-34	01-32	01-31	01-29	01-27	01-26	01-24	01-23	01-21	01-20
30	01-48	01-45	01-43	01-40	01-38	01-36	01-34	01-33	01-31	01-29	01-27	01-26	01-24	01-23	01-21	01-20	01-19
33 00	01-45	01-43	01-41	01-39	01-36	01-34	01-33	01-31	01-29	01-27	01-26	01-24	01-22	01-21	01-20	01-18	01-17
30	01-44	01-41	01-39	01-37	01-35	01-33	01-31	01-29	01-27	01-26	01-24	01-22	01-21	01-20	01-18	01-17	01-16
34 00	01-42	01-39	01-37	01-35	01-33	01-31	01-29	01-27	01-26	01-24	01-22	01-21	01-19	01-18	01-17	01-15	01-14
30	01-40	01-37	01-35	01-33	01-31	01-29	01-28	01-26	01-24	01-23	01-21	01-19	01-18	01-17	01-15	01-14	01-13
35 00	01-38	01-36	01-33	01-31	01-30	01-28	01-26	01-24	01-22	01-21	01-19	01-18	01-17	01-15	01-14	01-13	01-12
30	01-36	01-34	01-32	01-30	01-28	01-26	01-24	01-23	01-21	01-19	01-18	01-17	01-15	01-14	01-12	01-11	01-10
36 00	01-34	01-32	01-30	01-28	01-26	01-24	01-23	01-21	01-20	01-18	01-16	01-15	01-14	01-12	01-11	01-10	01-09
30	01-33	01-30	01-28	01-27	01-25	01-23	01-21	01-20	01-18	01-17	01-15	01-14	01-12	01-11	01-10	01-09	01-08
37 00	01-31	01-29	01-27	01-25	01-23	01-21	01-20	01-18	01-17	01-15	01-14	01-12	01-11	01-10	01-09	01-08	01-06
30	01-29	01-27	01-25	01-23	01-22	01-20	01-18	01-17	01-15	01-14	01-12	01-11	01-10	01-09	01-07	01-06	01-05
38 00	01-28	01-26	01-24	01-22	01-20	01-19	01-17	01-15	01-14	01-13	01-11	01-10	01-09	01-07	01-06	01-05	01-04
30	01-26	01-24	01-22	01-21	01-19	01-17	01-16	01-14	01-13	01-11	01-10	01-09	01-07	01-06	01-05	01-04	01-03
39 00	01-25	01-23	01-21	01-19	01-17	01-16	01-14	01-13	01-11	01-10	01-09	01-07	01-06	01-05	01-04	01-03	01-02
30	01-23	01-21	01-19	01-18	01-16	01-14	01-13	01-12	01-10	01-09	01-07	01-06	01-05	01-04	01-03	01-02	01-01
40 00	01-22	01-20	01-18	01-16	01-15	01-13	01-12	01-10	01-09	01-08	01-06	01-05	01-04	01-03	01-02	01-01	01-00
30	01-20	01-18	01-17	01-15	01-13	01-12	01-10	01-09	01-08	01-06	01-05	01-04	01-03	01-02	01-01	01-00	00-59
41 00	01-19	01-17	01-15	01-14	01-12	01-11	01-09	01-09	01-06	01-05	01-04	01-03	01-02	01-01	01-00	00-59	00-58
30	01-18	01-16	01-14	01-12	01-11	01-09	01-08	01-07	01-05	01-04	01-03	01-02	01-01	01-00	00-59	00-58	00-57
42 00	01-16	01-14	01-13	01-11	01-10	01-08	01-07	01-05	01-04	01-03	01-02	01-01	01-00	00-58	00-57	00-57	00-56
30	01-15	01-13	01-11	01-10	01-08	01-07	01-06	01-04	01-03	01-02	01-01	01-00	00-59	00-57	00-56	00-56	00-55
43 00	01-14	01-12	01-10	01-09	01-07	01-06	01-05	01-03	01-02	01-01	01-00	00-59	00-58	00-56	00-55	00-55	00-54
30	01-12	01-11	01-09	01-08	01-06	01-05	01-04	01-02	01-01	01-00	00-59	00-58	00-57	00-56	00-55	00-54	00-53
44 00	01-11	01-09	01-08	01-06	01-05	01-04	01-02	01-01	01-00	00-59	00-58	00-57	00-56	00-55	00-54	00-53	00-52
30	01-10	01-08	01-07	01-05	01-04	01-03	01-01	01-00	00-59	00-58	00-57	00-56	00-55	00-54	00-53	00-52	00-51
45 00	01-09	01-07	01-06	01-04	01-03	01-01	01-00	00-59	00-58	00-57	00-56	00-55	00-54	00-53	00-52	00-51	00-50
30	01-07	01-06	01-04	01-03	01-02	01-00	00-59	00-58	00-57	00-56	00-55	00-54	00-53	00-52	00-51	00-50	00-49
46 00	01-06	01-05	01-03	01-02	01-01	00-59	00-58	00-57	00-56	00-55	00-54	00-53	00-52	00-51	00-50	00-49	00-48
30	01-05	01-04	01-02	01-01	01-00	00-58	00-57	00-56	00-55	00-54	00-53	00-52	00-51	00-50	00-49	00-48	00-48

Table 1a. Astronomic Refraction Corrected for Temperature (Degrees)—Continued

Observed altitude	Temperature °F.																
	−30	−20	−10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120	+130
° ′	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″	′ ″
47 00	01-04	01-03	01-01	01-00	00-59	00-57	00-56	00 55	00-54	00-53	00-52	00-51	00-50	00-49	00-48	00-48	00-47
30	01-03	01-01	01-00	00-59	00-58	00-56	00-55	00-54	00-53	00-52	00-51	00-50	00-49	00-48	00-47	00-47	00-46
48 00	01-02	01-00	00-59	00-58	00-57	00-55	00-54	00-53	00-52	00-51	00-50	00-49	00-48	00-47	00-47	00-46	00-45
30	01-01	00-59	00-58	00-57	00-56	00-54	00-53	00-52	00-51	00-50	00-49	00-48	00-48	00-47	00-46	00-45	00-44
49 00	01-00	00-58	00-57	00-56	00-55	00-53	00-52	00-51	00-50	00-49	00-48	00-48	00-47	00-46	00-45	00-44	00-44
30	00-59	00-57	00-56	00-55	00-54	00-52	00-51	00-50	00-49	00-48	00-48	00-47	00-46	00-45	00-44	00-44	00-43
50 00	00-58	00-56	00-55	00-54	00-53	00-52	00-51	00-50	00-49	00-48	00-47	00-46	00-45	00-44	00-43	00-43	00-42
51 00	00-56	00-54	00-53	00-52	00-51	00-50	00-49	00-48	00-47	00-46	00-45	00-44	00-44	00-43	00-42	00-41	00-41
52 00	00-54	00-52	00-51	00-50	00-49	00-48	00-47	00-46	00-45	00-44	00-43	00-43	00-42	00-41	00-40	00-40	00-39
53 00	00-52	00-50	00-49	00-48	00-47	00-46	00-45	00-44	00-44	00-43	00-42	00-41	00-40	00-40	00-39	00-38	00-38
54 00	00-50	00-49	00-48	00-47	00-46	00-45	00-44	00-43	00-42	00-41	00-41	00-40	00-39	00-38	00-38	00-37	00-37
55 00	00-48	00-47	00-46	00-45	00-44	00-43	00-42	00-41	00-40	00-40	00-39	00-38	00-38	00-37	00-36	00-36	00-35
56 00	00-46	00-45	00-44	00-43	00-42	00-41	00-41	00-40	00-39	00-38	00-38	00-37	00-36	00-36	00-35	00-34	00-34
57 00	00-45	00-44	00-43	00-42	00-41	00-40	00-39	00-38	00-38	00-37	00-36	00-36	00-35	00-34	00-34	00-33	00-33
58 00	00-43	00-42	00-41	00-40	00-39	00-38	00-38	00-37	00-36	00-36	00-35	00-34	00-34	00-33	00-32	00-32	00-31
59 00	00-41	00-40	00-39	00-39	00-38	00-37	00-36	00-35	00-35	00-34	00-33	00-33	00-32	00-32	00-31	00-31	00-30
60 00	00-40	00-39	00-38	00-37	00-36	00-35	00-35	00-34	00-33	00-33	00-32	00-32	00-31	00-30	00-30	00-29	00-29

Table 1b. Astronomic Refraction Corrected for Temperature (Mils)

TO BE SUBTRACTED FROM OBSERVED ALTITUDE OF SUN OR STAR

(Use values of observed altitude and temperature nearest the values tabulated as arguments.)

Observed altitude	Temperature °F																
	−30	−20	−10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120	+130
m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m	m
0	12.65	12.35	12.08	11.82	11.57	11.33	11.10	10.88	10.66	10.46	10.26	10.08	9.90	9.72	9.54	9.40	9.25
10	9.83	9.60	9.39	9.18	8.99	8.80	8.63	8.45	8.29	8.13	7.97	7.83	7.69	7.55	7.42	7.30	7.19
20	8.18	7.99	7.82	7.64	7.49	7.33	7.21	7.04	6.90	6.77	6.64	6.52	6.40	6.28	6.17	6.08	5.98
30	6.94	6.78	6.63	6.49	6.35	6.22	6.09	5.97	5.85	5.74	5.63	5.53	5.43	5.33	5.24	5.16	5.08
40	5.99	5.85	5.72	5.60	5.48	5.36	5.26	5.15	5.05	4.95	4.86	4.77	4.69	4.60	4.52	4.45	4.38
50	5.24	5.11	5.00	4.89	4.79	4.69	4.60	4.50	4.42	4.33	4.25	4.17	4.10	4.02	3.95	3.89	3.83
60	4.64	4.53	4.43	4.33	4.24	4.15	4.07	3.99	3.91	3.84	3.76	3.70	3.63	3.56	3.50	3.45	3.39
70	4.15	4.05	3.96	3.88	3.80	3.72	3.64	3.57	3.50	3.43	3.37	3.31	3.25	3.19	3.13	3.08	3.03
80	3.75	3.66	3.58	3.50	3.43	3.35	3.29	3.22	3.16	3.10	3.04	2.99	2.93	2.88	2.83	2.78	2.74
90	3.41	3.33	3.26	3.19	3.12	3.06	2.99	2.93	2.88	2.82	2.77	2.72	2.67	2.62	2.57	2.53	2.46
100	3.13	3.05	2.99	2.92	2.86	2.80	2.74	2.69	2.64	2.59	2.54	2.49	2.45	2.40	2.36	2.32	2.28
110	2.88	2.81	2.75	2.69	2.64	2.58	2.53	2.48	2.43	2.38	2.34	2.30	2.25	2.21	2.17	2.14	2.11
120	2.67	2.61	2.55	2.49	2.44	2.39	2.34	2.30	2.25	2.21	2.17	2.13	2.09	2.05	2.01	1.98	1.95
130	2.49	2.43	2.37	2.32	2.27	2.22	2.18	2.14	2.10	2.06	2.02	1.98	1.94	1.91	1.88	1.85	1.82
140	2.32	2.27	2.22	2.17	2.13	2.08	2.04	2.00	1.96	1.92	1.88	1.85	1.82	1.79	1.75	1.73	1.70
150	2.18	2.13	2.08	2.04	2.00	1.95	1.91	1.88	1.84	1.80	1.77	1.74	1.71	1.68	1.65	1.62	1.59
160	2.05	2.00	1.96	1.92	1.88	1.84	1.80	1.77	1.73	1.70	1.67	1.64	1.61	1.58	1.55	1.53	1.50
170	1.94	1.89	1.85	1.81	1.77	1.74	1.70	1.67	1.64	1.60	1.57	1.55	1.52	1.49	1.46	1.44	1.42
180	1.84	1.79	1.75	1.72	1.68	1.64	1.61	1.58	1.55	1.52	1.49	1.46	1.44	1.41	1.39	1.36	1.34
190	1.74	1.70	1.67	1.63	1.59	1.56	1.53	1.50	1.47	1.44	1.41	1.39	1.36	1.34	1.32	1.29	1.27
200	1.66	1.62	1.58	1.55	1.52	1.49	1.46	1.43	1.40	1.37	1.35	1.32	1.30	1.27	1.25	1.23	1.21
210	1.58	1.54	1.51	1.48	1.45	1.42	1.39	1.36	1.33	1.31	1.28	1.26	1.24	1.22	1.19	1.18	1.16
220	1.51	1.48	1.44	1.41	1.38	1.35	1.33	1.30	1.27	1.25	1.23	1.20	1.18	1.16	1.14	1.12	1.10
230	1.45	1.41	1.38	1.35	1.32	1.29	1.27	1.25	1.22	1.20	1.17	1.15	1.13	1.11	1.09	1.07	1.06
240	1.39	1.35	1.32	1.29	1.27	1.24	1.22	1.19	1.17	1.15	1.12	1.10	1.08	1.06	1.05	1.03	1.01
250	1.33	1.30	1.27	1.24	1.22	1.19	1.17	1.14	1.12	1.10	1.08	1.06	1.04	1.02	1.00	0.99	0.97
260	1.28	1.25	1.22	1.19	1.17	1.14	1.12	1.10	1.08	1.06	1.04	1.02	1.00	0.98	0.96	0.95	0.93
270	1.23	1.20	1.18	1.15	1.13	1.10	1.08	1.06	1.04	1.02	0.99	0.98	0.96	0.95	0.93	0.91	0.90
280	1.19	1.16	1.13	1.11	1.09	1.06	1.04	1.02	1.00	0.98	0.96	0.94	0.93	0.91	0.90	0.88	0.87
290	1.14	1.12	1.09	1.07	1.05	1.02	1.00	0.98	0.96	0.95	0.93	0.91	0.89	0.88	0.86	0.85	0.84
300	1.10	1.08	1.06	1.03	1.01	0.99	0.97	0.95	0.93	0.91	0.90	0.88	0.86	0.85	0.83	0.82	0.81
310	1.07	1.04	1.02	1.00	0.98	0.96	0.94	0.92	0.90	0.88	0.87	0.85	0.84	0.82	0.81	0.79	0.78
320	1.03	1.01	0.99	0.96	0.94	0.92	0.91	0.89	0.87	0.85	0.84	0.82	0.81	0.79	0.78	0.77	0.75
330	1.00	0.98	0.96	0.93	0.92	0.90	0.88	0.86	0.84	0.83	0.81	0.80	0.78	0.77	0.75	0.74	0.73
340	0.97	0.95	0.93	0.91	0.89	0.87	0.85	0.83	0.82	0.80	0.79	0.77	0.76	0.74	0.73	0.72	0.71
350	0.94	0.92	0.90	0.88	0.86	0.84	0.82	0.81	0.79	0.78	0.76	0.75	0.74	0.72	0.71	0.70	0.69
360	0.91	0.89	0.87	0.85	0.83	0.82	0.80	0.78	0.77	0.75	0.74	0.73	0.71	0.70	0.69	0.68	0.67
370	0.89	0.86	0.85	0.83	0.81	0.79	0.78	0.76	0.75	0.73	0.72	0.71	0.69	0.68	0.67	0.66	0.65
380	0.86	0.84	0.82	0.80	0.79	0.77	0.76	0.74	0.73	0.71	0.70	0.69	0.67	0.66	0.65	0.64	0.63
390	0.84	0.82	0.80	0.78	0.77	0.75	0.73	0.72	0.71	0.69	0.68	0.67	0.65	0.64	0.63	0.62	0.61
400	0.81	0.79	0.78	0.76	0.74	0.73	0.71	0.70	0.69	0.67	0.66	0.65	0.64	0.62	0.61	0.60	0.59

Table 1b. Astronomic Refraction Corrected for Temperature (Mils)—Continued

Observed altitude	Temperature °F																
	−30	−20	−10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120	+130
‰	‰	‰	‰	‰	‰	‰	‰	‰	‰	‰	‰	‰	‰	‰	‰	‰	‰
410	0.79	0.77	0.76	0.74	0.72	0.71	0.70	0.68	0.67	0.65	0.64	0.63	0.62	0.61	0.60	0.59	0.58
420	0.77	0.75	0.74	0.72	0.71	0.69	0.68	0.66	0.65	0.64	0.63	0.61	0.60	0.59	0.58	0.57	0.56
430	0.75	0.73	0.72	0.70	0.69	0.67	0.66	0.65	0.63	0.62	0.61	0.60	0.59	0.58	0.57	0.56	0.55
440	0.73	0.71	0.70	0.68	0.67	0.66	0.64	0.63	0.62	0.61	0.59	0.58	0.57	0.56	0.55	0.54	0.54
450	0.71	0.70	0.68	0.67	0.65	0.64	0.63	0.61	0.60	0.59	0.58	0.57	0.56	0.55	0.54	0.53	0.52
460	0.70	0.68	0.66	0.65	0.64	0.62	0.61	0.60	0.59	0.58	0.56	0.55	0.54	0.53	0.53	0.52	0.51
470	0.68	0.66	0.65	0.64	0.62	0.61	0.60	0.58	0.57	0.56	0.55	0.54	0.53	0.52	0.51	0.50	0.50
480	0.66	0.65	0.63	0.62	0.61	0.59	0.58	0.57	0.56	0.55	0.54	0.53	0.52	0.51	0.50	0.49	0.48
490	0.65	0.63	0.62	0.60	0.59	0.58	0.57	0.56	0.55	0.54	0.52	0.52	0.51	0.50	0.49	0.48	0.47
500	0.63	0.62	0.60	0.59	0.58	0.57	0.55	0.54	0.53	0.52	0.51	0.50	0.49	0.49	0.48	0.47	0.46
510	0.62	0.62	0.59	0.58	0.56	0.55	0.54	0.53	0.52	0.51	0.50	0.49	0.48	0.47	0.47	0.46	0.45
520	0.60	0.59	0.58	0.56	0.55	0.54	0.53	0.52	0.51	0.50	0.49	0.48	0.47	0.46	0.46	0.45	0.44
530	0.59	0.58	0.56	0.55	0.54	0.53	0.52	0.51	0.50	0.49	0.48	0.47	0.46	0.45	0.45	0.44	0.43
540	0.58	0.56	0.55	0.54	0.53	0.52	0.51	0.50	0.49	0.48	0.47	0.46	0.45	0.44	0.43	0.43	0.42
550	0.56	0.55	0.54	0.53	0.52	0.51	0.50	0.49	0.48	0.47	0.46	0.45	0.44	0.43	0.42	0.42	0.41
560	0.55	0.54	0.53	0.52	0.50	0.49	0.48	0.47	0.47	0.46	0.45	0.44	0.43	0.42	0.42	0.41	0.40
570	0.54	0.53	0.52	0.50	0.49	0.48	0.47	0.46	0.46	0.45	0.44	0.43	0.42	0.41	0.41	0.40	0.39
580	0.53	0.52	0.50	0.49	0.48	0.47	0.46	0.45	0.45	0.44	0.43	0.42	0.41	0.41	0.40	0.39	0.39
590	0.52	0.50	0.49	0.48	0.47	0.46	0.45	0.44	0.44	0.43	0.42	0.41	0.40	0.40	0.39	0.38	0.38
600	0.51	0.49	0.48	0.47	0.46	0.45	0.44	0.44	0.43	0.42	0.41	0.40	0.40	0.39	0.38	0.38	0.37
610	0.50	0.48	0.47	0.46	0.45	0.44	0.44	0.43	0.42	0.41	0.40	0.40	0.39	0.38	0.37	0.37	0.36
620	0.49	0.47	0.46	0.45	0.44	0.43	0.43	0.42	0.41	0.40	0.39	0.39	0.38	0.37	0.37	0.36	0.35
630	0.48	0.46	0.45	0.44	0.44	0.43	0.42	0.41	0.40	0.39	0.39	0.38	0.37	0.37	0.36	0.35	0.35
640	0.47	0.45	0.44	0.43	0.43	0.42	0.41	0.40	0.39	0.39	0.38	0.37	0.36	0.36	0.35	0.35	0.34
650	0.46	0.45	0.44	0.43	0.42	0.41	0.40	0.39	0.38	0.38	0.37	0.36	0.36	0.35	0.34	0.34	0.33
660	0.45	0.44	0.43	0.42	0.41	0.40	0.39	0.38	0.38	0.37	0.36	0.36	0.35	0.34	0.34	0.33	0.33
670	0.44	0.43	0.42	0.41	0.40	0.39	0.38	0.38	0.37	0.36	0.36	0.35	0.34	0.34	0.33	0.33	0.32
680	0.43	0.42	0.41	0.40	0.39	0.39	0.38	0.37	0.36	0.36	0.35	0.34	0.34	0.33	0.32	0.32	0.31
690	0.42	0.41	0.40	0.39	0.39	0.38	0.37	0.36	0.36	0.35	0.34	0.34	0.33	0.32	0.32	0.31	0.31
700	0.41	0.40	0.39	0.39	0.38	0.37	0.36	0.36	0.35	0.34	0.33	0.33	0.32	0.32	0.31	0.31	0.30
710	0.40	0.40	0.39	0.38	0.37	0.36	0.36	0.35	0.34	0.33	0.33	0.32	0.32	0.31	0.31	0.30	0.30
720	0.40	0.39	0.38	0.37	0.36	0.36	0.35	0.34	0.33	0.33	0.32	0.32	0.31	0.30	0.30	0.29	0.29
730	0.39	0.38	0.37	0.36	0.36	0.35	0.34	0.33	0.33	0.32	0.31	0.31	0.30	0.30	0.29	0.29	0.28
740	0.38	0.37	0.36	0.36	0.35	0.34	0.33	0.33	0.32	0.32	0.31	0.30	0.30	0.29	0.29	0.28	0.28
750	0.37	0.36	0.36	0.35	0.34	0.33	0.33	0.32	0.32	0.31	0.30	0.30	0.29	0.29	0.28	0.28	0.27
760	0.37	0.36	0.35	0.34	0.34	0.33	0.32	0.32	0.31	0.30	0.30	0.29	0.29	0.28	0.28	0.27	0.27
770	0.36	0.35	0.34	0.34	0.33	0.32	0.32	0.31	0.30	0.30	0.29	0.29	0.28	0.28	0.27	0.27	0.26
780	0.35	0.34	0.34	0.33	0.32	0.32	0.31	0.30	0.30	0.29	0.29	0.28	0.28	0.27	0.27	0.26	0.26
790	0.35	0.34	0.33	0.32	0.32	0.31	0.30	0.30	0.29	0.29	0.28	0.28	0.27	0.27	0.26	0.26	0.25
800	0.34	0.33	0.32	0.32	0.31	0.30	0.30	0.29	0.29	0.28	0.28	0.27	0.27	0.26	0.26	0.25	0.25
810	0.33	0.32	0.32	0.31	0.30	0.30	0.29	0.29	0.28	0.27	0.27	0.26	0.26	0.26	0.25	0.25	0.24
820	0.33	0.32	0.31	0.30	0.30	0.29	0.29	0.28	0.27	0.27	0.26	0.26	0.25	0.25	0.25	0.24	0.24
830	0.32	0.31	0.31	0.30	0.29	0.29	0.28	0.28	0.27	0.26	0.26	0.25	0.25	0.25	0.24	0.24	0.23
840	0.31	0.31	0.30	0.29	0.29	0.28	0.27	0.27	0.26	0.26	0.25	0.25	0.24	0.24	0.24	0.23	0.23
850	0.31	0.30	0.29	0.29	0.28	0.27	0.27	0.26	0.26	0.25	0.25	0.24	0.24	0.24	0.23	0.23	0.22
860	0.30	0.29	0.29	0.28	0.28	0.27	0.26	0.26	0.25	0.25	0.24	0.24	0.24	0.23	0.23	0.22	0.22
870	0.30	0.29	0.28	0.28	0.27	0.26	0.26	0.25	0.25	0.24	0.24	0.24	0.23	0.23	0.22	0.22	0.22
880	0.29	0.28	0.28	0.27	0.26	0.25	0.25	0.25	0.24	0.24	0.23	0.23	0.23	0.22	0.22	0.21	0.21
890	0.28	0.28	0.27	0.27	0.26	0.25	0.25	0.24	0.24	0.23	0.23	0.23	0.22	0.22	0.21	0.21	0.21
900	0.28	0.27	0.27	0.26	0.25	0.25	0.24	0.24	0.23	0.23	0.23	0.22	0.22	0.21	0.21	0.21	0.20

Table 1b. Astronomic Refraction Corrected for Temperature (Mils)—Continued

Observed altitude	Temperature °F																
	−30	−20	−10	0	+10	+20	+30	+40	+50	+60	+70	+80	+90	+100	+110	+120	+130
mils	mils	mils	mils	mils	mils	mils	mils	mils	mils	mils	mils	mils	mils	mils	mils	mils	mils
910	0.27	0.27	0.26	0.25	0.25	0.24	0.24	0.23	0.23	0.23	0.22	0.22	0.21	0.21	0.21	0.20	0.20
920	0.27	0.26	0.26	0.25	0.24	0.24	0.23	0.23	0.23	0.22	0.22	0.21	0.21	0.21	0.20	0.20	0.20
930	0.26	0.26	0.25	0.24	0.24	0.23	0.23	0.23	0.22	0.22	0.21	0.21	0.20	0.20	0.20	0.19	0.19
940	0.26	0.25	0.25	0.24	0.24	0.23	0.23	0.22	0.22	0.21	0.21	0.20	0.20	0.20	0.19	0.19	0.19
950	0.25	0.25	0.24	0.23	0.23	0.22	0.22	0.22	0.21	0.21	0.20	0.20	0.20	0.19	0.19	0.19	0.18
960	0.25	0.24	0.24	0.23	0.23	0.22	0.22	0.21	0.21	0.20	0.20	0.20	0.19	0.19	0.19	0.18	0.18
970	0.24	0.24	0.23	0.23	0.22	0.22	0.21	0.21	0.20	0.20	0.20	0.19	0.19	0.19	0.18	0.18	0.18
980	0.24	0.23	0.23	0.22	0.22	0.21	0.21	0.20	0.20	0.20	0.19	0.19	0.19	0.18	0.18	0.18	0.17
990	0.23	0.23	0.22	0.22	0.21	0.21	0.20	0.20	0.20	0.19	0.19	0.18	0.18	0.18	0.17	0.17	0.17
1000	0.23	0.22	0.22	0.21	0.21	0.20	0.20	0.19	0.19	0.19	0.18	0.18	0.18	0.17	0.17	0.17	0.17
1010	0.22	0.22	0.21	0.21	0.20	0.20	0.19	0.19	0.19	0.18	0.18	0.18	0.17	0.17	0.17	0.16	0.16
1020	0.22	0.21	0.21	0.20	0.20	0.19	0.19	0.19	0.18	0.18	0.18	0.17	0.17	0.17	0.16	0.16	0.16
1030	0.21	0.21	0.20	0.20	0.19	0.19	0.19	0.18	0.18	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.16
1040	0.21	0.20	0.20	0.19	0.19	0.19	0.18	0.18	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.15	0.15
1050	0.20	0.20	0.19	0.19	0.19	0.18	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.15	0.15	0.15	0.15
1060	0.20	0.19	0.19	0.19	0.18	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.16	0.15	0.15	0.15	0.15
1070	0.19	0.19	0.19	0.18	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.15	0.15	0.15	0.15	0.14	0.14
1080	0.19	0.19	0.18	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.15	0.15	0.15	0.15	0.14	0.14	0.14
1090	0.19	0.18	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.15	0.15	0.15	0.15	0.14	0.14	0.14	0.14
1100	0.18	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.13	0.13
1110	0.18	0.17	0.17	0.17	0.16	0.16	0.16	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.13	0.13	0.13
1120	0.17	0.17	0.17	0.16	0.16	0.15	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.13
1130	0.17	0.16	0.16	0.16	0.15	0.15	0.15	0.15	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.13	0.12
1140	0.16	0.16	0.16	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.12	0.12	0.12
1150	0.16	0.16	0.15	0.15	0.15	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12
1160	0.16	0.15	0.15	0.15	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.12	0.11
1170	0.15	0.15	0.15	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.11	0.11	0.11
1180	0.15	0.15	0.14	0.14	0.14	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11
1190	0.14	0.14	0.14	0.14	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.11
1200	0.14	0.14	0.13	0.13	0.13	0.13	0.12	0.12	0.12	0.12	0.11	0.11	0.11	0.11	0.11	0.10	0.10

Table 1c. Pressure Correction Factor, Cb

(Apply to values in tables 1*a* or 1*b*)

Barometer		C_B	Barometer		C_B	Barometer		C_B
Inches	Millibars		Inches	Millibars		Inches	Millibars	
20.0	677	0.670	23.8	806	0.796	27.4	928	0.916
20.1	681	0.673	23.9	809	0.799	27.5	931	0.920
20.2	684	0.676				27.6	935	0.923
20.3	687	0.679				27.7	938	0.926
20.4	691	0.682	24.0	813	0.803			
			24.1	816	0.806			
20.5	694	0.685	24.2	820	0.809	27.8	941	0.929
20.6	698	0.688	24.3	823	0.813	27.9	945	0.933
20.7	701	0.692				28.0	948	0.936
20.8	704	0.696	24.4	826	0.816	28.1	952	0.939
20.9	708	0.699	24.5	830	0.820	28.2	955	0.942
			24.6	833	0.823			
21.0	711	0.703	24.7	836	0.826	28.3	958	0.946
21.1	715	0.706	24.8	840	0.829	28.4	962	0.949
21.2	718	0.709				28.5	965	0.953
21.3	721	0.712	24.9	843	0.832	28.6	969	0.956
21.4	725	0.716	25.0	847	0.835	28.7	972	0.959
			25.1	850	0.838			
21.5	728	0.719	25.2	853	0.842	28.8	975	0.963
21.6	731	0.722	25.3	857	0.846	28.9	979	0.966
21.7	735	0.725				29.0	982	0.970
21.8	738	0.729	25.4	860	0.849	29.1	985	0.973
21.9	742	0.732	25.5	864	0.853	29.2	989	0.976
			25.6	867	0.856			
22.0	745	0.735	25.7	870	0.859	29.3	992	0.979
22.1	748	0.739	25.8	874	0.862	29.4	996	0.983
22.2	752	0.742				29.5	999	0.986
22.3	755	0.746	25.9	877	0.866	29.6	1002	0.989
22.4	759	0.749	26.0	880	0.869	29.7	1006	0.992
			26.1	884	0.872			
22.5	762	0.752	26.2	887	0.875	29.8	1009	0.996
22.6	765	0.755	26.3	891	0.879	29.9	1013	0.999
22.7	769	0.759				30.0	1016	1.003
22.8	772	0.762	26.4	894	0.882	30.1	1019	1.007
22.9	775	0.766	26.5	897	0.885	30.2	1023	1.010
			26.6	901	0.889			
23.0	779	0.770	26.7	904	0.892	30.3	1026	1.013
23.1	782	0.773	26.8	908	0.896	30.4	1029	1.016
23.2	786	0.776				30.5	1033	1.020
23.3	789	0.779	26.9	911	0.899	30.6	1036	1.023
23.4	792	0.783	27.0	914	0.902	30.7	1040	1.026
			27.1	918	0.905			
23.5	796	0.786	27.2	921	0.909	30.8	1043	1.029
23.6	799	0.789	27.3	924	0.912	30.9	1046	1.033
23.7	803	0.792				31.0	1050	1.036

Note. Omit Pressure correction Factor for artillery surveys of fourth-order (1:3000) or lesser accuracies.

Table 2a. Sun, 1988, for Zero Hours Universal Time (GMT)

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
JAN 0 TH	-23 09 14		-411.62		-02 33.6		06 35 33.5
		+256		+1.26		-28.8	
JAN 1 FR	-23 04 58		-410.36		-03 02.4		06 39 30.2
		+283		+1.40		-28.4	
2 SA	-23 00 15		-408.96		-03 30.8		06 43 26.7
		+311		+1.53		-28.0	
3 SU	-22 55 04		-407.43		-03 58.8		06 47 23.3
		+338		+1.67		-27.8	
4 MO	-22 49 26		-405.76		-04 26.6		06 51 19.9
		+365		+1.80		-27.3	
5 TU	-22 43 21		-403.96		-04 53.9		06 55 16.4
		+392		+1.94		-27.0	
6 WE	-22 36 49		-402.02		-05 20.9		06 59 13.0
		+419		+2.07		-26.5	
7 TH	-22 29 50		-399.95		-05 47.4		07 03 09.5
		+446		+2.20		-26.0	
8 FR	-22 22 24		-397.75		-06 13.4		07 07 06.1
		+472		+2.33		-25.6	
9 SA	-22 14 32		-395.42		-06 39.0		07 11 02.6
		+498		+2.46		-25.1	
10 SU	-22 06 14		-392.96		-07 04.1		07 14 59.2
		+524		+2.59		-24.5	
11 MO	-21 57 30		-390.37		-07 28.6		07 18 55.8
		+550		+2.72		-24.0	
12 TU	-21 48 20		-387.65		-07 52.6		07 22 52.3
		+576		+2.84		-23.5	
13 WE	-21 38 44		-384.81		-08 16.1		07 26 48.9
		+601		+2.97		-22.8	
14 TH	-21 28 43		-381.84		-08 38.9		07 30 45.4
		+625		+3.08		-22.2	
15 FR	-21 18 18		-378.76		-09 01.1		07 34 42.0
		+651		+3.22		-21.6	
16 SA	-21 07 27		-375.54		-09 22.7		07 38 38.5
		+674		+3.33		-21.0	
17 SU	-20 56 13		-372.21		-09 43.7		07 42 35.1
		+699		+3.45		-20.2	
18 MO	-20 44 34		-368.76		-10 03.9		07 46 31.7
		+723		+3.57		-19.6	
19 TU	-20 32 31		-365.19		-10 23.5		07 50 28.2
		+745		+3.68		-18.8	
20 WE	-20 20 06		-361.51		-10 42.3		07 54 24.8
		+769		+3.80		-18.1	
21 TH	-20 07 17		-357.71		-11 00.4		07 58 21.4
		+792		+3.91		-17.4	
22 FR	-19 54 05		-353.80		-11 17.8		08 02 17.9
		+813		+4.01		-16.5	
23 SA	-19 40 32		-349.79		-11 34.3		08 06 14.5
		+836		+4.13		-15.8	
24 SU	-19 26 36		-345.66		-11 50.1		08 10 11.0
		+857		+4.23		-15.0	
25 MO	-19 12 19		-341.43		-12 05.1		08 14 07.6
		+878		+4.34		-14.1	
26 TU	-18 57 41		-337.09		-12 19.2		08 18 04.1
		+899		+4.44		-13.4	
27 WE	-18 42 42		-332.65		-12 32.6		08 22 00.7
		+919		+4.54		-12.5	
28 TH	-18 27 23		-328.11		-12 45.1		08 25 57.2
		+939		+4.63		-11.7	
29 FR	-18 11 44		-323.48		-12 56.8		08 29 53.8
		+959		+4.74		-10.9	
30 SA	-17 55 45		-318.74		-13 07.7		08 33 50.4
		+978		+4.83		-10.0	
31 SU	-17 39 27		-313.91		-13 17.7		08 37 46.9
		+978		+4.83		-10.0	

Table 2a. Sun, 1988, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
FEB 1 MO	-17 22 51	+1015	-308.99	+5.01	-13 26.9	-8.4	08 41 43.5
2 TU	-17 05 56	+1033	-303.98	+5.10	-13 35.3	-7.6	08 45 40.0
3 WE	-16 48 43	+1051	-298.88	+5.19	-13 42.9	-6.8	08 49 36.6
4 TH	-16 31 12	+1068	-293.69	+5.28	-13 49.7	-5.9	08 53 33.2
5 FR	-16 13 24	+1085	-288.41	+5.35	-13 55.6	-5.2	08 57 29.7
6 SA	-15 55 19	+1101	-283.06	+5.44	-14 00.8	-4.3	09 01 26.3
7 SU	-15 36 58	+1117	-277.62	+5.52	-14 05.1	-3.6	09 05 22.8
8 MO	-15 18 21	+1133	-272.10	+5.59	-14 08.7	-2.8	09 09 19.4
9 TU	-14 59 28	+1148	-266.51	+5.67	-14 11.5	-2.0	09 13 15.9
10 WE	-14 40 20	+1163	-260.84	+5.74	-14 13.5	-1.2	09 17 12.5
11 TH	-14 20 57	+1177	-255.10	+5.82	-14 14.7	-.5	09 21 09.0
12 FR	-14 01 20	+1192	-249.28	+5.88	-14 15.2	+.3	09 25 05.6
13 SA	-13 41 28	+1205	-243.40	+5.95	-14 14.9	+1.0	09 29 02.1
14 SU	-13 21 23	+1218	-237.45	+6.02	-14 13.9	+1.7	09 32 58.7
15 MO	-13 01 05	+1232	-231.43	+6.08	-14 12.2	+2.5	09 36 55.3
16 TU	-12 40 33	+1243	-225.35	+6.14	-14 09.7	+3.2	09 40 51.8
17 WE	-12 19 50	+1255	-219.21	+6.20	-14 06.5	+3.8	09 44 48.4
18 TH	-11 58 55	+1267	-213.01	+6.25	-14 02.7	+4.6	09 48 44.9
19 FR	-11 37 48	+1278	-206.76	+6.32	-13 58.1	+5.3	09 52 41.5
20 SA	-11 16 30	+1288	-200.44	+6.36	-13 52.8	+6.0	09 56 38.0
21 SU	-10 55 02	+1298	-194.08	+6.41	-13 46.8	+6.6	10 00 34.6
22 MO	-10 33 24	+1308	-187.67	+6.46	-13 40.2	+7.3	10 04 31.1
23 TU	-10 11 36	+1318	-181.21	+6.50	-13 32.9	+8.0	10 08 27.7
24 WE	-09 49 38	+1326	-174.71	+6.55	-13 24.9	+8.5	10 12 24.2
25 TH	-09 27 32	+1334	-168.16	+6.59	-13 16.4	+9.2	10 16 20.8
26 FR	-09 05 18	+1343	-161.57	+6.63	-13 07.2	+9.8	10 20 17.4
27 SA	-08 42 55	+1350	-154.94	+6.67	-12 57.4	+10.3	10 24 13.9
28 SU	-08 20 25	+1357	-148.27	+6.70	-12 47.1	+10.9	10 28 10.5
29 MO	-07 57 48	+1357	-141.57	+6.70	-12 36.2	+10.9	10 32 07.0

Table 2a. Sun, 1988, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
MAR 1 TU	-07 35 03		-134.83		-12 24.7		10 36 03.6
		+1370		+6.77		+11.9	
2 WE	-07 12 13		-128.06		-12 12.8		10 40 00.2
		+1377		+6.80		+12.5	
3 TH	-06 49 16		-121.26		-12 00.3		10 43 56.7
		+1383		+6.83		+12.9	
4 FR	-06 26 13		-114.43		-11 47.4		10 47 53.2
		+1388		+6.85		+13.4	
5 SA	-06 03 05		-107.58		-11 34.0		10 51 49.8
		+1392		+6.87		+13.8	
6 SU	-05 39 53		-100.71		-11 20.2		10 55 46.3
		+1398		+6.91		+14.2	
7 MO	-05 16 35		-93.80		-11 06.0		10 59 42.9
		+1402		+6.92		+14.6	
8 TU	-04 53 13		-86.88		-10 51.4		11 03 39.4
		+1406		+6.94		+14.9	
9 WE	-04 29 47		-79.94		-10 36.5		11 07 36.0
		+1409		+6.96		+15.3	
10 TH	-04 06 18		-72.98		-10 21.2		11 11 32.5
		+1413		+6.98		+15.6	
11 FR	-03 42 45		-66.00		-10 05.6		11 15 29.1
		+1415		+6.99		+15.9	
12 SA	-03 19 10		-59.01		-09 49.7		11 19 25.7
		+1418		+7.00		+16.2	
13 SU	-02 55 32		-52.01		-09 33.5		11 23 22.2
		+1420		+7.01		+16.5	
14 MO	-02 31 52		-45.00		-09 17.0		11 27 18.8
		+1421		+7.02		+16.7	
15 TU	-02 08 11		-37.98		-09 00.3		11 31 15.4
		+1423		+7.03		+16.9	
16 WE	-01 44 28		-30.95		-08 43.4		11 35 11.9
		+1424		+7.03		+17.1	
17 TH	-01 20 44		-23.92		-08 26.3		11 39 08.5
		+1424		+7.03		+17.3	
18 FR	-00 57 00		-16.89		-08 09.0		11 43 05.0
		+1425		+7.04		+17.4	
19 SA	-00 33 15		-9.85		-07 51.6		11 47 01.5
		+1423		+7.03		+17.6	
20 SU	-00 09 32		-2.82		-07 34.0		11 50 58.1
		+1424		+7.03		+17.8	
21 MO	00 14 12		+4.21		-07 16.2		11 54 54.6
		+1422		+7.02		+17.9	
22 TU	00 37 54		+11.23		-06 58.3		11 58 51.2
		+1421		+7.02		+18.0	
23 WE	01 01 35		+18.25		-06 40.3		12 02 47.8
		+1418		+7.00		+18.0	
24 TH	01 25 13		+25.25		-06 22.3		12 06 44.3
		+1417		+7.00		+18.2	
25 FR	01 48 50		+32.25		-06 04.1		12 10 40.9
		+1414		+6.98		+18.2	
26 SA	02 12 24		+39.23		-05 45.9		12 14 37.4
		+1411		+6.97		+18.2	
27 SU	02 35 55		+46.20		-05 27.7		12 18 34.0
		+1408		+6.95		+18.2	
28 MO	02 59 23		+53.15		-05 09.5		12 22 30.6
		+1404		+6.93		+18.2	
29 TU	03 22 47		+60.08		-04 51.3		12 26 27.1
		+1400		+6.92		+18.1	
30 WE	03 46 07		+67.00		-04 33.2		12 30 23.7
		+1396		+6.89		+18.1	
31 TH	04 09 23		+73.89		-04 15.1		12 34 20.2
		+1396		+6.89		+18.1	

Table 2a. Sun, 1988, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
APR 1 FR	04 32 34		+80.76		-03 57.1		12 38 16.7
		+1386		+6.84		+18.0	
2 SA	04 55 40		+87.60		-03 39.1		12 42 13.3
		+1381		+6.82		+17.7	
3 SU	05 18 41		+94.42		-03 21.4		12 46 09.8
		+1376		+6.80		+17.7	
4 MO	05 41 37		+101.22		-03 03.7		12 50 06.4
		+1369		+6.76		+17.5	
5 TU	06 04 26		+107.98		-02 46.2		12 54 02.9
		+1364		+6.74		+17.2	
6 WE	06 27 10		+114.72		-02 29.0		12 57 59.5
		+1356		+6.69		+17.1	
7 TH	06 49 46		+121.41		-02 11.9		13 01 56.1
		+1350		+6.67		+16.8	
8 FR	07 12 16		+128.08		-01 55.1		13 05 52.6
		+1343		+6.63		+16.6	
9 SA	07 34 39		+134.71		-01 38.5		13 09 49.2
		+1335		+6.59		+16.3	
10 SU	07 56 54		+141.30		-01 22.2		13 13 45.7
		+1328		+6.56		+16.0	
11 MO	08 19 02		+147.86		-01 06.2		13 17 42.3
		+1319		+6.52		+15.7	
12 TU	08 41 01		+154.38		-00 50.5		13 21 38.9
		+1310		+6.46		+15.4	
13 WE	09 02 51		+160.84		-00 35.1		13 25 35.4
		+1302		+6.43		+15.1	
14 TH	09 24 33		+167.27		-00 20.0		13 29 32.0
		+1292		+6.38		+14.7	
15 FR	09 46 05		+173.65		-00 05.3		13 33 28.5
		+1283		+6.34		+14.3	
16 SA	10 07 28		+179.99		00 09.0		13 37 25.1
		+1272		+6.28		+14.0	
17 SU	10 28 40		+186.27		00 23.0		13 41 21.6
		+1262		+6.23		+13.6	
18 MO	10 49 42		+192.50		00 36.6		13 45 18.2
		+1252		+6.19		+13.2	
19 TU	11 10 34		+198.69		00 49.8		13 49 14.7
		+1240		+6.12		+12.8	
20 WE	11 31 14		+204.81		01 02.6		13 53 11.3
		+1229		+6.07		+12.4	
21 TH	11 51 43		+210.88		01 15.0		13 57 07.8
		+1217		+6.01		+11.9	
22 FR	12 12 00		+216.89		01 26.9		14 01 04.4
		+1205		+5.95		+11.6	
23 SA	12 32 05		+222.84		01 38.5		14 05 01.0
		+1192		+5.89		+11.0	
24 SU	12 51 57		+228.73		01 49.5		14 08 57.5
		+1179		+5.82		+10.7	
25 MO	13 11 36		+234.55		02 00.2		14 12 54.1
		+1167		+5.76		+10.1	
26 TU	13 31 03		+240.31		02 10.3		14 16 50.6
		+1153		+5.69		+9.7	
27 WE	13 50 16		+246.00		02 20.0		14 20 47.2
		+1139		+5.63		+9.2	
28 TH	14 09 15		+251.63		02 29.2		14 24 43.7
		+1125		+5.56		+8.7	
29 FR	14 28 00		+257.19		02 37.9		14 28 40.3
		+1111		+5.48		+8.2	
30 SA	14 46 31		+262.67		02 46.1		14 32 36.8
		+1111		+5.48		+8.2	

Table 2a. Sun, 1988, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
MAY 1 SU	15 04 47		+268.08		02 53.8		14 36 33.4
		+1081		+5.34		+7.1	
2 MO	15 22 48		+273.42		03 00.9		14 40 29.9
		+1066		+5.27		+6.6	
3 TU	15 40 34		+278.69		03 07.5		14 44 26.5
		+1050		+5.18		+6.0	
4 WE	15 58 04		+283.87		03 13.5		14 48 23.0
		+1035		+5.11		+5.5	
5 TH	16 15 19		+288.98		03 19.0		14 52 19.6
		+1019		+5.03		+4.9	
6 FR	16 32 18		+294.01		03 23.9		14 56 16.2
		+1002		+4.95		+4.3	
7 SA	16 49 00		+298.96		03 28.2		15 00 12.7
		+985		+4.87		+3.8	
8 SU	17 05 25		+303.83		03 32.0		15 04 09.3
		+969		+4.78		+3.1	
9 MO	17 21 34		+308.61		03 35.1		15 08 05.9
		+951		+4.70		+2.6	
10 TU	17 37 25		+313.31		03 37.7		15 12 02.4
		+933		+4.61		+1.9	
11 WE	17 52 58		+317.92		03 39.6		15 15 59.0
		+916		+4.52		+1.4	
12 TH	18 08 14		+322.44		03 41.0		15 19 55.5
		+897		+4.43		+.8	
13 FR	18 23 11		+326.87		03 41.8		15 23 52.1
		+879		+4.34		+.2	
14 SA	18 37 50		+331.21		03 42.0		15 27 48.6
		+860		+4.25		-.4	
15 SU	18 52 10		+335.46		03 41.6		15 31 45.2
		+841		+4.15		-.9	
16 MO	19 06 11		+339.61		03 40.7		15 35 41.7
		+821		+4.05		-1.6	
17 TU	19 19 52		+343.66		03 39.1		15 39 38.3
		+802		+3.96		-2.0	
18 WE	19 33 14		+347.62		03 37.1		15 43 34.9
		+781		+3.86		-2.7	
19 TH	19 46 15		+351.48		03 34.4		15 47 31.4
		+761		+3.76		-3.1	
20 FR	19 58 56		+355.24		03 31.3		15 51 28.0
		+741		+3.66		-3.7	
21 SA	20 11 17		+358.90		03 27.6		15 55 24.5
		+720		+3.55		-4.2	
22 SU	20 23 17		+362.45		03 23.4		15 59 21.1
		+699		+3.46		-4.7	
23 MO	20 34 56		+365.91		03 18.7		16 03 17.7
		+678		+3.34		-5.2	
24 TU	20 46 14		+369.25		03 13.5		16 07 14.2
		+656		+3.24		-5.7	
25 WE	20 57 10		+372.49		03 07.8		16 11 10.8
		+635		+3.14		-6.2	
26 TH	21 07 45		+375.63		03 01.6		16 15 07.3
		+612		+3.02		-6.6	
27 FR	21 17 57		+378.65		02 55.0		16 19 03.9
		+591		+2.92		-7.1	
28 SA	21 27 48		+381.57		02 47.9		16 23 00.4
		+568		+2.81		-7.5	
29 SU	21 37 16		+384.38		02 40.4		16 26 57.0
		+546		+2.69		-8.0	
30 MO	21 46 22		+387.07		02 32.4		16 30 53.5
		+523		+2.58		-8.4	
31 TU	21 55 05		+389.65		02 24.0		16 34 50.1
		+523		+2.58		-8.4	

Table 2a. Sun, 1988, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
JUN 1 WE	22 03 25		+392.12		02 15.2		16 38 46.6
		+477		+2.36		-9.2	
2 TH	22 11 22		+394.48		02 06.0		16 42 43.2
		+454		+2.24		-9.6	
3 FR	22 18 56		+396.72		01 56.4		16 46 39.8
		+431		+2.13		-9.9	
4 SA	22 26 07		+398.85		01 46.5		16 50 36.3
		+407		+2.01		-10.4	
5 SU	22 32 54		+400.86		01 36.1		16 54 32.9
		+384		+1.90		-10.6	
6 MO	22 39 18		+402.76		01 25.5		16 58 29.5
		+360		+1.77		-11.0	
7 TU	22 45 18		+404.53		01 14.5		17 02 26.0
		+335		+1.66		-11.4	
8 WE	22 50 53		+406.19		01 03.1		17 06 22.6
		+312		+1.54		-11.5	
9 TH	22 56 05		+407.73		00 51.6		17 10 19.1
		+288		+1.42		-11.9	
10 FR	23 00 53		+409.15		00 39.7		17 14 15.7
		+263		+1.30		-12.1	
11 SA	23 05 16		+410.45		00 27.6		17 18 12.2
		+239		+1.18		-12.4	
12 SU	23 09 15		+411.63		00 15.2		17 22 08.8
		+214		+1.06		-12.5	
13 MO	23 12 49		+412.69		00 02.7		17 26 05.4
		+190		+.93		-12.7	
14 TU	23 15 59		+413.62		-00 10.0		17 30 01.9
		+165		+.82		-12.8	
15 WE	23 18 44		+414.44		-00 22.8		17 33 58.5
		+141		+.70		-12.9	
16 TH	23 21 05		+415.14		-00 35.7		17 37 55.0
		+115		+.56		-13.1	
17 FR	23 23 00		+415.70		-00 48.8		17 41 51.6
		+91		+.45		-13.0	
18 SA	23 24 31		+416.15		-01 01.8		17 45 48.2
		+66		+.33		-13.2	
19 SU	23 25 37		+416.48		-01 15.0		17 49 44.7
		+41		+.20		-13.1	
20 MO	23 26 18		+416.68		-01 28.1		17 53 41.3
		+17		+.09		-13.1	
21 TU	23 26 35		+416.77		-01 41.2		17 57 37.8
		-9		-.05		-13.0	
22 WE	23 26 26		+416.72		-01 54.2		18 01 34.4
		-33		-.16		-13.0	
23 TH	23 25 53		+416.56		-02 07.2		18 05 30.9
		-58		-.29		-12.9	
24 FR	23 24 55		+416.27		-02 20.1		18 09 27.5
		-83		-.41		-12.7	
25 SA	23 23 32		+415.86		-02 32.8		18 13 24.0
		-107		-.53		-12.7	
26 SU	23 21 45		+415.33		-02 45.5		18 17 20.6
		-132		-.65		-12.4	
27 MO	23 19 33		+414.68		-02 57.9		18 21 17.2
		-157		-.77		-12.3	
28 TU	23 16 56		+413.91		-03 10.2		18 25 13.7
		-181		-.90		-12.1	
29 WE	23 13 55		+413.01		-03 22.3		18 29 10.3
		-205		-1.01		-11.9	
30 TH	23 10 30		+412.00		-03 34.2		18 33 06.9
		-205		-1.01		-11.9	

Table 2a. Sun, 1988, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
JUL 1 FR	23 06 40		+410.86		-03 45.8		18 37 03.4
		-253		-1.25		-11.4	
2 SA	23 02 27		+409.61		-03 57.2		18 41 00.0
		-278		-1.37		-11.1	
3 SU	22 57 49		+408.24		-04 08.3		18 44 56.6
		-302		-1.49		-10.9	
4 MO	22 52 47		+406.75		-04 19.2		18 48 53.1
		-326		-1.61		-10.5	
5 TU	22 47 21		+405.14		-04 29.7		18 52 49.7
		-350		-1.73		-10.2	
6 WE	22 41 31		+403.41		-04 39.9		18 56 46.2
		-373		-1.84		-9.9	
7 TH	22 35 18		+401.57		-04 49.8		19 00 42.8
		-397		-1.96		-9.5	
8 FR	22 28 41		+399.61		-04 59.3		19 04 39.3
		-420		-2.07		-9.2	
9 SA	22 21 41		+397.54		-05 08.5		19 08 35.9
		-444		-2.20		-8.7	
10 SU	22 14 17		+395.34		-05 17.2		19 12 32.4
		-466		-2.30		-8.4	
11 MO	22 06 31		+393.04		-05 25.6		19 16 29.0
		-489		-2.41		-7.9	
12 TU	21 58 22		+390.63		-05 33.5		19 20 25.6
		-512		-2.53		-7.4	
13 WE	21 49 50		+388.10		-05 40.9		19 24 22.1
		-535		-2.64		-7.0	
14 TH	21 40 55		+385.46		-05 47.9		19 28 18.7
		-556		-2.75		-6.5	
15 FR	21 31 39		+382.71		-05 54.4		19 32 15.3
		-579		-2.86		-6.0	
16 SA	21 22 00		+379.85		-06 00.4		19 36 11.8
		-600		-2.96		-5.5	
17 SU	21 12 00		+376.89		-06 05.9		19 40 08.4
		-622		-3.07		-4.9	
18 MO	21 01 38		+373.82		-06 10.8		19 44 04.9
		-644		-3.18		-4.3	
19 TU	20 50 54		+370.64		-06 15.1		19 48 01.5
		-664		-3.28		-3.8	
20 WE	20 39 50		+367.36		-06 18.9		19 51 58.0
		-685		-3.38		-3.3	
21 TH	20 28 25		+363.98		-06 22.2		19 55 54.6
		-706		-3.49		-2.6	
22 FR	20 16 39		+360.49		-06 24.8		19 59 51.1
		-726		-3.59		-2.1	
23 SA	20 04 33		+356.90		-06 26.9		20 03 47.7
		-746		-3.68		-1.4	
24 SU	19 52 07		+353.22		-06 28.3		20 07 44.2
		-766		-3.78		-.9	
25 MO	19 39 21		+349.44		-06 29.2		20 11 40.8
		-785		-3.88		-.2	
26 TU	19 26 16		+345.56		-06 29.4		20 15 37.4
		-804		-3.97		+.3	
27 WE	19 12 52		+341.59		-06 29.1		20 19 33.9
		-824		-4.07		+1.0	
28 TH	18 59 08		+337.52		-06 28.1		20 23 30.5
		-842		-4.16		+1.6	
29 FR	18 45 06		+333.36		-06 26.5		20 27 27.1
		-860		-4.24		+2.2	
30 SA	18 30 46		+329.12		-06 24.3		20 31 23.6
		-879		-4.34		+2.8	
31 SU	18 16 07		+324.78		-06 21.5		20 35 20.2
		-879		-4.34		+2.8	

Table 2a. Sun, 1988, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES	MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
AUG 1 MO	18 01 10	-914	+320.35	-4.52	-06 18.1	+4.0	20 39 16.7
2 TU	17 45 56	-932	+315.83	-4.60	-06 14.1	+4.5	20 43 13.3
3 WE	17 30 24	-949	+311.23	-4.69	-06 09.6	+5.2	20 47 09.8
4 TH	17 14 35	-966	+306.54	-4.77	-06 04.4	+5.7	20 51 06.4
5 FR	16 58 29	-982	+301.77	-4.85	-05 58.7	+6.3	20 55 02.9
6 SA	16 42 07	-999	+296.92	-4.93	-05 52.4	+6.9	20 58 59.5
7 SU	16 25 28	-1015	+291.99	-5.01	-05 45.5	+7.5	21 02 56.0
8 MO	16 08 33	-1030	+286.98	-5.09	-05 38.0	+8.1	21 06 52.6
9 TU	15 51 23	-1045	+281.89	-5.16	-05 29.9	+8.6	21 10 49.2
10 WE	15 33 58	-1061	+276.73	-5.24	-05 21.3	+9.1	21 14 45.7
11 TH	15 16 17	-1075	+271.49	-5.31	-05 12.2	+9.8	21 18 42.3
12 FR	14 58 22	-1090	+266.18	-5.38	-05 02.4	+10.3	21 22 38.8
13 SA	14 40 12	-1104	+260.80	-5.45	-04 52.1	+10.8	21 26 35.4
14 SU	14 21 48	-1117	+255.35	-5.52	-04 41.3	+11.4	21 30 32.0
15 MO	14 03 11	-1131	+249.83	-5.58	-04 29.9	+12.0	21 34 28.5
16 TU	13 44 20	-1144	+244.25	-5.65	-04 17.9	+12.4	21 38 25.0
17 WE	13 25 16	-1156	+238.60	-5.71	-04 05.5	+13.0	21 42 21.6
18 TH	13 06 00	-1169	+232.89	-5.77	-03 52.5	+13.5	21 46 18.1
19 FR	12 46 31	-1181	+227.12	-5.84	-03 39.0	+14.0	21 50 14.7
20 SA	12 26 50	-1193	+221.28	-5.89	-03 25.0	+14.6	21 54 11.3
21 SU	12 06 57	-1204	+215.39	-5.94	-03 10.4	+14.9	21 58 07.8
22 MO	11 46 53	-1215	+209.45	-6.00	-02 55.5	+15.5	22 02 04.4
23 TU	11 26 38	-1226	+203.45	-6.06	-02 40.0	+15.9	22 06 00.9
24 WE	11 06 12	-1236	+197.39	-6.10	-02 24.1	+16.3	22 09 57.5
25 TH	10 45 36	-1246	+191.29	-6.15	-02 07.8	+16.8	22 13 54.1
26 FR	10 24 50	-1256	+185.14	-6.21	-01 51.0	+17.2	22 17 50.6
27 SA	10 03 54	-1266	+178.93	-6.25	-01 33.8	+17.5	22 21 47.2
28 SU	09 42 48	-1275	+172.68	-6.29	-01 16.3	+17.9	22 25 43.7
29 MO	09 21 33	-1284	+166.39	-6.35	-00 58.4	+18.2	22 29 40.3
30 TU	09 00 09	-1292	+160.04	-6.38	-00 40.2	+18.6	22 33 36.8
31 WE	08 38 37	-1292	+153.66	-6.38	-00 21.6	+18.6	22 37 33.4

Table 2a. Sun, 1988, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
SEP 1 TH	08 16 56		+147.24		-00 02.7		22 41 29.9
		-1310		-6.47		+19.1	
2 FR	07 55 06		+140.77		00 16.4		22 45 26.5
		-1317		-6.50		+19.4	
3 SA	07 33 09		+134.27		00 35.8		22 49 23.0
		-1324		-6.54		+19.7	
4 SU	07 11 05		+127.73		00 55.5		22 53 19.6
		-1332		-6.58		+19.9	
5 MO	06 48 53		+121.15		01 15.4		22 57 16.2
		-1338		-6.61		+20.1	
6 TU	06 26 35		+114.54		01 35.5		23 01 12.7
		-1345		-6.64		+20.2	
7 WE	06 04 10		+107.90		01 55.7		23 05 09.3
		-1351		-6.67		+20.5	
8 TH	05 41 39		+101.23		02 16.2		23 09 05.8
		-1357		-6.70		+20.6	
9 FR	05 19 02		+94.53		02 36.8		23 13 02.4
		-1362		-6.73		+20.8	
10 SA	04 56 20		+87.80		02 57.6		23 16 58.9
		-1368		-6.75		+20.9	
11 SU	04 33 32		+81.05		03 18.5		23 20 55.5
		-1372		-6.78		+21.1	
12 MO	04 10 40		+74.27		03 39.6		23 24 52.0
		-1376		-6.79		+21.1	
13 TU	03 47 44		+67.48		04 00.7		23 28 48.6
		-1380		-6.82		+21.2	
14 WE	03 24 44		+60.66		04 21.9		23 32 45.1
		-1385		-6.84		+21.3	
15 TH	03 01 39		+53.82		04 43.2		23 36 41.7
		-1387		-6.85		+21.3	
16 FR	02 38 32		+46.97		05 04.5		23 40 38.2
		-1390		-6.86		+21.4	
17 SA	02 15 22		+40.11		05 25.9		23 44 34.8
		-1394		-6.89		+21.3	
18 SU	01 52 08		+33.22		05 47.2		23 48 31.3
		-1395		-6.88		+21.4	
19 MO	01 28 53		+26.34		06 08.6		23 52 27.9
		-1397		-6.90		+21.3	
20 TU	01 05 36		+19.44		06 29.9		23 56 24.5
		-1399		-6.91		+21.3	
21 WE	00 42 17		+12.53		06 51.2		00 00 21.0
		-1400		-6.92		+21.2	
22 TH	00 18 57		+5.61		07 12.4		00 04 17.6
		-1401		-6.91		+21.2	
23 FR	-00 04 24		-1.30		07 33.6		00 08 14.1
		-1402		-6.93		+21.0	
24 SA	-00 27 46		-8.23		07 54.6		00 12 10.7
		-1402		-6.92		+20.9	
25 SU	-00 51 08		-15.15		08 15.5		00 16 07.2
		-1402		-6.92		+20.7	
26 MO	-01 14 30		-22.07		08 36.2		00 20 03.8
		-1401		-6.92		+20.5	
27 TU	-01 37 51		-28.99		08 56.7		00 24 00.3
		-1402		-6.93		+20.3	
28 WE	-02 01 13		-35.92		09 17.0		00 27 56.9
		-1400		-6.91		+20.1	
29 TH	-02 24 33		-42.83		09 37.1		00 31 53.4
		-1399		-6.91		+19.9	
30 FR	-02 47 52		-49.74		09 57.0		00 35 50.0
		-1399		-6.91		+19.9	

Table 2a. Sun, 1988, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
OCT 1 SA	-03 11 09		-56.64		10 16.5		00 39 46.5
		-1396		-6.89		+19.2	
2 SU	-03 34 25		-63.53		10 35.7		00 43 43.1
		-1393		-6.88		+19.0	
3 MO	-03 57 38		-70.41		10 54.7		00 47 39.7
		-1391		-6.87		+18.5	
4 TU	-04 20 49		-77.28		11 13.2		00 51 36.2
		-1387		-6.85		+18.2	
5 WE	-04 43 56		-84.13		11 31.4		00 55 32.8
		-1384		-6.83		+17.9	
6 TH	-05 07 00		-90.96		11 49.3		00 59 29.3
		-1381		-6.82		+17.4	
7 FR	-05 30 01		-97.78		12 06.7		01 03 25.9
		-1376		-6.80		+17.0	
8 SA	-05 52 57		-104.58		12 23.7		01 07 22.4
		-1372		-6.77		+16.5	
9 SU	-06 15 49		-111.35		12 40.2		01 11 19.0
		-1367		-6.75		+16.2	
10 MO	-06 38 36		-118.10		12 56.4		01 15 15.5
		-1361		-6.72		+15.6	
11 TU	-07 01 17		-124.82		13 12.0		01 19 12.1
		-1356		-6.70		+15.2	
12 WE	-07 23 53		-131.52		13 27.2		01 23 08.6
		-1350		-6.67		+14.6	
13 TH	-07 46 23		-138.19		13 41.8		01 27 05.2
		-1343		-6.63		+14.1	
14 FR	-08 08 46		-144.82		13 55.9		01 31 01.7
		-1336		-6.60		+13.6	
15 SA	-08 31 02		-151.42		14 09.5		01 34 58.3
		-1329		-6.56		+13.1	
16 SU	-08 53 11		-157.98		14 22.6		01 38 54.8
		-1321		-6.52		+12.5	
17 MO	-09 15 12		-164.50		14 35.1		01 42 51.4
		-1314		-6.49		+11.9	
18 TU	-09 37 06		-170.99		14 47.0		01 46 48.0
		-1305		-6.45		+11.3	
19 WE	-09 58 51		-177.44		14 58.3		01 50 44.5
		-1295		-6.39		+10.7	
20 TH	-10 20 26		-183.83		15 09.0		01 54 41.1
		-1287		-6.36		+10.1	
21 FR	-10 41 53		-190.19		15 19.1		01 58 37.6
		-1277		-6.30		+9.5	
22 SA	-11 03 10		-196.49		15 28.6		02 02 34.2
		-1267		-6.26		+8.8	
23 SU	-11 24 17		-202.75		15 37.4		02 06 30.7
		-1257		-6.21		+8.1	
24 MO	-11 45 14		-208.96		15 45.5		02 10 27.3
		-1245		-6.15		+7.4	
25 TU	-12 05 59		-215.11		15 52.9		02 14 23.8
		-1235		-6.09		+6.7	
26 WE	-12 26 34		-221.20		15 59.6		02 18 20.4
		-1224		-6.05		+6.0	
27 TH	-12 46 58		-227.25		16 05.6		02 22 16.9
		-1211		-5.98		+5.2	
28 FR	-13 07 09		-233.23		16 10.8		02 26 13.5
		-1200		-5.93		+4.4	
29 SA	-13 27 09		-239.16		16 15.2		02 30 10.1
		-1186		-5.85		+3.7	
30 SU	-13 46 55		-245.01		16 18.9		02 34 06.6
		-1174		-5.80		+2.9	
31 MO	-14 06 29		-250.81		16 21.8		02 38 03.2
		-1174		-5.80		+2.9	

Table 2a. Sun, 1988, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
NOV 1 TU	-14 25 50		-256.54		16 23.8		02 41 59.7
		-1146		-5.66		+1.3	
2 WE	-14 44 56		-262.20		16 25.1		02 45 56.3
		-1132		-5.59		+.4	
3 TH	-15 03 48		-267.79		16 25.5		02 49 52.9
		-1118		-5.52		-.4	
4 FR	-15 22 26		-273.31		16 25.1		02 53 49.4
		-1103		-5.45		-1.3	
5 SA	-15 40 49		-278.76		16 23.8		02 57 46.0
		-1087		-5.37		-2.0	
6 SU	-15 58 56		-284.13		16 21.8		03 01 42.5
		-1071		-5.29		-3.0	
7 MO	-16 16 47		-289.42		16 18.8		03 05 39.1
		-1054		-5.20		-3.8	
8 TU	-16 34 21		-294.62		16 15.0		03 09 35.6
		-1038		-5.13		-4.6	
9 WE	-16 51 39		-299.75		16 10.4		03 13 32.2
		-1021		-5.04		-5.5	
10 TH	-17 08 40		-304.79		16 04.9		03 17 28.7
		-1003		-4.95		-6.3	
11 FR	-17 25 23		-309.74		15 58.6		03 21 25.3
		-986		-4.87		-7.2	
12 SA	-17 41 49		-314.61		15 51.4		03 25 21.8
		-966		-4.77		-8.0	
13 SU	-17 57 55		-319.38		15 43.4		03 29 18.4
		-948		-4.68		-8.9	
14 MO	-18 13 43		-324.06		15 34.5		03 33 15.0
		-929		-4.59		-9.7	
15 TU	-18 29 12		-328.65		15 24.8		03 37 11.5
		-909		-4.49		-10.5	
16 WE	-18 44 21		-333.14		15 14.3		03 41 08.1
		-889		-4.39		-11.3	
17 TH	-18 59 10		-337.53		15 03.0		03 45 04.6
		-868		-4.29		-12.2	
18 FR	-19 13 38		-341.82		14 50.8		03 49 01.2
		-848		-4.18		-12.9	
19 SA	-19 27 46		-346.00		14 37.9		03 52 57.8
		-827		-4.09		-13.8	
20 SU	-19 41 33		-350.09		14 24.1		03 56 54.3
		-805		-3.97		-14.6	
21 MO	-19 54 58		-354.06		14 09.5		04 00 50.9
		-784		-3.88		-15.3	
22 TU	-20 08 02		-357.94		13 54.2		04 04 47.4
		-761		-3.75		-16.1	
23 WE	-20 20 43		-361.69		13 38.1		04 08 44.0
		-739		-3.65		-16.9	
24 TH	-20 33 02		-365.34		13 21.2		04 12 40.5
		-716		-3.54		-17.7	
25 FR	-20 44 58		-368.88		13 03.5		04 16 37.1
		-693		-3.42		-18.4	
26 SA	-20 56 31		-372.30		12 45.1		04 20 33.7
		-669		-3.30		-19.2	
27 SU	-21 07 40		-375.60		12 25.9		04 24 30.2
		-646		-3.20		-19.9	
28 MO	-21 18 26		-378.80		12 06.0		04 28 26.8
		-622		-3.07		-20.7	
29 TU	-21 28 48		-381.87		11 45.3		04 32 23.3
		-597		-2.94		-21.3	
30 WE	-21 38 45		-384.81		11 24.0		04 36 19.9
		-597		-2.94		-21.3	

Table 2a. Sun, 1988, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
DEC 1 TH	-21 48 17	-548	-387.64	-2.71	11 02.0	-22.7	04 40 16.5
2 FR	-21 57 25	-522	-390.35	-2.57	10 39.3	-23.4	04 44 13.0
3 SA	-22 06 07	-497	-392.92	-2.46	10 15.9	-23.9	04 48 09.6
4 SU	-22 14 24	-471	-395.38	-2.32	09 52.0	-24.6	04 52 06.1
5 MO	-22 22 15	-445	-397.70	-2.20	09 27.4	-25.1	04 56 02.7
6 TU	-22 29 40	-418	-399.90	-2.07	09 02.3	-25.7	04 59 59.2
7 WE	-22 36 38	-392	-401.97	-1.93	08 36.6	-26.1	05 03 55.8
8 TH	-22 43 10	-365	-403.90	-1.80	08 10.5	-26.7	05 07 52.3
9 FR	-22 49 15	-338	-405.70	-1.67	07 43.8	-27.1	05 11 48.9
10 SA	-22 54 53	-311	-407.37	-1.54	07 16.7	-27.5	05 15 45.5
11 SU	-23 00 04	-283	-408.91	-1.40	06 49.2	-27.8	05 19 42.0
12 MO	-23 04 47	-257	-410.31	-1.27	06 21.4	-28.3	05 23 38.6
13 TU	-23 09 04	-228	-411.58	-1.12	05 53.1	-28.5	05 27 35.2
14 WE	-23 12 52	-201	-412.70	-.99	05 24.6	-28.8	05 31 31.7
15 TH	-23 16 13	-172	-413.69	-.85	04 55.8	-29.0	05 35 28.3
16 FR	-23 19 05	-145	-414.54	-.72	04 26.8	-29.3	05 39 24.8
17 SA	-23 21 30	-117	-415.26	-.58	03 57.5	-29.4	05 43 21.4
18 SU	-23 23 27	-88	-415.84	-.43	03 28.1	-29.5	05 47 17.9
19 MO	-23 24 55	-61	-416.27	-.30	02 58.6	-29.7	05 51 14.5
20 TU	-23 25 56	-32	-416.57	-.16	02 28.9	-29.7	05 55 11.1
21 WE	-23 26 28	-4	-416.73	-.02	01 59.2	-29.7	05 59 07.6
22 TH	-23 26 32	+24	-416.75	+.12	01 29.5	-29.8	06 03 04.2
23 FR	-23 26 08	+53	-416.63	+.26	00 59.7	-29.8	06 07 00.7
24 SA	-23 25 15	+80	-416.37	+.39	00 29.9	-29.7	06 10 57.3
25 SU	-23 23 55	+109	-415.98	+.54	00 00.2	-29.7	06 14 53.9
26 MO	-23 22 06	+137	-415.44	+.68	-00 29.5	-29.5	06 18 50.4
27 TU	-23 19 49	+165	-414.76	+.81	-00 59.0	-29.4	06 22 47.0
28 WE	-23 17 04	+193	-413.95	+.96	-01 28.4	-29.3	06 26 43.6
29 TH	-23 13 51	+220	-412.99	+1.08	-01 57.7	-29.1	06 30 40.1
30 FR	-23 10 11	+249	-411.91	+1.23	-02 26.8	-28.8	06 34 36.7
31 SA	-23 06 02	+277	-410.68	+1.37	-02 55.6	-28.5	06 38 33.2
32 SU	-23 01 25		-409.31		-03 24.1		06 42 29.8

Table 2b. Sun, 1989, for Zero Hours Universal Time (GMT)

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
JAN 0 SA	-23 06 02		-410.68		-02 55.6		06 38 33.2
		+277		+1.37		-28.5	
JAN 1 SU	-23 01 25		-409.31		-03 24.1		06 42 29.8
		+304		+1.50		-28.3	
2 MO	-22 56 21		-407.81		-03 52.4		06 46 26.3
		+332		+1.64		-28.0	
3 TU	-22 50 49		-406.17		-04 20.4		06 50 22.9
		+359		+1.77		-27.5	
4 WE	-22 44 50		-404.40		-04 47.9		06 54 19.4
		+386		+1.91		-27.3	
5 TH	-22 38 24		-402.49		-05 15.2		06 58 16.0
		+413		+2.04		-26.7	
6 FR	-22 31 31		-400.45		-05 41.9		07 02 12.6
		+439		+2.17		-26.4	
7 SA	-22 24 12		-398.28		-06 08.3		07 06 09.1
		+467		+2.30		-25.8	
8 SU	-22 16 25		-395.98		-06 34.1		07 10 05.7
		+492		+2.43		-25.4	
9 MO	-22 08 13		-393.55		-06 59.5		07 14 02.3
		+519		+2.57		-24.8	
10 TU	-21 59 34		-390.98		-07 24.3		07 17 58.8
		+544		+2.68		-24.2	
11 WE	-21 50 30		-388.30		-07 48.5		07 21 55.4
		+570		+2.82		-23.6	
12 TH	-21 41 00		-385.48		-08 12.1		07 25 51.9
		+595		+2.94		-23.0	
13 FR	-21 31 05		-382.54		-08 35.1		07 29 48.5
		+620		+3.06		-22.3	
14 SA	-21 20 45		-379.48		-08 57.4		07 33 45.0
		+645		+3.18		-21.7	
15 SU	-21 10 00		-376.30		-09 19.1		07 37 41.6
		+668		+3.30		-21.0	
16 MO	-20 58 52		-373.00		-09 40.1		07 41 38.1
		+693		+3.42		-20.3	
17 TU	-20 47 19		-369.58		-10 00.4		07 45 34.7
		+717		+3.55		-19.5	
18 WE	-20 35 22		-366.03		-10 19.9		07 49 31.3
		+739		+3.64		-18.9	
19 TH	-20 23 03		-362.39		-10 38.8		07 53 27.8
		+763		+3.77		-18.0	
20 FR	-20 10 20		-358.62		-10 56.8		07 57 24.4
		+785		+3.88		-17.4	
21 SA	-19 57 15		-354.74		-11 14.2		08 01 21.0
		+808		+3.99		-16.5	
22 SU	-19 43 47		-350.75		-11 30.7		08 05 17.5
		+829		+4.09		-15.8	
23 MO	-19 29 58		-346.66		-11 46.5		08 09 14.1
		+852		+4.21		-15.1	
24 TU	-19 15 46		-342.45		-12 01.6		08 13 10.6
		+872		+4.31		-14.2	
25 WE	-19 01 14		-338.14		-12 15.8		08 17 07.2
		+893		+4.41		-13.5	
26 TH	-18 46 21		-333.73		-12 29.3		08 21 03.7
		+914		+4.51		-12.7	
27 FR	-18 31 07		-329.22		-12 42.0		08 25 00.3
		+934		+4.61		-11.9	
28 SA	-18 15 33		-324.61		-12 53.9		08 28 56.8
		+954		+4.71		-11.0	
29 SU	-17 59 39		-319.90		-13 04.9		08 32 53.4
		+974		+4.81		-10.3	
30 MO	-17 43 25		-315.09		-13 15.2		08 36 49.9
		+992		+4.90		-9.5	
31 TU	-17 26 53		-310.19		-13 24.7		08 40 46.5
		+992		+4.90		-9.5	

Table 2b. Sun, 1989, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES	MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
FEB 1 WE	-17 10 02		-305.20		-13 33.4		08 44 43.1
		+1030		+5.09		-7.9	
2 TH	-16 52 52		-300.11		-13 41.3		08 48 39.6
		+1047		+5.17		-7.1	
3 FR	-16 35 25		-294.94		-13 48.4		08 52 36.2
		+1064		+5.26		-6.3	
4 SA	-16 17 41		-289.68		-13 54.7		08 56 32.8
		+1082		+5.34		-5.5	
5 SU	-15 59 39		-284.34		-14 00.2		09 00 29.3
		+1098		+5.42		-4.7	
6 MO	-15 41 21		-278.92		-14 04.9		09 04 25.9
		+1114		+5.50		-3.8	
7 TU	-15 22 47		-273.42		-14 08.7		09 08 22.4
		+1130		+5.58		-3.1	
8 WE	-15 03 57		-267.84		-14 11.8		09 12 19.0
		+1146		+5.66		-2.3	
9 TH	-14 44 51		-262.18		-14 14.1		09 16 15.5
		+1160		+5.73		-1.5	
10 FR	-14 25 31		-256.45		-14 15.6		09 20 12.1
		+1174		+5.80		-.6	
11 SA	-14 05 57		-250.65		-14 16.2		09 24 08.6
		+1188		+5.86		+.1	
12 SU	-13 46 09		-244.79		-14 16.1		09 28 05.2
		+1202		+5.94		+.9	
13 MO	-13 26 07		-238.85		-14 15.2		09 32 01.7
		+1215		+6.00		+1.6	
14 TU	-13 05 52		-232.85		-14 13.6		09 35 58.3
		+1227		+6.06		+2.4	
15 WE	-12 45 25		-226.79		-14 11.2		09 39 54.9
		+1240		+6.12		+3.2	
16 TH	-12 24 45		-220.67		-14 08.0		09 43 51.4
		+1251		+6.18		+3.9	
17 FR	-12 03 54		-214.49		-14 04.1		09 47 48.0
		+1263		+6.24		+4.6	
18 SA	-11 42 51		-208.25		-13 59.5		09 51 44.5
		+1274		+6.29		+5.3	
19 SU	-11 21 37		-201.96		-13 54.2		09 55 41.1
		+1284		+6.34		+5.9	
20 MO	-11 00 13		-195.62		-13 48.3		09 59 37.7
		+1295		+6.40		+6.7	
21 TU	-10 38 38		-189.22		-13 41.6		10 03 34.2
		+1305		+6.44		+7.3	
22 WE	-10 16 53		-182.78		-13 34.3		10 07 30.8
		+1314		+6.49		+7.9	
23 TH	-09 54 59		-176.29		-13 26.4		10 11 27.3
		+1323		+6.53		+8.5	
24 FR	-09 32 56		-169.76		-13 17.9		10 15 23.8
		+1332		+6.58		+9.1	
25 SA	-09 10 44		-163.18		-13 08.8		10 19 20.4
		+1340		+6.62		+9.7	
26 SU	-08 48 24		-156.56		-12 59.1		10 23 16.9
		+1348		+6.65		+10.2	
27 MO	-08 25 56		-149.91		-12 48.9		10 27 13.5
		+1356		+6.70		+10.7	
28 TU	-08 03 20		-143.21		-12 38.2		10 31 10.1
		+1356		+6.70		+10.7	

Table 2b. Sun, 1989, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
MAR 1 WE	-07 40 37		-136.48		-12 26.9		10 35 06.6
		+1370		+6.77		+11.8	
2 TH	-07 17 47		-129.71		-12 15.1		10 39 03.2
		+1376		+6.79		+12.2	
3 FR	-06 54 51		-122.92		-12 02.9		10 42 59.7
		+1382		+6.83		+12.7	
4 SA	-06 31 49		-116.09		-11 50.2		10 46 56.3
		+1388		+6.85		+13.2	
5 SU	-06 08 41		-109.24		-11 37.0		10 50 52.9
		+1393		+6.88		+13.5	
6 MO	-05 45 28		-102.36		-11 23.5		10 54 49.4
		+1397		+6.90		+14.0	
7 TU	-05 22 11		-95.46		-11 09.5		10 58 46.0
		+1402		+6.92		+14.4	
8 WE	-04 58 49		-88.54		-10 55.1		11 02 42.5
		+1406		+6.94		+14.7	
9 TH	-04 35 23		-81.60		-10 40.4		11 06 39.1
		+1409		+6.96		+15.2	
10 FR	-04 11 54		-74.64		-10 25.2		11 10 35.6
		+1412		+6.98		+15.4	
11 SA	-03 48 22		-67.66		-10 09.8		11 14 32.2
		+1415		+6.98		+15.8	
12 SU	-03 24 47		-60.68		-09 54.0		11 18 28.7
		+1418		+7.01		+16.2	
13 MO	-03 01 09		-53.67		-09 37.8		11 22 25.3
		+1419		+7.00		+16.4	
14 TU	-02 37 30		-46.67		-09 21.4		11 26 21.8
		+1421		+7.02		+16.7	
15 WE	-02 13 49		-39.65		-09 04.7		11 30 18.4
		+1421		+7.02		+16.9	
16 TH	-01 50 08		-32.63		-08 47.8		11 34 14.9
		+1423		+7.03		+17.2	
17 FR	-01 26 25		-25.60		-08 30.6		11 38 11.5
		+1423		+7.02		+17.4	
18 SA	-01 02 42		-18.58		-08 13.2		11 42 08.1
		+1423		+7.03		+17.6	
19 SU	-00 38 59		-11.55		-07 55.6		11 46 04.6
		+1422		+7.02		+17.7	
20 MO	-00 15 17		-4.53		-07 37.9		11 50 01.2
		+1423		+7.03		+17.9	
21 TU	00 08 26		+2.50		-07 20.0		11 53 57.7
		+1421		+7.02		+18.0	
22 WE	00 32 07		+9.52		-07 02.0		11 57 54.3
		+1420		+7.01		+18.1	
23 TH	00 55 47		+16.53		-06 43.9		12 01 50.8
		+1418		+7.00		+18.2	
24 FR	01 19 25		+23.53		-06 25.7		12 05 47.3
		+1416		+6.99		+18.3	
25 SA	01 43 01		+30.52		-06 07.4		12 09 43.9
		+1414		+6.99		+18.2	
26 SU	02 06 35		+37.51		-05 49.2		12 13 40.4
		+1411		+6.96		+18.3	
27 MO	02 30 06		+44.47		-05 30.9		12 17 37.0
		+1409		+6.96		+18.2	
28 TU	02 53 35		+51.43		-05 12.7		12 21 33.6
		+1405		+6.94		+18.2	
29 WE	03 17 00		+58.37		-04 54.5		12 25 30.1
		+1401		+6.92		+18.2	
30 TH	03 40 21		+65.29		-04 36.3		12 29 26.7
		+1398		+6.90		+18.1	
31 FR	04 03 39		+72.19		-04 18.2		12 33 23.2
		+1398		+6.90		+18.1	

Table 2b. Sun, 1989, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
APR 1 SA	04 26 52		+79.07		-04 00.3		12 37 19.8
		+1388		+6.86		+17.9	
2 SU	04 50 00		+85.93		-03 42.4		12 41 16.4
		+1384		+6.83		+17.7	
3 MO	05 13 04		+92.76		-03 24.7		12 45 12.9
		+1378		+6.81		+17.5	
4 TU	05 36 02		+99.57		-03 07.2		12 49 09.5
		+1372		+6.77		+17.4	
5 WE	05 58 54		+106.34		-02 49.8		12 53 06.0
		+1366		+6.75		+17.2	
6 TH	06 21 40		+113.09		-02 32.6		12 57 02.5
		+1359		+6.71		+17.0	
7 FR	06 44 19		+119.80		-02 15.6		13 00 59.1
		+1352		+6.67		+16.8	
8 SA	07 06 51		+126.47		-01 58.8		13 04 55.7
		+1345		+6.65		+16.5	
9 SU	07 29 16		+133.12		-01 42.3		13 08 52.2
		+1338		+6.60		+16.3	
10 MO	07 51 34		+139.72		-01 26.0		13 12 48.8
		+1329		+6.57		+16.1	
11 TU	08 13 43		+146.29		-01 09.9		13 16 45.3
		+1321		+6.52		+15.8	
12 WE	08 35 44		+152.81		-00 54.1		13 20 41.9
		+1312		+6.48		+15.5	
13 TH	08 57 36		+159.29		-00 38.6		13 24 38.5
		+1303		+6.43		+15.2	
14 FR	09 19 19		+165.72		-00 23.4		13 28 35.0
		+1294		+6.39		+14.9	
15 SA	09 40 53		+172.11		-00 08.5		13 32 31.6
		+1284		+6.34		+14.6	
16 SU	10 02 17		+178.45		00 06.1		13 36 28.1
		+1274		+6.30		+14.2	
17 MO	10 23 31		+184.75		00 20.3		13 40 24.7
		+1263		+6.23		+13.8	
18 TU	10 44 34		+190.98		00 34.1		13 44 21.2
		+1253		+6.19		+13.5	
19 WE	11 05 27		+197.17		00 47.6		13 48 17.8
		+1242		+6.13		+13.0	
20 TH	11 26 09		+203.30		01 00.6		13 52 14.3
		+1230		+6.08		+12.7	
21 FR	11 46 39		+209.38		01 13.3		13 56 10.9
		+1219		+6.02		+12.2	
22 SA	12 06 58		+215.40		01 25.5		14 00 07.4
		+1208		+5.96		+11.7	
23 SU	12 27 06		+221.36		01 37.2		14 04 04.0
		+1194		+5.90		+11.3	
24 MO	12 47 00		+227.26		01 48.5		14 08 00.5
		+1183		+5.84		+10.9	
25 TU	13 06 43		+233.10		01 59.4		14 11 57.1
		+1169		+5.77		+10.3	
26 WE	13 26 12		+238.87		02 09.7		14 15 53.6
		+1157		+5.72		+9.8	
27 TH	13 45 29		+244.59		02 19.5		14 19 50.2
		+1143		+5.64		+9.3	
28 FR	14 04 32		+250.23		02 28.8		14 23 46.8
		+1129		+5.58		+8.8	
29 SA	14 23 21		+255.81		02 37.6		14 27 43.3
		+1115		+5.50		+8.2	
30 SU	14 41 56		+261.31		02 45.8		14 31 39.9
		+1115		+5.50		+8.2	

Table 2b. Sun, 1989, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
MAY 1 MO	15 00 17		+266.75		02 53.5		14 35 36.4
		+1085		+5.36		+7.1	
2 TU	15 18 22		+272.11		03 00.6		14 39 33.0
		+1071		+5.29		+6.6	
3 WE	15 36 13		+277.40		03 07.2		14 43 29.5
		+1055		+5.21		+6.0	
4 TH	15 53 48		+282.61		03 13.2		14 47 26.1
		+1039		+5.13		+5.5	
5 FR	16 11 07		+287.74		03 18.7		14 51 22.6
		+1024		+5.06		+4.9	
6 SA	16 28 11		+292.80		03 23.6		14 55 19.2
		+1006		+4.96		+4.3	
7 SU	16 44 57		+297.76		03 27.9		14 59 15.8
		+990		+4.89		+3.8	
8 MO	17 01 27		+302.65		03 31.7		15 03 12.3
		+973		+4.81		+3.2	
9 TU	17 17 40		+307.46		03 34.9		15 07 08.9
		+955		+4.71		+2.6	
10 WE	17 33 35		+312.17		03 37.5		15 11 05.4
		+938		+4.63		+2.1	
11 TH	17 49 13		+316.80		03 39.6		15 15 02.0
		+920		+4.55		+1.5	
12 FR	18 04 33		+321.35		03 41.1		15 18 58.6
		+901		+4.45		+1.0	
13 SA	18 19 34		+325.80		03 42.1		15 22 55.1
		+883		+4.36		+.4	
14 SU	18 34 17		+330.16		03 42.5		15 26 51.7
		+864		+4.26		-.1	
15 MO	18 48 41		+334.42		03 42.4		15 30 48.2
		+844		+4.17		-.7	
16 TU	19 02 45		+338.59		03 41.7		15 34 44.8
		+826		+4.08		-1.2	
17 WE	19 16 31		+342.67		03 40.5		15 38 41.3
		+806		+3.98		-1.8	
18 TH	19 29 57		+346.65		03 38.7		15 42 37.9
		+785		+3.88		-2.3	
19 FR	19 43 02		+350.53		03 36.4		15 46 34.4
		+766		+3.78		-2.9	
20 SA	19 55 48		+354.31		03 33.5		15 50 31.0
		+746		+3.69		-3.4	
21 SU	20 08 14		+358.00		03 30.1		15 54 27.5
		+724		+3.57		-3.9	
22 MO	20 20 18		+361.57		03 26.2		15 58 24.1
		+704		+3.48		-4.5	
23 TU	20 32 02		+365.05		03 21.7		16 02 20.7
		+683		+3.37		-5.0	
24 WE	20 43 25		+368.42		03 16.7		16 06 17.2
		+662		+3.27		-5.5	
25 TH	20 54 27		+371.69		03 11.2		16 10 13.8
		+640		+3.16		-6.0	
26 FR	21 05 07		+374.85		03 05.2		16 14 10.4
		+619		+3.06		-6.5	
27 SA	21 15 26		+377.91		02 58.7		16 18 06.9
		+596		+2.94		-7.1	
28 SU	21 25 22		+380.85		02 51.6		16 22 03.5
		+574		+2.83		-7.5	
29 MO	21 34 56		+383.68		02 44.1		16 26 00.0
		+552		+2.73		-8.0	
30 TU	21 44 08		+386.41		02 36.1		16 29 56.6
		+529		+2.61		-8.4	
31 WE	21 52 57		+389.02		02 27.7		16 33 53.1
		+529		+2.61		-8.4	

Table 2b. Sun, 1989, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
JUN 1 TH	22 01 23		+391.52		02 18.8		16 37 49.7
		+484		+2.39		-9.3	
2 FR	22 09 27		+393.91		02 09.5		16 41 46.2
		+460		+2.27		-9.7	
3 SA	22 17 07		+396.18		01 59.8		16 45 42.8
		+436		+2.16		-10.0	
4 SU	22 24 23		+398.34		01 49.8		16 49 39.4
		+413		+2.04		-10.4	
5 MO	22 31 16		+400.38		01 39.4		16 53 35.9
		+390		+1.92		-10.8	
6 TU	22 37 46		+402.30		01 28.6		16 57 32.5
		+365		+1.80		-11.0	
7 WE	22 43 51		+404.10		01 17.6		17 01 29.1
		+342		+1.69		-11.3	
8 TH	22 49 33		+405.79		01 06.3		17 05 25.6
		+317		+1.57		-11.6	
9 FR	22 54 50		+407.36		00 54.7		17 09 22.2
		+294		+1.45		-11.8	
10 SA	22 59 44		+408.81		00 42.9		17 13 18.7
		+269		+1.33		-12.1	
11 SU	23 04 13		+410.14		00 30.8		17 17 15.3
		+244		+1.20		-12.2	
12 MO	23 08 17		+411.34		00 18.6		17 21 11.8
		+220		+1.09		-12.3	
13 TU	23 11 57		+412.43		00 06.3		17 25 08.4
		+196		+.97		-12.6	
14 WE	23 15 13		+413.40		-00 06.3		17 29 04.9
		+171		+.84		-12.6	
15 TH	23 18 04		+414.24		-00 18.9		17 33 01.5
		+146		+.72		-12.8	
16 FR	23 20 30		+414.96		-00 31.7		17 36 58.1
		+122		+.61		-12.8	
17 SA	23 22 32		+415.57		-00 44.5		17 40 54.6
		+97		+.47		-12.9	
18 SU	23 24 09		+416.04		-00 57.4		17 44 51.2
		+72		+.36		-13.0	
19 MO	23 25 21		+416.40		-01 10.4		17 48 47.7
		+47		+.23		-13.0	
20 TU	23 26 08		+416.63		-01 23.4		17 52 44.3
		+23		+.12		-13.0	
21 WE	23 26 31		+416.75		-01 36.4		17 56 40.9
		-2		-.01		-12.9	
22 TH	23 26 29		+416.74		-01 49.3		18 00 37.4
		-27		-.14		-13.0	
23 FR	23 26 02		+416.60		-02 02.3		18 04 34.0
		-51		-.25		-12.9	
24 SA	23 25 11		+416.35		-02 15.2		18 08 30.5
		-77		-.38		-12.8	
25 SU	23 23 54		+415.97		-02 28.0		18 12 27.1
		-101		-.50		-12.7	
26 MO	23 22 13		+415.47		-02 40.7		18 16 23.7
		-126		-.62		-12.6	
27 TU	23 20 07		+414.85		-02 53.3		18 20 20.2
		-150		-.74		-12.4	
28 WE	23 17 37		+414.11		-03 05.7		18 24 16.8
		-175		-.87		-12.3	
29 TH	23 14 42		+413.24		-03 18.0		18 28 13.3
		-200		-.98		-12.1	
30 FR	23 11 22		+412.26		-03 30.1		18 32 09.9
		-200		-.98		-12.1	

Table 2b. Sun, 1989, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
JUL 1 SA	23 07 38		+411.15		-03 42.0		18 36 06.4
		-248		-1.22		-11.7	
2 SU	23 03 30		+409.93		-03 53.7		18 40 03.0
		-272		-1.35		-11.4	
3 MO	22 58 58		+408.58		-04 05.1		18 43 59.6
		-297		-1.46		-11.1	
4 TU	22 54 01		+407.12		-04 16.2		18 47 56.1
		-320		-1.58		-10.7	
5 WE	22 48 41		+405.54		-04 26.9		18 51 52.7
		-345		-1.71		-10.5	
6 TH	22 42 56		+403.83		-04 37.4		18 55 49.3
		-368		-1.82		-10.0	
7 FR	22 36 48		+402.01		-04 47.4		18 59 45.8
		-391		-1.93		-9.7	
8 SA	22 30 17		+400.08		-04 57.1		19 03 42.4
		-415		-2.05		-9.3	
9 SU	22 23 22		+398.03		-05 06.4		19 07 38.9
		-438		-2.16		-8.8	
10 MO	22 16 04		+395.87		-05 15.2		19 11 35.5
		-461		-2.27		-8.4	
11 TU	22 08 23		+393.60		-05 23.6		19 15 32.0
		-484		-2.40		-8.0	
12 WE	22 00 19		+391.20		-05 31.6		19 19 28.6
		-506		-2.49		-7.4	
13 TH	21 51 53		+388.71		-05 39.0		19 23 25.1
		-529		-2.62		-7.0	
14 FR	21 43 04		+386.09		-05 46.0		19 27 21.7
		-551		-2.72		-6.5	
15 SA	21 33 53		+383.37		-05 52.5		19 31 18.3
		-573		-2.83		-5.9	
16 SU	21 24 20		+380.54		-05 58.4		19 35 14.8
		-594		-2.93		-5.5	
17 MO	21 14 26		+377.61		-06 03.9		19 39 11.4
		-616		-3.04		-4.9	
18 TU	21 04 10		+374.57		-06 08.8		19 43 07.9
		-638		-3.15		-4.4	
19 WE	20 53 32		+371.42		-06 13.2		19 47 04.5
		-658		-3.25		-3.8	
20 TH	20 42 34		+368.17		-06 17.0		19 51 01.1
		-680		-3.36		-3.3	
21 FR	20 31 14		+364.81		-06 20.3		19 54 57.6
		-700		-3.46		-2.7	
22 SA	20 19 34		+361.35		-06 23.0		19 58 54.2
		-721		-3.56		-2.2	
23 SU	20 07 33		+357.79		-06 25.2		20 02 50.7
		-741		-3.66		-1.6	
24 MO	19 55 12		+354.13		-06 26.8		20 06 47.3
		-760		-3.75		-1.0	
25 TU	19 42 32		+350.38		-06 27.8		20 10 43.8
		-781		-3.86		-.5	
26 WE	19 29 31		+346.52		-06 28.3		20 14 40.4
		-800		-3.95		+.1	
27 TH	19 16 11		+342.57		-06 28.2		20 18 36.9
		-820		-4.05		+.7	
28 FR	19 02 31		+338.52		-06 27.5		20 22 33.5
		-838		-4.13		+1.3	
29 SA	18 48 33		+334.39		-06 26.2		20 26 30.1
		-857		-4.24		+1.9	
30 SU	18 34 16		+330.15		-06 24.3		20 30 26.6
		-875		-4.32		+2.4	
31 MO	18 19 41		+325.83		-06 21.9		20 34 23.2
		-875		-4.32		+2.4	

Table 2b. Sun, 1989, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
AUG 1 TU	18 04 47		+321.42		-06 18.8		20 38 19.8
		-911		-4.50		+3.7	
2 WE	17 49 36		+316.92		-06 15.1		20 42 16.3
		-928		-4.58		+4.2	
3 TH	17 34 08		+312.34		-06 10.9		20 46 12.9
		-946		-4.68		+4.9	
4 FR	17 18 22		+307.66		-06 06.0		20 50 09.4
		-962		-4.75		+5.5	
5 SA	17 02 20		+302.91		-06 00.5		20 54 06.0
		-979		-4.83		+6.1	
6 SU	16 46 01		+298.08		-05 54.4		20 58 02.5
		-995		-4.91		+6.8	
7 MO	16 29 26		+293.17		-05 47.6		21 01 59.1
		-1011		-5.00		+7.3	
8 TU	16 12 35		+288.17		-05 40.3		21 05 55.6
		-1026		-5.06		+7.9	
9 WE	15 55 29		+283.11		-05 32.4		21 09 52.2
		-1042		-5.15		+8.6	
10 TH	15 38 07		+277.96		-05 23.8		21 13 48.7
		-1057		-5.22		+9.1	
11 FR	15 20 30		+272.74		-05 14.7		21 17 45.3
		-1071		-5.29		+9.7	
12 SA	15 02 39		+267.45		-05 05.0		21 21 41.8
		-1086		-5.36		+10.3	
13 SU	14 44 33		+262.09		-04 54.7		21 25 38.4
		-1099		-5.43		+10.8	
14 MO	14 26 14		+256.66		-04 43.9		21 29 35.0
		-1113		-5.49		+11.4	
15 TU	14 07 41		+251.17		-04 32.5		21 33 31.5
		-1127		-5.57		+12.0	
16 WE	13 48 54		+245.60		-04 20.5		21 37 28.1
		-1140		-5.63		+12.4	
17 TH	13 29 54		+239.97		-04 08.1		21 41 24.6
		-1152		-5.69		+13.0	
18 FR	13 10 42		+234.28		-03 55.1		21 45 21.2
		-1165		-5.75		+13.5	
19 SA	12 51 17		+228.53		-03 41.6		21 49 17.7
		-1178		-5.82		+14.0	
20 SU	12 31 39		+222.71		-03 27.6		21 53 14.3
		-1189		-5.87		+14.4	
21 MO	12 11 50		+216.84		-03 13.2		21 57 10.8
		-1201		-5.93		+14.9	
22 TU	11 51 49		+210.91		-02 58.3		22 01 07.4
		-1212		-5.99		+15.3	
23 WE	11 31 37		+204.92		-02 43.0		22 05 03.9
		-1224		-6.04		+15.8	
24 TH	11 11 13		+198.88		-02 27.2		22 09 00.5
		-1234		-6.09		+16.1	
25 FR	10 50 39		+192.79		-02 11.1		22 12 57.1
		-1245		-6.15		+16.6	
26 SA	10 29 54		+186.64		-01 54.5		22 16 53.6
		-1255		-6.20		+16.9	
27 SU	10 08 59		+180.44		-01 37.6		22 20 50.2
		-1264		-6.24		+17.3	
28 MO	09 47 55		+174.20		-01 20.3		22 24 46.8
		-1274		-6.29		+17.7	
29 TU	09 26 41		+167.91		-01 02.6		22 28 43.3
		-1283		-6.34		+18.0	
30 WE	09 05 18		+161.57		-00 44.6		22 32 39.9
		-1292		-6.38		+18.3	
31 TH	08 43 46		+155.19		-00 26.3		22 36 36.4
		-1292		-6.38		+18.3	

Table 2b. Sun, 1989, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
SEP 1 FR	08 22 06	-1308	+148.77	-6.46	-00 07.6	+18.9	22 40 33.0
2 SA	08 00 18	-1316	+142.31	-6.50	00 11.3	+19.3	22 44 29.5
3 SU	07 38 22	-1323	+135.81	-6.53	00 30.6	+19.5	22 48 26.1
4 MO	07 16 19	-1330	+129.28	-6.57	00 50.1	+19.8	22 52 22.6
5 TU	06 54 09	-1337	+122.71	-6.60	01 09.9	+20.0	22 56 19.2
6 WE	06 31 52	-1344	+116.11	-6.64	01 29.9	+20.3	23 00 15.7
7 TH	06 09 28	-1349	+109.47	-6.66	01 50.2	+20.4	23 04 12.3
8 FR	05 46 59	-1355	+102.81	-6.69	02 10.6	+20.7	23 08 08.8
9 SA	05 24 24	-1360	+96.12	-6.72	02 31.3	+20.8	23 12 05.4
10 SU	05 01 44	-1365	+89.40	-6.74	02 52.1	+21.0	23 16 01.9
11 MO	04 38 59	-1370	+82.66	-6.76	03 13.1	+21.1	23 19 58.5
12 TU	04 16 09	-1374	+75.90	-6.79	03 34.2	+21.3	23 23 55.1
13 WE	03 53 15	-1379	+69.11	-6.81	03 55.5	+21.3	23 27 51.6
14 TH	03 30 16	-1382	+62.30	-6.82	04 16.8	+21.4	23 31 48.2
15 FR	03 07 14	-1385	+55.48	-6.84	04 38.2	+21.5	23 35 44.7
16 SA	02 44 09	-1389	+48.64	-6.86	04 59.7	+21.4	23 39 41.3
17 SU	02 21 00	-1392	+41.78	-6.88	05 21.1	+21.5	23 43 37.8
18 MO	01 57 48	-1394	+34.90	-6.88	05 42.6	+21.4	23 47 34.4
19 TU	01 34 34	-1396	+28.02	-6.89	06 04.0	+21.4	23 51 30.9
20 WE	01 11 18	-1399	+21.13	-6.91	06 25.4	+21.3	23 55 27.5
21 TH	00 47 59	-1400	+14.22	-6.92	06 46.7	+21.3	23 59 24.0
22 FR	00 24 39	-1401	+7.30	-6.91	07 08.0	+21.1	00 03 20.6
23 SA	00 01 18	-1403	+.39	-6.93	07 29.1	+20.9	00 07 17.1
24 SU	-00 22 05	-1403	-6.54	-6.93	07 50.0	+20.8	00 11 13.7
25 MO	-00 45 28	-1403	-13.47	-6.93	08 10.8	+20.7	00 15 10.3
26 TU	-01 08 51	-1403	-20.40	-6.93	08 31.5	+20.4	00 19 06.8
27 WE	-01 32 14	-1402	-27.33	-6.92	08 51.9	+20.2	00 23 03.4
28 TH	-01 55 36	-1402	-34.25	-6.93	09 12.1	+20.0	00 26 59.9
29 FR	-02 18 58	-1400	-41.18	-6.91	09 32.1	+19.8	00 30 56.5
30 SA	-02 42 18	-1400	-48.09	-6.91	09 51.9	+19.8	00 34 53.0

Table 2b. Sun, 1989, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
OCT 1 SU	-03 05 37	-1396	-55.00	-6.89	10 11.4	+19.2	00 38 49.5
2 MO	-03 28 53	-1395	-61.89	-6.89	10 30.6	+18.9	00 42 46.1
3 TU	-03 52 08	-1391	-68.78	-6.87	10 49.5	+18.6	00 46 42.6
4 WE	-04 15 19	-1388	-75.65	-6.85	11 08.1	+18.3	00 50 39.2
5 TH	-04 38 27	-1385	-82.50	-6.84	11 26.4	+17.9	00 54 35.8
6 FR	-05 01 32	-1381	-89.34	-6.82	11 44.3	+17.5	00 58 32.3
7 SA	-05 24 33	-1377	-96.16	-6.80	12 01.8	+17.2	01 02 28.9
8 SU	-05 47 30	-1372	-102.96	-6.78	12 19.0	+16.7	01 06 25.4
9 MO	-06 10 22	-1367	-109.74	-6.75	12 35.7	+16.4	01 10 22.0
10 TU	-06 33 09	-1362	-116.49	-6.72	12 52.1	+15.9	01 14 18.6
11 WE	-06 55 51	-1356	-123.21	-6.70	13 08.0	+15.4	01 18 15.1
12 TH	-07 18 27	-1350	-129.91	-6.67	13 23.4	+14.9	01 22 11.7
13 FR	-07 40 57	-1344	-136.58	-6.63	13 38.3	+14.4	01 26 08.2
14 SA	-08 03 21	-1337	-143.21	-6.61	13 52.7	+13.9	01 30 04.7
15 SU	-08 25 38	-1329	-149.82	-6.56	14 06.6	+13.4	01 34 01.3
16 MO	-08 47 47	-1323	-156.38	-6.53	14 20.0	+12.7	01 37 57.9
17 TU	-09 09 50	-1314	-162.91	-6.49	14 32.7	+12.2	01 41 54.4
18 WE	-09 31 44	-1307	-169.40	-6.46	14 44.9	+11.5	01 45 51.0
19 TH	-09 53 31	-1298	-175.86	-6.41	14 56.4	+10.9	01 49 47.5
20 FR	-10 15 09	-1289	-182.27	-6.36	15 07.3	+10.3	01 53 44.1
21 SA	-10 36 38	-1280	-188.63	-6.32	15 17.6	+9.5	01 57 40.7
22 SU	-10 57 58	-1270	-194.95	-6.27	15 27.1	+8.9	02 01 37.2
23 MO	-11 19 08	-1260	-201.22	-6.23	15 36.0	+8.2	02 05 33.8
24 TU	-11 40 08	-1250	-207.45	-6.17	15 44.2	+7.5	02 09 30.3
25 WE	-12 00 58	-1238	-213.62	-6.11	15 51.7	+6.7	02 13 26.9
26 TH	-12 21 36	-1227	-219.73	-6.06	15 58.4	+6.0	02 17 23.4
27 FR	-12 42 03	-1215	-225.79	-6.00	16 04.4	+5.3	02 21 20.0
28 SA	-13 02 18	-1204	-231.79	-5.95	16 09.7	+4.5	02 25 16.5
29 SU	-13 22 22	-1190	-237.74	-5.87	16 14.2	+3.7	02 29 13.1
30 MO	-13 42 12	-1177	-243.61	-5.82	16 17.9	+2.9	02 33 09.6
31 TU	-14 01 49	-1177	-249.43	-5.82	16 20.8	+2.9	02 37 06.2

Table 2b. Sun, 1989, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
NOV 1 WE	-14 21 13		-255.18		16 23.0		02 41 02.7
		-1150		-5.67		+1.3	
2 TH	-14 40 23		-260.85		16 24.3		02 44 59.3
		-1136		-5.61		+.6	
3 FR	-14 59 19		-266.46		16 24.9		02 48 55.9
		-1121		-5.54		-.2	
4 SA	-15 18 00		-272.00		16 24.7		02 52 52.4
		-1106		-5.46		-1.0	
5 SU	-15 36 26		-277.46		16 23.7		02 56 49.0
		-1090		-5.38		-1.9	
6 MO	-15 54 36		-282.84		16 21.8		03 00 45.5
		-1075		-5.31		-2.6	
7 TU	-16 12 31		-288.15		16 19.2		03 04 42.1
		-1058		-5.23		-3.5	
8 WE	-16 30 09		-293.38		16 15.7		03 08 38.6
		-1041		-5.14		-4.3	
9 TH	-16 47 30		-298.52		16 11.4		03 12 35.2
		-1024		-5.06		-5.1	
10 FR	-17 04 34		-303.58		16 06.3		03 16 31.7
		-1007		-4.97		-6.0	
11 SA	-17 21 21		-308.55		16 00.3		03 20 28.3
		-988		-4.88		-6.8	
12 SU	-17 37 49		-313.43		15 53.5		03 24 24.8
		-971		-4.79		-7.6	
13 MO	-17 54 00		-318.22		15 45.9		03 28 21.4
		-952		-4.70		-8.5	
14 TU	-18 09 52		-322.92		15 37.4		03 32 18.0
		-932		-4.61		-9.3	
15 WE	-18 25 24		-327.53		15 28.1		03 36 14.5
		-914		-4.51		-10.2	
16 TH	-18 40 38		-332.04		15 17.9		03 40 11.1
		-894		-4.41		-11.0	
17 FR	-18 55 32		-336.45		15 06.9		03 44 07.7
		-873		-4.32		-11.9	
18 SA	-19 10 05		-340.77		14 55.0		03 48 04.2
		-854		-4.21		-12.7	
19 SU	-19 24 19		-344.98		14 42.3		03 52 00.8
		-832		-4.11		-13.6	
20 MO	-19 38 11		-349.09		14 28.7		03 55 57.3
		-811		-4.01		-14.4	
21 TU	-19 51 42		-353.10		14 14.3		03 59 53.9
		-789		-3.89		-15.3	
22 WE	-20 04 51		-356.99		13 59.0		04 03 50.4
		-767		-3.79		-16.0	
23 TH	-20 17 38		-360.78		13 43.0		04 07 47.0
		-745		-3.68		-16.9	
24 FR	-20 30 03		-364.46		13 26.1		04 11 43.5
		-722		-3.56		-17.6	
25 SA	-20 42 05		-368.02		13 08.5		04 15 40.1
		-699		-3.46		-18.4	
26 SU	-20 53 44		-371.48		12 50.1		04 19 36.6
		-676		-3.33		-19.2	
27 MO	-21 05 00		-374.81		12 30.9		04 23 33.2
		-652		-3.22		-19.9	
28 TU	-21 15 52		-378.03		12 11.0		04 27 29.8
		-627		-3.10		-20.6	
29 WE	-21 26 19		-381.13		11 50.4		04 31 26.3
		-604		-2.98		-21.3	
30 TH	-21 36 23		-384.11		11 29.1		04 35 22.9
		-604		-2.98		-21.3	

Table 2b. Sun, 1989, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES	MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
DEC 1 FR	-21 46 01		-386.97		11 07.1		04 39 19.5
		-554		-2.73		-22.6	
2 SA	-21 55 15		-389.70		10 44.5		04 43 16.0
		-528		-2.61		-23.2	
3 SU	-22 04 03		-392.31		10 21.3		04 47 12.6
		-502		-2.48		-23.8	
4 MO	-22 12 25		-394.79		09 57.5		04 51 09.1
		-477		-2.36		-24.4	
5 TU	-22 20 22		-397.15		09 33.1		04 55 05.7
		-451		-2.22		-24.9	
6 WE	-22 27 53		-399.37		09 08.2		04 59 02.3
		-425		-2.10		-25.4	
7 TH	-22 34 58		-401.47		08 42.8		05 02 58.8
		-397		-1.96		-25.9	
8 FR	-22 41 35		-403.43		08 16.9		05 06 55.4
		-372		-1.84		-26.4	
9 SA	-22 47 47		-405.27		07 50.5		05 10 51.9
		-344		-1.70		-26.8	
10 SU	-22 53 31		-406.97		07 23.7		05 14 48.5
		-317		-1.56		-27.2	
11 MO	-22 58 48		-408.53		06 56.5		05 18 45.0
		-290		-1.44		-27.6	
12 TU	-23 03 38		-409.97		06 28.9		05 22 41.6
		-263		-1.29		-27.9	
13 WE	-23 08 01		-411.26		06 01.0		05 26 38.2
		-235		-1.16		-28.3	
14 TH	-23 11 56		-412.42		05 32.7		05 30 34.7
		-208		-1.03		-28.6	
15 FR	-23 15 24		-413.45		05 04.1		05 34 31.3
		-180		-.89		-28.9	
16 SA	-23 18 24		-414.34		04 35.2		05 38 27.9
		-151		-.75		-29.1	
17 SU	-23 20 55		-415.09		04 06.1		05 42 24.4
		-124		-.61		-29.3	
18 MO	-23 22 59		-415.70		03 36.8		05 46 21.0
		-96		-.47		-29.5	
19 TU	-23 24 35		-416.17		03 07.3		05 50 17.5
		-68		-.34		-29.7	
20 WE	-23 25 43		-416.51		02 37.6		05 54 14.1
		-39		-.19		-29.8	
21 TH	-23 26 22		-416.70		02 07.8		05 58 10.6
		-11		-.06		-29.8	
22 FR	-23 26 33		-416.76		01 38.0		06 02 07.2
		+17		+.09		-30.0	
23 SA	-23 26 16		-416.67		01 08.0		06 06 03.7
		+46		+.23		-29.9	
24 SU	-23 25 30		-416.44		00 38.1		06 10 00.3
		+74		+.36		-29.9	
25 MO	-23 24 16		-416.08		00 08.2		06 13 56.9
		+102		+.50		-29.9	
26 TU	-23 22 34		-415.58		-00 21.7		06 17 53.4
		+130		+.65		-29.7	
27 WE	-23 20 24		-414.93		-00 51.4		06 21 50.0
		+158		+.78		-29.6	
28 TH	-23 17 46		-414.15		-01 21.0		06 25 46.5
		+187		+.92		-29.5	
29 FR	-23 14 39		-413.23		-01 50.5		06 29 43.1
		+214		+1.06		-29.2	
30 SA	-23 11 05		-412.17		-02 19.7		06 33 39.7
		+243		+1.20		-29.0	
31 SU	-23 07 02		-410.97		-02 48.7		06 37 36.2
		+270		+1.33		-28.7	
32 MO	-23 02 32		-409.64		-03 17.4		06 41 32.8

Table 2c. Sun, 1990, for Zero Hours Universal Time (GMT)

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
JAN 0 SU	-23 07 02		-410.97		-02 48.7		06 37 36.2
		+270		+1.33		-28.7	
JAN 1 MO	-23 02 32		-409.64		-03 17.4		06 41 32.8
		+298		+1.47		-28.3	
2 TU	-22 57 34		-408.17		-03 45.7		06 45 29.3
		+325		+1.61		-28.1	
3 WE	-22 52 09		-406.56		-04 13.8		06 49 25.9
		+352		+1.74		-27.6	
4 TH	-22 46 17		-404.82		-04 41.4		06 53 22.4
		+380		+1.87		-27.2	
5 FR	-22 39 57		-402.95		-05 08.6		06 57 19.0
		+406		+2.01		-26.8	
6 SA	-22 33 11		-400.94		-05 35.4		07 01 15.6
		+433		+2.14		-26.3	
7 SU	-22 25 58		-398.80		-06 01.7		07 05 12.1
		+460		+2.27		-25.8	
8 MO	-22 18 18		-396.53		-06 27.5		07 09 08.7
		+486		+2.40		-25.3	
9 TU	-22 10 12		-394.13		-06 52.8		07 13 05.2
		+511		+2.52		-24.7	
10 WE	-22 01 41		-391.61		-07 17.5		07 17 01.8
		+538		+2.66		-24.2	
11 TH	-21 52 43		-388.95		-07 41.7		07 20 58.4
		+563		+2.78		-23.6	
12 FR	-21 43 20		-386.17		-08 05.3		07 24 54.9
		+588		+2.90		-23.0	
13 SA	-21 33 32		-383.27		-08 28.3		07 28 51.5
		+613		+3.03		-22.4	
14 SU	-21 23 19		-380.24		-08 50.7		07 32 48.1
		+638		+3.15		-21.7	
15 MO	-21 12 41		-377.09		-09 12.4		07 36 44.6
		+663		+3.27		-21.2	
16 TU	-21 01 38		-373.82		-09 33.6		07 40 41.2
		+686		+3.39		-20.4	
17 WE	-20 50 12		-370.43		-09 54.0		07 44 37.7
		+711		+3.51		-19.8	
18 TH	-20 38 21		-366.92		-10 13.8		07 48 34.3
		+734		+3.63		-19.0	
19 FR	-20 26 07		-363.29		-10 32.8		07 52 30.8
		+757		+3.73		-18.4	
20 SA	-20 13 30		-359.56		-10 51.2		07 56 27.4
		+780		+3.86		-17.6	
21 SU	-20 00 30		-355.70		-11 08.8		08 00 23.9
		+803		+3.96		-16.9	
22 MO	-19 47 07		-351.74		-11 25.7		08 04 20.5
		+825		+4.08		-16.2	
23 TU	-19 33 22		-347.66		-11 41.9		08 08 17.1
		+847		+4.18		-15.3	
24 WE	-19 19 15		-343.48		-11 57.2		08 12 13.6
		+868		+4.28		-14.7	
25 TH	-19 04 47		-339.20		-12 11.9		08 16 10.2
		+889		+4.40		-13.8	
26 FR	-18 49 58		-334.80		-12 25.7		08 20 06.7
		+910		+4.49		-13.0	
27 SA	-18 34 48		-330.31		-12 38.7		08 24 03.3
		+930		+4.59		-12.2	
28 SU	-18 19 18		-325.72		-12 50.9		08 27 59.9
		+950		+4.69		-11.4	
29 MO	-18 03 28		-321.03		-13 02.3		08 31 56.4
		+969		+4.79		-10.6	
30 TU	-17 47 19		-316.24		-13 12.9		08 35 53.0
		+988		+4.88		-9.7	
31 WE	-17 30 51		-311.36		-13 22.6		08 39 49.5
		+988		+4.88		-9.7	

Table 2c. Sun, 1990, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
FEB 1 TH	-17 14 04	+1025	-306.39	+5.06	-13 31.5	-8.1	08 43 46.1
2 FR	-16 56 59	+1043	-301.33	+5.15	-13 39.6	-7.2	08 47 42.6
3 SA	-16 39 36	+1060	-296.18	+5.24	-13 46.8	-6.4	08 51 39.2
4 SU	-16 21 56	+1077	-290.94	+5.32	-13 53.2	-5.6	08 55 35.7
5 MO	-16 03 59	+1093	-285.62	+5.39	-13 58.8	-4.8	08 59 32.3
6 TU	-15 45 46	+1109	-280.23	+5.48	-14 03.6	-3.9	09 03 28.9
7 WE	-15 27 17	+1126	-274.75	+5.56	-14 07.5	-3.1	09 07 25.4
8 TH	-15 08 31	+1140	-269.19	+5.63	-14 10.6	-2.3	09 11 22.0
9 FR	-14 49 31	+1155	-263.56	+5.70	-14 12.9	-1.5	09 15 18.5
10 SA	-14 30 16	+1170	-257.86	+5.78	-14 14.4	-.8	09 19 15.1
11 SU	-14 10 46	+1184	-252.08	+5.85	-14 15.2	+.1	09 23 11.7
12 MO	-13 51 02	+1198	-246.23	+5.91	-14 15.1	+.8	09 27 08.2
13 TU	-13 31 04	+1211	-240.32	+5.98	-14 14.3	+1.5	09 31 04.7
14 WE	-13 10 53	+1224	-234.34	+6.05	-14 12.8	+2.2	09 35 01.3
15 TH	-12 50 29	+1237	-228.29	+6.11	-14 10.6	+3.0	09 38 57.8
16 FR	-12 29 52	+1249	-222.18	+6.17	-14 07.6	+3.7	09 42 54.4
17 SA	-12 09 03	+1260	-216.01	+6.22	-14 03.9	+4.3	09 46 51.0
18 SU	-11 48 03	+1272	-209.79	+6.28	-13 59.6	+5.0	09 50 47.5
19 MO	-11 26 51	+1283	-203.51	+6.33	-13 54.6	+5.7	09 54 44.1
20 TU	-11 05 28	+1293	-197.18	+6.39	-13 48.9	+6.4	09 58 40.6
21 WE	-10 43 55	+1304	-190.79	+6.44	-13 42.5	+7.0	10 02 37.2
22 TH	-10 22 11	+1313	-184.35	+6.48	-13 35.5	+7.6	10 06 33.7
23 FR	-10 00 18	+1322	-177.87	+6.53	-13 27.9	+8.2	10 10 30.3
24 SA	-09 38 16	+1331	-171.34	+6.57	-13 19.7	+8.8	10 14 26.9
25 SU	-09 16 05	+1339	-164.77	+6.62	-13 10.9	+9.4	10 18 23.4
26 MO	-08 53 46	+1347	-158.15	+6.65	-13 01.5	+9.9	10 22 20.0
27 TU	-08 31 19	+1355	-151.50	+6.69	-12 51.6	+10.5	10 26 16.5
28 WE	-08 08 44	+1355	-144.81	+6.69	-12 41.1	+10.5	10 30 13.1

Table 2c. Sun, 1990, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
MAR 1 TH	-07 46 02		-138.08		-12 30.0		10 34 09.6
		+1368		+6.75		+11.6	
2 FR	-07 23 14		-131.33		-12 18.4		10 38 06.2
		+1375		+6.79		+12.1	
3 SA	-07 00 19		-124.54		-12 06.3		10 42 02.7
		+1380		+6.82		+12.6	
4 SU	-06 37 19		-117.72		-11 53.7		10 45 59.3
		+1386		+6.84		+13.1	
5 MO	-06 14 13		-110.88		-11 40.6		10 49 55.8
		+1391		+6.87		+13.6	
6 TU	-05 51 02		-104.01		-11 27.0		10 53 52.4
		+1396		+6.89		+14.0	
7 WE	-05 27 46		-97.12		-11 13.0		10 57 49.0
		+1399		+6.91		+14.4	
8 TH	-05 04 27		-90.21		-10 58.6		11 01 45.5
		+1404		+6.94		+14.8	
9 FR	-04 41 03		-83.27		-10 43.8		11 05 42.1
		+1407		+6.94		+15.2	
10 SA	-04 17 36		-76.33		-10 28.6		11 09 38.6
		+1411		+6.97		+15.5	
11 SU	-03 54 05		-69.36		-10 13.1		11 13 35.2
		+1413		+6.98		+15.8	
12 MO	-03 30 32		-62.38		-09 57.3		11 17 31.7
		+1416		+6.99		+16.2	
13 TU	-03 06 56		-55.39		-09 41.1		11 21 28.3
		+1418		+7.00		+16.4	
14 WE	-02 43 18		-48.39		-09 24.7		11 25 24.8
		+1420		+7.02		+16.7	
15 TH	-02 19 38		-41.37		-09 08.0		11 29 21.4
		+1421		+7.01		+16.9	
16 FR	-01 55 57		-34.36		-08 51.1		11 33 17.9
		+1422		+7.03		+17.2	
17 SA	-01 32 15		-27.33		-08 33.9		11 37 14.5
		+1423		+7.02		+17.3	
18 SU	-01 08 32		-20.31		-08 16.6		11 41 11.0
		+1424		+7.04		+17.5	
19 MO	-00 44 48		-13.27		-07 59.1		11 45 07.6
		+1423		+7.02		+17.6	
20 TU	-00 21 05		-6.25		-07 41.5		11 49 04.1
		+1424		+7.04		+17.8	
21 WE	00 02 39		+.79		-07 23.7		11 53 00.7
		+1422		+7.02		+17.8	
22 TH	00 26 21		+7.81		-07 05.9		11 56 57.3
		+1421		+7.01		+18.0	
23 FR	00 50 02		+14.82		-06 47.9		12 00 53.8
		+1420		+7.02		+18.0	
24 SA	01 13 42		+21.84		-06 29.9		12 04 50.4
		+1418		+7.00		+18.1	
25 SU	01 37 20		+28.84		-06 11.8		12 08 46.9
		+1416		+6.99		+18.1	
26 MO	02 00 56		+35.83		-05 53.7		12 12 43.5
		+1413		+6.98		+18.1	
27 TU	02 24 29		+42.81		-05 35.6		12 16 40.0
		+1410		+6.96		+18.1	
28 WE	02 47 59		+49.77		-05 17.5		12 20 36.6
		+1407		+6.95		+18.1	
29 TH	03 11 26		+56.72		-04 59.4		12 24 33.1
		+1403		+6.93		+18.0	
30 FR	03 34 49		+63.65		-04 41.4		12 28 29.7
		+1399		+6.91		+18.1	
31 SA	03 58 08		+70.56		-04 23.3		12 32 26.2
		+1399		+6.91		+18.1	

Table 2c. Sun, 1990, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
APR 1 SU	04 21 22	+1389	+77.44	+6.86	-04 05.4	+17.9	12 36 22.8
2 MO	04 44 31	+1384	+84.30	+6.84	-03 47.5	+17.7	12 40 19.3
3 TU	05 07 35	+1379	+91.14	+6.81	-03 29.8	+17.7	12 44 15.9
4 WE	05 30 34	+1373	+97.95	+6.78	-03 12.1	+17.5	12 48 12.5
5 TH	05 53 27	+1366	+104.73	+6.74	-02 54.6	+17.4	12 52 09.0
6 FR	06 16 13	+1360	+111.47	+6.72	-02 37.2	+17.1	12 56 05.6
7 SA	06 38 53	+1353	+118.19	+6.68	-02 20.1	+17.0	13 00 02.1
8 SU	07 01 26	+1345	+124.87	+6.64	-02 03.1	+16.7	13 03 58.7
9 MO	07 23 51	+1339	+131.51	+6.61	-01 46.4	+16.6	13 07 55.2
10 TU	07 46 10	+1330	+138.12	+6.57	-01 29.8	+16.2	13 11 51.8
11 WE	08 08 20	+1322	+144.69	+6.53	-01 13.6	+16.0	13 15 48.3
12 TH	08 30 22	+1314	+151.22	+6.49	-00 57.6	+15.6	13 19 44.9
13 FR	08 52 16	+1305	+157.71	+6.44	-00 42.0	+15.4	13 23 41.4
14 SA	09 14 01	+1296	+164.15	+6.40	-00 26.6	+15.0	13 27 38.0
15 SU	09 35 37	+1287	+170.55	+6.36	-00 11.6	+14.6	13 31 34.5
16 MO	09 57 04	+1277	+176.91	+6.30	00 03.0	+14.3	13 35 31.1
17 TU	10 18 21	+1266	+183.21	+6.26	00 17.3	+13.8	13 39 27.6
18 WE	10 39 27	+1257	+189.47	+6.20	00 31.1	+13.5	13 43 24.2
19 TH	11 00 24	+1245	+195.67	+6.15	00 44.6	+13.0	13 47 20.8
20 FR	11 21 09	+1234	+201.82	+6.10	00 57.6	+12.7	13 51 17.3
21 SA	11 41 43	+1223	+207.92	+6.04	01 10.3	+12.1	13 55 13.9
22 SU	12 02 06	+1211	+213.96	+5.98	01 22.4	+11.7	13 59 10.4
23 MO	12 22 17	+1199	+219.94	+5.92	01 34.1	+11.3	14 03 07.0
24 TU	12 42 16	+1186	+225.86	+5.85	01 45.4	+10.7	14 07 03.5
25 WE	13 02 02	+1174	+231.71	+5.80	01 56.1	+10.3	14 11 00.1
26 TH	13 21 36	+1160	+237.51	+5.73	02 06.4	+9.8	14 14 56.6
27 FR	13 40 56	+1146	+243.24	+5.66	02 16.2	+9.3	14 18 53.2
28 SA	14 00 02	+1133	+248.90	+5.59	02 25.5	+8.8	14 22 49.7
29 SU	14 18 55	+1118	+254.49	+5.52	02 34.3	+8.3	14 26 46.3
30 MO	14 37 33	+1118	+260.01	+5.52	02 42.6	+8.3	14 30 42.9

Table 2c. Sun, 1990, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
MAY 1 TU	14 55 57	+1089	+265.47	+5.37	02 50.4	+7.3	14 34 39.4
2 WE	15 14 06	+1074	+270.84	+5.31	02 57.7	+6.7	14 38 36.0
3 TH	15 32 00	+1058	+276.15	+5.22	03 04.4	+6.3	14 42 32.5
4 FR	15 49 38	+1042	+281.37	+5.15	03 10.7	+5.7	14 46 29.1
5 SA	16 07 00	+1027	+286.52	+5.07	03 16.4	+5.1	14 50 25.6
6 SU	16 24 07	+1010	+291.59	+4.99	03 21.5	+4.6	14 54 22.2
7 MO	16 40 57	+993	+296.58	+4.90	03 26.1	+4.1	14 58 18.7
8 TU	16 57 30	+976	+301.48	+4.82	03 30.2	+3.5	15 02 15.3
9 WE	17 13 46	+959	+306.30	+4.74	03 33.7	+2.9	15 06 11.8
10 TH	17 29 45	+941	+311.04	+4.64	03 36.6	+2.3	15 10 08.4
11 FR	17 45 26	+924	+315.68	+4.57	03 38.9	+1.8	15 14 05.0
12 SA	18 00 50	+906	+320.25	+4.47	03 40.7	+1.2	15 18 01.5
13 SU	18 15 56	+887	+324.72	+4.38	03 41.9	+.6	15 21 58.1
14 MO	18 30 43	+869	+329.10	+4.29	03 42.5	+0.0	15 25 54.6
15 TU	18 45 12	+850	+333.39	+4.20	03 42.5	-.5	15 29 51.2
16 WE	18 59 22	+830	+337.59	+4.10	03 42.0	-1.2	15 33 47.8
17 TH	19 13 12	+811	+341.69	+4.00	03 40.8	-1.7	15 37 44.3
18 FR	19 26 43	+791	+345.69	+3.91	03 39.1	-2.3	15 41 40.9
19 SA	19 39 54	+772	+349.60	+3.81	03 36.8	-2.8	15 45 37.4
20 SU	19 52 46	+750	+353.41	+3.71	03 34.0	-3.5	15 49 34.0
21 MO	20 05 16	+731	+357.12	+3.61	03 30.5	-4.0	15 53 30.5
22 TU	20 17 27	+709	+360.73	+3.50	03 26.5	-4.5	15 57 27.1
23 WE	20 29 16	+688	+364.23	+3.39	03 22.0	-5.1	16 01 23.6
24 TH	20 40 44	+667	+367.62	+3.30	03 16.9	-5.6	16 05 20.2
25 FR	20 51 51	+646	+370.92	+3.19	03 11.3	-6.0	16 09 16.8
26 SA	21 02 37	+624	+374.11	+3.08	03 05.3	-6.6	16 13 13.3
27 SU	21 13 01	+601	+377.19	+2.97	02 58.7	-7.0	16 17 09.9
28 MO	21 23 02	+580	+380.16	+2.86	02 51.7	-7.5	16 21 06.5
29 TU	21 32 42	+556	+383.02	+2.75	02 44.2	-7.9	16 25 03.0
30 WE	21 41 58	+535	+385.77	+2.64	02 36.3	-8.3	16 28 59.6
31 TH	21 50 53	+535	+388.41	+2.64	02 28.0	-8.3	16 32 56.1

Table 2c. Sun, 1990, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
JUN 1 FR	21 59 24		+390.93		02 19.3		16 36 52.7
		+488		+2.41		-9.2	
2 SA	22 07 32		+393.34		02 10.1		16 40 49.2
		+466		+2.30		-9.4	
3 SU	22 15 18		+395.64		02 00.7		16 44 45.8
		+441		+2.18		-9.9	
4 MO	22 22 39		+397.82		01 50.8		16 48 42.3
		+419		+2.07		-10.1	
5 TU	22 29 38		+399.89		01 40.7		16 52 38.9
		+395		+1.95		-10.5	
6 WE	22 36 13		+401.84		01 30.2		16 56 35.4
		+371		+1.83		-10.8	
7 TH	22 42 24		+403.67		01 19.4		17 00 32.0
		+347		+1.72		-11.2	
8 FR	22 48 11		+405.39		01 08.2		17 04 28.6
		+323		+1.59		-11.3	
9 SA	22 53 34		+406.98		00 56.9		17 08 25.1
		+299		+1.48		-11.7	
10 SU	22 58 33		+408.46		00 45.2		17 12 21.7
		+275		+1.36		-11.8	
11 MO	23 03 08		+409.82		00 33.4		17 16 18.3
		+251		+1.24		-12.1	
12 TU	23 07 19		+411.06		00 21.3		17 20 14.8
		+226		+1.11		-12.3	
13 WE	23 11 05		+412.17		00 09.0		17 24 11.4
		+202		+1.00		-12.5	
14 TH	23 14 27		+413.17		-00 03.5		17 28 07.9
		+177		+.87		-12.7	
15 FR	23 17 24		+414.04		-00 16.2		17 32 04.5
		+152		+.76		-12.8	
16 SA	23 19 56		+414.80		-00 29.0		17 36 01.0
		+128		+.63		-12.9	
17 SU	23 22 04		+415.43		-00 41.9		17 39 57.6
		+103		+.51		-13.1	
18 MO	23 23 47		+415.94		-00 55.0		17 43 54.1
		+78		+.38		-13.1	
19 TU	23 25 05		+416.32		-01 08.1		17 47 50.7
		+53		+.26		-13.1	
20 WE	23 25 58		+416.58		-01 21.2		17 51 47.3
		+28		+.14		-13.2	
21 TH	23 26 26		+416.72		-01 34.4		17 55 43.8
		+4		+.02		-13.2	
22 FR	23 26 30		+416.74		-01 47.6		17 59 40.4
		-21		-.10		-13.1	
23 SA	23 26 09		+416.64		-02 00.7		18 03 37.0
		-46		-.23		-13.1	
24 SU	23 25 23		+416.41		-02 13.8		18 07 33.5
		-71		-.35		-13.0	
25 MO	23 24 12		+416.06		-02 26.8		18 11 30.1
		-96		-.47		-12.8	
26 TU	23 22 36		+415.59		-02 39.6		18 15 26.6
		-120		-.60		-12.7	
27 WE	23 20 36		+414.99		-02 52.3		18 19 23.2
		-145		-.71		-12.6	
28 TH	23 18 11		+414.28		-03 04.9		18 23 19.8
		-169		-.84		-12.3	
29 FR	23 15 22		+413.44		-03 17.2		18 27 16.3
		-194		-.96		-12.1	
30 SA	23 12 08		+412.48		-03 29.3		18 31 12.9
		-194		-.96		-12.1	

Table 2c. Sun, 1990, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
JUL 1 SU	23 08 30		+411.41		-03 41.2		18 35 09.4
		-243		-1.20		-11.6	
2 MO	23 04 27		+410.21		-03 52.8		18 39 06.0
		-267		-1.32		-11.3	
3 TU	23 00 00		+408.89		-04 04.1		18 43 02.5
		-290		-1.43		-11.0	
4 WE	22 55 10		+407.46		-04 15.1		18 46 59.1
		-315		-1.56		-10.7	
5 TH	22 49 55		+405.90		-04 25.8		18 50 55.6
		-338		-1.67		-10.3	
6 FR	22 44 17		+404.23		-04 36.1		18 54 52.2
		-362		-1.79		-10.0	
7 SA	22 38 15		+402.44		-04 46.1		18 58 48.8
		-386		-1.90		-9.7	
8 SU	22 31 49		+400.54		-04 55.8		19 02 45.3
		-408		-2.02		-9.2	
9 MO	22 25 01		+398.52		-05 05.0		19 06 41.9
		-432		-2.13		-8.8	
10 TU	22 17 49		+396.39		-05 13.8		19 10 38.5
		-456		-2.25		-8.5	
11 WE	22 10 13		+394.14		-05 22.3		19 14 35.0
		-477		-2.36		-8.0	
12 TH	22 02 16		+391.78		-05 30.3		19 18 31.6
		-501		-2.47		-7.5	
13 FR	21 53 55		+389.31		-05 37.8		19 22 28.1
		-523		-2.58		-7.1	
14 SA	21 45 12		+386.73		-05 44.9		19 26 24.7
		-546		-2.70		-6.7	
15 SU	21 36 06		+384.03		-05 51.6		19 30 21.2
		-568		-2.81		-6.1	
16 MO	21 26 38		+381.22		-05 57.7		19 34 17.8
		-590		-2.91		-5.7	
17 TU	21 16 48		+378.31		-06 03.4		19 38 14.3
		-611		-3.02		-5.2	
18 WE	21 06 37		+375.29		-06 08.6		19 42 10.9
		-633		-3.12		-4.6	
19 TH	20 56 04		+372.17		-06 13.2		19 46 07.5
		-655		-3.24		-4.2	
20 FR	20 45 09		+368.93		-06 17.4		19 50 04.0
		-675		-3.33		-3.6	
21 SA	20 33 54		+365.60		-06 21.0		19 54 00.6
		-696		-3.44		-3.0	
22 SU	20 22 18		+362.16		-06 24.0		19 57 57.2
		-717		-3.54		-2.5	
23 MO	20 10 21		+358.62		-06 26.5		20 01 53.7
		-737		-3.64		-1.8	
24 TU	19 58 04		+354.98		-06 28.3		20 05 50.3
		-756		-3.73		-1.3	
25 WE	19 45 28		+351.25		-06 29.6		20 09 46.8
		-777		-3.84		-.7	
26 TH	19 32 31		+347.41		-06 30.3		20 13 43.4
		-796		-3.93		-.1	
27 FR	19 19 15		+343.48		-06 30.4		20 17 39.9
		-815		-4.02		+.6	
28 SA	19 05 40		+339.46		-06 29.8		20 21 36.5
		-834		-4.12		+1.1	
29 SU	18 51 46		+335.34		-06 28.7		20 25 33.0
		-852		-4.21		+1.8	
30 MO	18 37 34		+331.13		-06 26.9		20 29 29.6
		-871		-4.30		+2.4	
31 TU	18 23 03		+326.83		-06 24.5		20 33 26.1
		-871		-4.30		+2.4	

Table 2c. Sun, 1990, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
AUG 1 WE	18 08 15		+322.44		-06 21.4		20 37 22.7
		-906		-4.47		+3.6	
2 TH	17 53 09		+317.97		-06 17.8		20 41 19.3
		-924		-4.56		+4.3	
3 FR	17 37 45		+313.41		-06 13.5		20 45 15.8
		-941		-4.65		+4.9	
4 SA	17 22 04		+308.76		-06 08.6		20 49 12.4
		-957		-4.73		+5.5	
5 SU	17 06 07		+304.03		-06 03.1		20 53 08.9
		-974		-4.81		+6.1	
6 MO	16 49 53		+299.22		-05 57.0		20 57 05.5
		-991		-4.89		+6.7	
7 TU	16 33 22		+294.33		-05 50.3		21 01 02.1
		-1006		-4.97		+7.3	
8 WE	16 16 36		+289.36		-05 43.0		21 04 58.6
		-1022		-5.04		+7.9	
9 TH	15 59 34		+284.32		-05 35.1		21 08 55.2
		-1038		-5.13		+8.5	
10 FR	15 42 16		+279.19		-05 26.6		21 12 51.7
		-1053		-5.20		+9.0	
11 SA	15 24 43		+273.99		-05 17.6		21 16 48.3
		-1067		-5.27		+9.6	
12 SU	15 06 56		+268.72		-05 08.0		21 20 44.8
		-1083		-5.35		+10.1	
13 MO	14 48 53		+263.37		-04 57.9		21 24 41.4
		-1096		-5.41		+10.7	
14 TU	14 30 37		+257.96		-04 47.2		21 28 37.9
		-1111		-5.49		+11.2	
15 WE	14 12 06		+252.47		-04 36.0		21 32 34.5
		-1124		-5.55		+11.7	
16 TH	13 53 22		+246.92		-04 24.3		21 36 31.0
		-1138		-5.62		+12.2	
17 FR	13 34 24		+241.30		-04 12.1		21 40 27.6
		-1150		-5.68		+12.7	
18 SA	13 15 14		+235.62		-03 59.4		21 44 24.2
		-1164		-5.74		+13.2	
19 SU	12 55 50		+229.88		-03 46.2		21 48 20.7
		-1175		-5.81		+13.7	
20 MO	12 36 15		+224.07		-03 32.5		21 52 17.3
		-1188		-5.86		+14.2	
21 TU	12 16 27		+218.21		-03 18.3		21 56 13.8
		-1199		-5.92		+14.7	
22 WE	11 56 28		+212.29		-03 03.6		22 00 10.4
		-1210		-5.98		+15.1	
23 TH	11 36 18		+206.31		-02 48.5		22 04 06.9
		-1222		-6.03		+15.5	
24 FR	11 15 56		+200.28		-02 33.0		22 08 03.5
		-1232		-6.09		+16.0	
25 SA	10 55 24		+194.19		-02 17.0		22 12 00.0
		-1242		-6.13		+16.5	
26 SU	10 34 42		+188.06		-02 00.5		22 15 56.6
		-1252		-6.18		+16.8	
27 MO	10 13 50		+181.88		-01 43.7		22 19 53.1
		-1262		-6.24		+17.3	
28 TU	09 52 48		+175.64		-01 26.4		22 23 49.7
		-1271		-6.27		+17.6	
29 WE	09 31 37		+169.37		-01 08.8		22 27 46.2
		-1280		-6.32		+18.1	
30 TH	09 10 17		+163.05		-00 50.7		22 31 42.8
		-1289		-6.37		+18.3	
31 FR	08 48 48		+156.68		-00 32.4		22 35 39.4
		-1289		-6.37		+18.3	

Table 2c. Sun, 1990, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
SEP 1 SA	08 27 11	-1306	+150.28	-6.45	-00 13.7	+19.1	22 39 35.9
2 SU	08 05 25	-1313	+143.83	-6.49	00 05.4	+19.3	22 43 32.5
3 MO	07 43 32	-1320	+137.34	-6.52	00 24.7	+19.6	22 47 29.0
4 TU	07 21 32	-1327	+130.82	-6.55	00 44.3	+19.9	22 51 25.6
5 WE	06 59 25	-1335	+124.27	-6.59	01 04.2	+20.1	22 55 22.1
6 TH	06 37 10	-1340	+117.68	-6.62	01 24.3	+20.3	22 59 18.7
7 FR	06 14 50	-1348	+111.06	-6.66	01 44.6	+20.5	23 03 15.2
8 SA	05 52 22	-1353	+104.40	-6.68	02 05.1	+20.7	23 07 11.8
9 SU	05 29 49	-1358	+97.72	-6.70	02 25.8	+20.8	23 11 08.3
10 MO	05 07 11	-1365	+91.02	-6.74	02 46.6	+21.0	23 15 04.9
11 TU	04 44 26	-1369	+84.28	-6.76	03 07.6	+21.1	23 19 01.4
12 WE	04 21 37	-1374	+77.52	-6.79	03 28.7	+21.1	23 22 58.0
13 TH	03 58 43	-1378	+70.73	-6.80	03 49.8	+21.2	23 26 54.6
14 FR	03 35 45	-1382	+63.93	-6.83	04 11.0	+21.3	23 30 51.1
15 SA	03 12 43	-1386	+57.10	-6.84	04 32.3	+21.3	23 34 47.7
16 SU	02 49 37	-1389	+50.26	-6.86	04 53.6	+21.3	23 38 44.2
17 MO	02 26 28	-1392	+43.40	-6.88	05 14.9	+21.4	23 42 40.8
18 TU	02 03 16	-1395	+36.52	-6.89	05 36.3	+21.3	23 46 37.3
19 WE	01 40 01	-1397	+29.63	-6.89	05 57.6	+21.2	23 50 33.9
20 TH	01 16 44	-1399	+22.74	-6.91	06 18.8	+21.3	23 54 30.4
21 FR	00 53 25	-1400	+15.83	-6.92	06 40.1	+21.1	23 58 27.0
22 SA	00 30 05	-1401	+8.91	-6.91	07 01.2	+21.1	00 02 23.5
23 SU	00 06 44	-1402	+2.00	-6.93	07 22.3	+21.0	00 06 20.1
24 MO	-00 16 38	-1403	-4.93	-6.93	07 43.3	+20.8	00 10 16.6
25 TU	-00 40 01	-1403	-11.86	-6.93	08 04.1	+20.7	00 14 13.2
26 WE	-01 03 24	-1402	-18.79	-6.92	08 24.8	+20.5	00 18 09.7
27 TH	-01 26 46	-1402	-25.71	-6.92	08 45.3	+20.4	00 22 06.3
28 FR	-01 50 08	-1401	-32.63	-6.92	09 05.7	+20.2	00 26 02.9
29 SA	-02 13 29	-1399	-39.55	-6.91	09 25.9	+19.9	00 29 59.4
30 SU	-02 36 48	-1399	-46.46	-6.91	09 45.8	+19.9	00 33 56.0

Table 2c. Sun, 1990, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
OCT 1 MO	-03 00 06	-1396	-53.36	-6.90	10 05.5	+19.5	00 37 52.5
2 TU	-03 23 22	-1394	-60.26	-6.88	10 25.0	+19.1	00 41 49.1
3 WE	-03 46 36	-1390	-67.14	-6.86	10 44.1	+18.8	00 45 45.6
4 TH	-04 09 46	-1389	-74.00	-6.86	11 02.9	+18.5	00 49 42.2
5 FR	-04 32 55	-1384	-80.86	-6.84	11 21.4	+18.2	00 53 38.7
6 SA	-04 55 59	-1381	-87.70	-6.82	11 39.6	+17.7	00 57 35.3
7 SU	-05 19 00	-1378	-94.52	-6.80	11 57.3	+17.4	01 01 31.8
8 MO	-05 41 58	-1373	-101.32	-6.78	12 14.7	+16.9	01 05 28.4
9 TU	-06 04 51	-1368	-108.10	-6.76	12 31.6	+16.4	01 09 24.9
10 WE	-06 27 39	-1364	-114.86	-6.74	12 48.0	+16.0	01 13 21.5
11 TH	-06 50 23	-1358	-121.60	-6.70	13 04.0	+15.5	01 17 18.1
12 FR	-07 13 01	-1352	-128.30	-6.68	13 19.5	+15.0	01 21 14.6
13 SA	-07 35 33	-1346	-134.98	-6.64	13 34.5	+14.4	01 25 11.2
14 SU	-07 57 59	-1339	-141.62	-6.62	13 48.9	+13.9	01 29 07.7
15 MO	-08 20 18	-1333	-148.24	-6.58	14 02.8	+13.4	01 33 04.3
16 TU	-08 42 31	-1325	-154.82	-6.54	14 16.2	+12.7	01 37 00.8
17 WE	-09 04 36	-1317	-161.36	-6.51	14 28.9	+12.2	01 40 57.4
18 TH	-09 26 33	-1309	-167.87	-6.46	14 41.1	+11.6	01 44 53.9
19 FR	-09 48 22	-1301	-174.33	-6.43	14 52.7	+10.9	01 48 50.5
20 SA	-10 10 03	-1292	-180.76	-6.38	15 03.6	+10.3	01 52 47.0
21 SU	-10 31 35	-1282	-187.14	-6.33	15 13.9	+9.7	01 56 43.6
22 MO	-10 52 57	-1272	-193.47	-6.28	15 23.6	+9.0	02 00 40.1
23 TU	-11 14 09	-1262	-199.75	-6.23	15 32.6	+8.3	02 04 36.7
24 WE	-11 35 11	-1252	-205.98	-6.18	15 40.9	+7.7	02 08 33.2
25 TH	-11 56 03	-1241	-212.16	-6.13	15 48.6	+6.9	02 12 29.8
26 FR	-12 16 44	-1229	-218.29	-6.07	15 55.5	+6.3	02 16 26.4
27 SA	-12 37 13	-1217	-224.36	-6.01	16 01.8	+5.5	02 20 22.9
28 SU	-12 57 30	-1205	-230.37	-5.95	16 07.3	+4.8	02 24 19.5
29 MO	-13 17 35	-1193	-236.32	-5.89	16 12.1	+4.1	02 28 16.0
30 TU	-13 37 28	-1179	-242.21	-5.82	16 16.2	+3.3	02 32 12.6
31 WE	-13 57 07	-1179	-248.03	-5.82	16 19.5	+3.3	02 36 09.1

Table 2c. Sun, 1990, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
NOV 1 TH	-14 16 34		-253.80		16 22.0		02 40 05.7
		-1152		-5.69		+1.7	
2 FR	-14 35 46		-259.49		16 23.7		02 44 02.2
		-1138		-5.62		+1.0	
3 SA	-14 54 44		-265.11		16 24.7		02 47 58.8
		-1124		-5.55		+.1	
4 SU	-15 13 28		-270.66		16 24.8		02 51 55.3
		-1109		-5.47		-.7	
5 MO	-15 31 57		-276.13		16 24.1		02 55 51.9
		-1094		-5.41		-1.5	
6 TU	-15 50 11		-281.54		16 22.6		02 59 48.5
		-1078		-5.32		-2.4	
7 WE	-16 08 09		-286.86		16 20.2		03 03 45.0
		-1062		-5.24		-3.2	
8 TH	-16 25 51		-292.10		16 17.0		03 07 41.6
		-1046		-5.17		-4.1	
9 FR	-16 43 17		-297.27		16 12.9		03 11 38.2
		-1028		-5.08		-4.9	
10 SA	-17 00 25		-302.35		16 08.0		03 15 34.7
		-1012		-4.99		-5.8	
11 SU	-17 17 17		-307.34		16 02.2		03 19 31.3
		-993		-4.91		-6.7	
12 MO	-17 33 50		-312.25		15 55.5		03 23 27.8
		-976		-4.82		-7.5	
13 TU	-17 50 06		-317.07		15 48.0		03 27 24.4
		-957		-4.72		-8.5	
14 WE	-18 06 03		-321.79		15 39.5		03 31 20.9
		-938		-4.63		-9.2	
15 TH	-18 21 41		-326.42		15 30.3		03 35 17.5
		-918		-4.54		-10.2	
16 FR	-18 36 59		-330.96		15 20.1		03 39 14.0
		-899		-4.44		-10.9	
17 SA	-18 51 58		-335.40		15 09.2		03 43 10.6
		-879		-4.34		-11.9	
18 SU	-19 06 37		-339.74		14 57.3		03 47 07.1
		-858		-4.24		-12.6	
19 MO	-19 20 55		-343.98		14 44.7		03 51 03.7
		-837		-4.13		-13.5	
20 TU	-19 34 52		-348.11		14 31.2		03 55 00.3
		-816		-4.03		-14.3	
21 WE	-19 48 28		-352.14		14 16.9		03 58 56.8
		-795		-3.92		-15.0	
22 TH	-20 01 43		-356.06		14 01.9		04 02 53.4
		-772		-3.82		-15.9	
23 FR	-20 14 35		-359.88		13 46.0		04 06 49.9
		-750		-3.70		-16.6	
24 SA	-20 27 05		-363.58		13 29.4		04 10 46.5
		-727		-3.59		-17.4	
25 SU	-20 39 12		-367.17		13 12.0		04 14 43.1
		-704		-3.48		-18.1	
26 MO	-20 50 56		-370.65		12 53.9		04 18 39.6
		-681		-3.36		-18.9	
27 TU	-21 02 17		-374.01		12 35.0		04 22 36.2
		-657		-3.24		-19.6	
28 WE	-21 13 14		-377.25		12 15.4		04 26 32.7
		-633		-3.13		-20.2	
29 TH	-21 23 47		-380.38		11 55.2		04 30 29.3
		-609		-3.01		-21.0	
30 FR	-21 33 56		-383.39		11 34.2		04 34 25.8
		-609		-3.01		-21.0	

Table 2c. Sun, 1990, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
DEC 1 SA	-21 43 40		-386.27		11 12.6		04 38 22.4
		-559		-2.76		-22.2	
2 SU	-21 52 59		-389.03		10 50.4		04 42 18.9
		-534		-2.64		-22.9	
3 MO	-22 01 53		-391.67		10 27.5		04 46 15.5
		-509		-2.51		-23.5	
4 TU	-22 10 22		-394.18		10 04.0		04 50 12.1
		-483		-2.39		-24.1	
5 WE	-22 18 25		-396.57		09 39.9		04 54 08.6
		-458		-2.26		-24.7	
6 TH	-22 26 03		-398.83		09 15.2		04 58 05.2
		-431		-2.13		-25.2	
7 FR	-22 33 14		-400.96		08 50.0		05 02 01.8
		-404		-1.99		-25.8	
8 SA	-22 39 58		-402.95		08 24.2		05 05 58.3
		-378		-1.87		-26.2	
9 SU	-22 46 16		-404.82		07 58.0		05 09 54.9
		-352		-1.74		-26.8	
10 MO	-22 52 08		-406.56		07 31.2		05 13 51.4
		-324		-1.60		-27.2	
11 TU	-22 57 32		-408.16		07 04.0		05 17 48.0
		-297		-1.46		-27.6	
12 WE	-23 02 29		-409.62		06 36.4		05 21 44.5
		-269		-1.33		-28.0	
13 TH	-23 06 58		-410.95		06 08.4		05 25 41.1
		-242		-1.20		-28.4	
14 FR	-23 11 00		-412.15		05 40.0		05 29 37.6
		-214		-1.05		-28.7	
15 SA	-23 14 34		-413.20		05 11.3		05 33 34.2
		-186		-.92		-28.9	
16 SU	-23 17 40		-414.12		04 42.4		05 37 30.8
		-159		-.79		-29.2	
17 MO	-23 20 19		-414.91		04 13.2		05 41 27.3
		-130		-.64		-29.4	
18 TU	-23 22 29		-415.55		03 43.8		05 45 23.9
		-103		-.51		-29.6	
19 WE	-23 24 12		-416.06		03 14.2		05 49 20.5
		-74		-.36		-29.8	
20 TH	-23 25 26		-416.42		02 44.4		05 53 17.0
		-46		-.23		-29.8	
21 FR	-23 26 12		-416.65		02 14.6		05 57 13.6
		-17		-.09		-29.9	
22 SA	-23 26 29		-416.74		01 44.7		06 01 10.1
		+10		+.05		-29.9	
23 SU	-23 26 19		-416.69		01 14.8		06 05 06.7
		+39		+.20		-29.9	
24 MO	-23 25 40		-416.49		00 44.9		06 09 03.2
		+67		+.33		-29.8	
25 TU	-23 24 33		-416.16		00 15.1		06 12 59.8
		+95		+.47		-29.8	
26 WE	-23 22 58		-415.69		-00 14.7		06 16 56.3
		+124		+.61		-29.6	
27 TH	-23 20 54		-415.08		-00 44.3		06 20 52.9
		+151		+.74		-29.5	
28 FR	-23 18 23		-414.34		-01 13.8		06 24 49.5
		+180		+.89		-29.3	
29 SA	-23 15 23		-413.45		-01 43.1		06 28 46.0
		+207		+1.03		-29.1	
30 SU	-23 11 56		-412.42		-02 12.2		06 32 42.6
		+235		+1.16		-28.8	
31 MO	-23 08 01		-411.26		-02 41.0		06 36 39.2
		+263		+1.29		-28.6	
32 TU	-23 03 38		-409.97		-03 09.6		06 40 35.7

Table 2d. Sun, 1991, for Zero Hours Universal Time (GMT)

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
JAN 0 MO	-23 08 01		-411.26		-02 41.0		06 36 39.2
		+263		+1.29		-28.6	
JAN 1 TU	-23 03 38		-409.97		-03 09.6		06 40 35.7
		+291		+1.44		-28.3	
2 WE	-22 58 47		-408.53		-03 37.9		06 44 32.3
		+318		+1.57		-27.9	
3 TH	-22 53 29		-406.96		-04 05.8		06 48 28.9
		+345		+1.71		-27.7	
4 FR	-22 47 44		-405.25		-04 33.5		06 52 25.4
		+372		+1.83		-27.2	
5 SA	-22 41 32		-403.42		-05 00.7		06 56 22.0
		+400		+1.98		-26.9	
6 SU	-22 34 52		-401.44		-05 27.6		07 00 18.5
		+426		+2.10		-26.4	
7 MO	-22 27 46		-399.34		-05 54.0		07 04 15.1
		+453		+2.24		-26.0	
8 TU	-22 20 13		-397.10		-06 20.0		07 08 11.6
		+480		+2.37		-25.5	
9 WE	-22 12 13		-394.73		-06 45.5		07 12 08.2
		+506		+2.50		-25.0	
10 TH	-22 03 47		-392.23		-07 10.5		07 16 04.7
		+531		+2.62		-24.4	
11 FR	-21 54 56		-389.61		-07 34.9		07 20 01.3
		+558		+2.76		-23.9	
12 SA	-21 45 38		-386.85		-07 58.8		07 23 57.8
		+582		+2.87		-23.3	
13 SU	-21 35 56		-383.98		-08 22.1		07 27 54.4
		+608		+3.00		-22.7	
14 MO	-21 25 48		-380.98		-08 44.8		07 31 51.0
		+633		+3.13		-22.1	
15 TU	-21 15 15		-377.85		-09 06.9		07 35 47.5
		+657		+3.24		-21.5	
16 WE	-21 04 18		-374.61		-09 28.4		07 39 44.1
		+681		+3.37		-20.7	
17 TH	-20 52 57		-371.24		-09 49.1		07 43 40.7
		+706		+3.48		-20.0	
18 FR	-20 41 11		-367.76		-10 09.1		07 47 37.2
		+729		+3.60		-19.4	
19 SA	-20 29 02		-364.16		-10 28.5		07 51 33.8
		+752		+3.72		-18.6	
20 SU	-20 16 30		-360.44		-10 47.1		07 55 30.3
		+774		+3.82		-17.8	
21 MO	-20 03 36		-356.62		-11 04.9		07 59 26.9
		+798		+3.94		-17.1	
22 TU	-19 50 18		-352.68		-11 22.0		08 03 23.4
		+819		+4.04		-16.3	
23 WE	-19 36 39		-348.64		-11 38.3		08 07 20.0
		+841		+4.16		-15.5	
24 TH	-19 22 38		-344.48		-11 53.8		08 11 16.5
		+863		+4.26		-14.7	
25 FR	-19 08 15		-340.22		-12 08.5		08 15 13.1
		+883		+4.36		-13.9	
26 SA	-18 53 32		-335.86		-12 22.4		08 19 09.6
		+904		+4.46		-13.0	
27 SU	-18 38 28		-331.40		-12 35.4		08 23 06.2
		+925		+4.57		-12.3	
28 MO	-18 23 03		-326.83		-12 47.7		08 27 02.8
		+944		+4.66		-11.4	
29 TU	-18 07 19		-322.17		-12 59.1		08 30 59.3
		+963		+4.76		-10.6	
30 WE	-17 51 16		-317.41		-13 09.7		08 34 55.9
		+983		+4.85		-9.8	
31 TH	-17 34 53		-312.56		-13 19.5		08 38 52.5
		+983		+4.85		-9.8	

Table 2d. Sun, 1991, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
FEB 1 FR	-17 18 11		-307.61		-13 28.5		08 42 49.0
		+1019		+5.03		-8.2	
2 SA	-17 01 12		-302.58		-13 36.7		08 46 45.6
		+1038		+5.13		-7.3	
3 SU	-16 43 54		-297.45		-13 44.0		08 50 42.1
		+1056		+5.21		-6.6	
4 MO	-16 26 18		-292.24		-13 50.6		08 54 38.7
		+1072		+5.30		-5.8	
5 TU	-16 08 26		-286.94		-13 56.4		08 58 35.2
		+1090		+5.38		-4.9	
6 WE	-15 50 16		-281.56		-14 01.3		09 02 31.8
		+1106		+5.46		-4.2	
7 TH	-15 31 50		-276.10		-14 05.5		09 06 28.3
		+1122		+5.54		-3.4	
8 FR	-15 13 08		-270.56		-14 08.9		09 10 24.9
		+1137		+5.62		-2.6	
9 SA	-14 54 11		-264.94		-14 11.5		09 14 21.4
		+1153		+5.69		-1.9	
10 SU	-14 34 58		-259.25		-14 13.4		09 18 18.0
		+1168		+5.77		-1.1	
11 MO	-14 15 30		-253.48		-14 14.5		09 22 14.6
		+1181		+5.83		-.3	
12 TU	-13 55 49		-247.65		-14 14.8		09 26 11.1
		+1196		+5.91		+.4	
13 WE	-13 35 53		-241.74		-14 14.4		09 30 07.7
		+1209		+5.97		+1.2	
14 TH	-13 15 44		-235.77		-14 13.2		09 34 04.2
		+1222		+6.03		+2.0	
15 FR	-12 55 22		-229.74		-14 11.2		09 38 00.8
		+1234		+6.10		+2.6	
16 SA	-12 34 48		-223.64		-14 08.6		09 41 57.3
		+1246		+6.15		+3.4	
17 SU	-12 14 02		-217.49		-14 05.2		09 45 53.9
		+1259		+6.22		+4.1	
18 MO	-11 53 03		-211.27		-14 01.1		09 49 50.4
		+1269		+6.26		+4.8	
19 TU	-11 31 54		-205.01		-13 56.3		09 53 47.0
		+1280		+6.32		+5.5	
20 WE	-11 10 34		-198.69		-13 50.8		09 57 43.5
		+1291		+6.38		+6.2	
21 TH	-10 49 03		-192.31		-13 44.6		10 01 40.1
		+1301		+6.42		+6.9	
22 FR	-10 27 22		-185.89		-13 37.7		10 05 36.6
		+1310		+6.47		+7.5	
23 SA	-10 05 32		-179.42		-13 30.2		10 09 33.2
		+1319		+6.52		+8.2	
24 SU	-09 43 33		-172.90		-13 22.0		10 13 29.8
		+1328		+6.55		+8.7	
25 MO	-09 21 25		-166.35		-13 13.3		10 17 26.3
		+1336		+6.60		+9.4	
26 TU	-08 59 09		-159.75		-13 03.9		10 21 22.9
		+1344		+6.64		+10.0	
27 WE	-08 36 45		-153.11		-12 53.9		10 25 19.5
		+1352		+6.68		+10.5	
28 TH	-08 14 13		-146.43		-12 43.4		10 29 16.0
		+1352		+6.68		+10.5	

Table 2d. Sun, 1991, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
MAR 1 FR	-07 51 34	+1366	-139.72	+6.74	-12 32.3	+11.6	10 33 12.6
2 SA	-07 28 48	+1372	-132.98	+6.78	-12 20.7	+12.1	10 37 09.1
3 SU	-07 05 56	+1379	-126.20	+6.81	-12 08.6	+12.6	10 41 05.6
4 MO	-06 42 57	+1384	-119.39	+6.83	-11 56.0	+13.0	10 45 02.2
5 TU	-06 19 53	+1389	-112.56	+6.86	-11 43.0	+13.5	10 48 58.7
6 WE	-05 56 44	+1395	-105.70	+6.89	-11 29.5	+13.9	10 52 55.3
7 TH	-05 33 29	+1399	-98.81	+6.91	-11 15.6	+14.2	10 56 51.9
8 FR	-05 10 10	+1404	-91.90	+6.93	-11 01.4	+14.7	11 00 48.4
9 SA	-04 46 46	+1407	-84.97	+6.95	-10 46.7	+15.0	11 04 45.0
10 SU	-04 23 19	+1411	-78.02	+6.97	-10 31.7	+15.3	11 08 41.5
11 MO	-03 59 48	+1413	-71.05	+6.98	-10 16.4	+15.6	11 12 38.1
12 TU	-03 36 15	+1417	-64.07	+6.99	-10 00.8	+16.0	11 16 34.6
13 WE	-03 12 38	+1418	-57.08	+7.01	-09 44.8	+16.2	11 20 31.2
14 TH	-02 49 00	+1421	-50.07	+7.01	-09 28.6	+16.5	11 24 27.7
15 FR	-02 25 19	+1422	-43.06	+7.03	-09 12.1	+16.7	11 28 24.3
16 SA	-02 01 37	+1423	-36.03	+7.02	-08 55.4	+16.9	11 32 20.8
17 SU	-01 37 54	+1423	-29.01	+7.03	-08 38.5	+17.2	11 36 17.4
18 MO	-01 14 11	+1424	-21.98	+7.03	-08 21.3	+17.3	11 40 13.9
19 TU	-00 50 27	+1424	-14.95	+7.03	-08 04.0	+17.6	11 44 10.5
20 WE	-00 26 43	+1424	-7.92	+7.04	-07 46.4	+17.6	11 48 07.0
21 TH	-00 02 59	+1422	-.88	+7.02	-07 28.8	+17.9	11 52 03.6
22 FR	00 20 43	+1421	+6.14	+7.02	-07 10.9	+17.9	11 56 00.2
23 SA	00 44 24	+1420	+13.16	+7.01	-06 53.0	+18.1	11 59 56.7
24 SU	01 08 04	+1418	+20.17	+7.00	-06 34.9	+18.1	12 03 53.3
25 MO	01 31 42	+1415	+27.17	+6.99	-06 16.8	+18.2	12 07 49.8
26 TU	01 55 17	+1413	+34.16	+6.98	-05 58.6	+18.3	12 11 46.4
27 WE	02 18 50	+1409	+41.14	+6.95	-05 40.3	+18.2	12 15 42.9
28 TH	02 42 19	+1407	+48.09	+6.95	-05 22.1	+18.3	12 19 39.5
29 FR	03 05 46	+1402	+55.04	+6.93	-05 03.8	+18.2	12 23 36.0
30 SA	03 29 08	+1399	+61.97	+6.90	-04 45.6	+18.2	12 27 32.6
31 SU	03 52 27	+1399	+68.87	+6.90	-04 27.4	+18.2	12 31 29.1

Table 2d. Sun, 1991, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES	MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
APR 1 MO	04 15 42		+75.76		-04 09.4		12 35 25.7
		+1390		+6.87		+18.0	
2 TU	04 38 52		+82.63		-03 51.4		12 39 22.2
		+1385		+6.84		+17.9	
3 WE	05 01 57		+89.47		-03 33.5		12 43 18.8
		+1380		+6.81		+17.7	
4 TH	05 24 57		+96.28		-03 15.8		12 47 15.3
		+1374		+6.79		+17.6	
5 FR	05 47 51		+103.07		-02 58.2		12 51 11.9
		+1368		+6.75		+17.4	
6 SA	06 10 39		+109.82		-02 40.8		12 55 08.5
		+1362		+6.73		+17.1	
7 SU	06 33 21		+116.55		-02 23.7		12 59 05.0
		+1355		+6.69		+17.0	
8 MO	06 55 56		+123.24		-02 06.7		13 03 01.6
		+1349		+6.66		+16.7	
9 TU	07 18 25		+129.90		-01 50.0		13 06 58.1
		+1341		+6.62		+16.5	
10 WE	07 40 46		+136.52		-01 33.5		13 10 54.7
		+1333		+6.59		+16.1	
11 TH	08 02 59		+143.11		-01 17.4		13 14 51.2
		+1325		+6.54		+15.9	
12 FR	08 25 04		+149.65		-01 01.5		13 18 47.8
		+1317		+6.50		+15.6	
13 SA	08 47 01		+156.15		-00 45.9		13 22 44.3
		+1308		+6.46		+15.3	
14 SU	09 08 49		+162.61		-00 30.6		13 26 40.9
		+1299		+6.42		+14.9	
15 MO	09 30 28		+169.03		-00 15.7		13 30 37.4
		+1289		+6.36		+14.6	
16 TU	09 51 57		+175.39		-00 01.1		13 34 34.0
		+1280		+6.32		+14.2	
17 WE	10 13 17		+181.71		00 13.1		13 38 30.5
		+1269		+6.27		+13.9	
18 TH	10 34 26		+187.98		00 27.0		13 42 27.1
		+1259		+6.22		+13.5	
19 FR	10 55 25		+194.20		00 40.5		13 46 23.7
		+1248		+6.16		+13.1	
20 SA	11 16 13		+200.36		00 53.6		13 50 20.2
		+1237		+6.11		+12.7	
21 SU	11 36 50		+206.47		01 06.3		13 54 16.8
		+1225		+6.05		+12.4	
22 MO	11 57 15		+212.52		01 18.7		13 58 13.3
		+1213		+5.99		+11.9	
23 TU	12 17 28		+218.51		01 30.6		14 02 09.9
		+1201		+5.93		+11.4	
24 WE	12 37 29		+224.44		01 42.0		14 06 06.4
		+1188		+5.87		+11.0	
25 TH	12 57 17		+230.31		01 53.0		14 10 03.0
		+1176		+5.80		+10.6	
26 FR	13 16 53		+236.11		02 03.6		14 13 59.5
		+1162		+5.74		+10.1	
27 SA	13 36 15		+241.85		02 13.7		14 17 56.1
		+1149		+5.68		+9.6	
28 SU	13 55 24		+247.53		02 23.3		14 21 52.6
		+1135		+5.60		+9.0	
29 MO	14 14 19		+253.13		02 32.3		14 25 49.2
		+1122		+5.54		+8.6	
30 TU	14 33 01		+258.67		02 40.9		14 29 45.7
		+1122		+5.54		+8.6	

Table 2d. Sun, 1991, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
MAY 1 WE	14 51 28	+1092	+264.14	+5.39	02 49.0	+7.5	14 33 42.3
2 TH	15 09 40	+1077	+269.53	+5.32	02 56.5	+6.9	14 37 38.9
3 FR	15 27 37	+1062	+274.85	+5.24	03 03.4	+6.4	14 41 35.4
4 SA	15 45 19	+1047	+280.09	+5.17	03 09.8	+5.9	14 45 32.0
5 SU	16 02 46	+1030	+285.26	+5.09	03 15.7	+5.2	14 49 28.5
6 MO	16 19 56	+1015	+290.35	+5.01	03 20.9	+4.7	14 53 25.1
7 TU	16 36 51	+997	+295.36	+4.93	03 25.6	+4.1	14 57 21.7
8 WE	16 53 28	+981	+300.29	+4.84	03 29.7	+3.6	15 01 18.2
9 TH	17 09 49	+964	+305.13	+4.76	03 33.3	+2.9	15 05 14.8
10 FR	17 25 53	+947	+309.89	+4.68	03 36.2	+2.3	15 09 11.3
11 SA	17 41 40	+928	+314.57	+4.58	03 38.5	+1.8	15 13 07.9
12 SU	17 57 08	+911	+319.15	+4.50	03 40.3	+1.1	15 17 04.4
13 MO	18 12 19	+892	+323.65	+4.40	03 41.4	+.6	15 21 01.0
14 TU	18 27 11	+873	+328.05	+4.32	03 42.0	+0.0	15 24 57.5
15 WE	18 41 44	+855	+332.37	+4.22	03 42.0	-.5	15 28 54.1
16 TH	18 55 59	+835	+336.59	+4.12	03 41.5	-1.1	15 32 50.6
17 FR	19 09 54	+815	+340.71	+4.03	03 40.4	-1.7	15 36 47.2
18 SA	19 23 29	+796	+344.74	+3.93	03 38.7	-2.2	15 40 43.8
19 SU	19 36 45	+776	+348.67	+3.83	03 36.5	-2.7	15 44 40.3
20 MO	19 49 41	+755	+352.50	+3.73	03 33.8	-3.3	15 48 36.9
21 TU	20 02 16	+735	+356.23	+3.63	03 30.5	-3.7	15 52 33.4
22 WE	20 14 31	+714	+359.86	+3.52	03 26.8	-4.3	15 56 30.0
23 TH	20 26 25	+693	+363.38	+3.42	03 22.5	-4.8	16 00 26.6
24 FR	20 37 58	+672	+366.80	+3.32	03 17.7	-5.3	16 04 23.1
25 SA	20 49 10	+650	+370.12	+3.21	03 12.4	-5.8	16 08 19.7
26 SU	21 00 00	+629	+373.33	+3.11	03 06.6	-6.2	16 12 16.2
27 MO	21 10 29	+606	+376.44	+2.99	03 00.4	-6.8	16 16 12.8
28 TU	21 20 35	+585	+379.43	+2.89	02 53.6	-7.2	16 20 09.3
29 WE	21 30 20	+562	+382.32	+2.78	02 46.4	-7.6	16 24 05.9
30 TH	21 39 42	+540	+385.10	+2.66	02 38.8	-8.1	16 28 02.4
31 FR	21 48 42	+540	+387.76	+2.66	02 30.7	-8.1	16 31 59.0

Table 2d. Sun, 1991, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
JUN 1 SA	21 57 19		+390.32		02 22.2		16 35 55.6
		+494		+2.44		-9.0	
2 SU	22 05 33		+392.76		02 13.2		16 39 52.1
		+471		+2.32		-9.3	
3 MO	22 13 24		+395.08		02 03.9		16 43 48.7
		+448		+2.21		-9.8	
4 TU	22 20 52		+397.29		01 54.1		16 47 45.2
		+424		+2.10		-10.1	
5 WE	22 27 56		+399.39		01 44.0		16 51 41.8
		+401		+1.98		-10.5	
6 TH	22 34 37		+401.37		01 33.5		16 55 38.3
		+377		+1.86		-10.8	
7 FR	22 40 54		+403.23		01 22.7		16 59 34.9
		+353		+1.74		-11.2	
8 SA	22 46 47		+404.97		01 11.5		17 03 31.5
		+329		+1.63		-11.5	
9 SU	22 52 16		+406.60		01 00.0		17 07 28.0
		+305		+1.50		-11.7	
10 MO	22 57 21		+408.10		00 48.3		17 11 24.6
		+281		+1.39		-12.0	
11 TU	23 02 02		+409.49		00 36.3		17 15 21.1
		+256		+1.27		-12.2	
12 WE	23 06 18		+410.76		00 24.1		17 19 17.7
		+232		+1.14		-12.4	
13 TH	23 10 10		+411.90		00 11.7		17 23 14.3
		+207		+1.02		-12.6	
14 FR	23 13 37		+412.92		-00 00.9		17 27 10.8
		+183		+.91		-12.8	
15 SA	23 16 40		+413.83		-00 13.7		17 31 07.4
		+158		+.78		-12.8	
16 SU	23 19 18		+414.61		-00 26.5		17 35 04.0
		+134		+.66		-13.0	
17 MO	23 21 32		+415.27		-00 39.5		17 39 00.5
		+109		+.54		-13.0	
18 TU	23 23 21		+415.81		-00 52.5		17 42 57.1
		+84		+.41		-13.0	
19 WE	23 24 45		+416.22		-01 05.5		17 46 53.6
		+59		+.29		-13.1	
20 TH	23 25 44		+416.51		-01 18.6		17 50 50.2
		+34		+.17		-13.0	
21 FR	23 26 18		+416.68		-01 31.6		17 54 46.7
		+10		+.05		-13.1	
22 SA	23 26 28		+416.73		-01 44.7		17 58 43.3
		-15		-.07		-12.9	
23 SU	23 26 13		+416.66		-01 57.6		18 02 39.8
		-40		-.20		-12.9	
24 MO	23 25 33		+416.46		-02 10.5		18 06 36.4
		-65		-.32		-12.9	
25 TU	23 24 28		+416.14		-02 23.4		18 10 33.0
		-89		-.44		-12.7	
26 WE	23 22 59		+415.70		-02 36.1		18 14 29.5
		-114		-.56		-12.5	
27 TH	23 21 05		+415.14		-02 48.6		18 18 26.1
		-139		-.69		-12.5	
28 FR	23 18 46		+414.45		-03 01.1		18 22 22.6
		-163		-.81		-12.2	
29 SA	23 16 03		+413.64		-03 13.3		18 26 19.2
		-187		-.92		-12.1	
30 SU	23 12 56		+412.72		-03 25.4		18 30 15.8
		-187		-.92		-12.1	

Table 2d. Sun, 1991, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
JUL 1 MO	23 09 24		+411.67		-03 37.2		18 34 12.3
		-237		-1.17		-11.6	
2 TU	23 05 27		+410.50		-03 48.8		18 38 08.9
		-260		-1.28		-11.4	
3 WE	23 01 07		+409.22		-04 00.2		18 42 05.4
		-285		-1.41		-11.1	
4 TH	22 56 22		+407.81		-04 11.3		18 46 02.0
		-309		-1.52		-10.8	
5 FR	22 51 13		+406.29		-04 22.1		18 49 58.5
		-332		-1.64		-10.6	
6 SA	22 45 41		+404.65		-04 32.7		18 53 55.1
		-357		-1.77		-10.2	
7 SU	22 39 44		+402.88		-04 42.9		18 57 51.6
		-380		-1.87		-9.8	
8 MO	22 33 24		+401.01		-04 52.7		19 01 48.2
		-404		-2.00		-9.5	
9 TU	22 26 40		+399.01		-05 02.2		19 05 44.8
		-427		-2.11		-9.1	
10 WE	22 19 33		+396.90		-05 11.3		19 09 41.3
		-450		-2.22		-8.7	
11 TH	22 12 03		+394.68		-05 20.0		19 13 37.9
		-473		-2.33		-8.3	
12 FR	22 04 10		+392.35		-05 28.3		19 17 34.5
		-496		-2.45		-7.8	
13 SA	21 55 54		+389.90		-05 36.1		19 21 31.0
		-518		-2.56		-7.3	
14 SU	21 47 16		+387.34		-05 43.4		19 25 27.6
		-540		-2.67		-6.9	
15 MO	21 38 16		+384.67		-05 50.3		19 29 24.1
		-563		-2.78		-6.3	
16 TU	21 28 53		+381.89		-05 56.6		19 33 20.7
		-585		-2.89		-5.8	
17 WE	21 19 08		+379.00		-06 02.4		19 37 17.2
		-606		-2.99		-5.3	
18 TH	21 09 02		+376.01		-06 07.7		19 41 13.8
		-628		-3.10		-4.7	
19 FR	20 58 34		+372.91		-06 12.4		19 45 10.3
		-649		-3.21		-4.2	
20 SA	20 47 45		+369.70		-06 16.6		19 49 06.9
		-669		-3.30		-3.6	
21 SU	20 36 36		+366.40		-06 20.2		19 53 03.4
		-691		-3.41		-3.0	
22 MO	20 25 05		+362.99		-06 23.2		19 57 00.0
		-711		-3.51		-2.4	
23 TU	20 13 14		+359.48		-06 25.6		20 00 56.6
		-731		-3.61		-1.9	
24 WE	20 01 03		+355.87		-06 27.5		20 04 53.1
		-751		-3.71		-1.2	
25 TH	19 48 32		+352.16		-06 28.7		20 08 49.7
		-771		-3.81		-.7	
26 FR	19 35 41		+348.35		-06 29.4		20 12 46.3
		-791		-3.91		-.1	
27 SA	19 22 30		+344.44		-06 29.5		20 16 42.8
		-809		-3.99		+.5	
28 SU	19 09 01		+340.45		-06 29.0		20 20 39.4
		-829		-4.09		+1.2	
29 MO	18 55 12		+336.36		-06 27.8		20 24 35.9
		-847		-4.19		+1.7	
30 TU	18 41 05		+332.17		-06 26.1		20 28 32.5
		-866		-4.27		+2.3	
31 WE	18 26 39		+327.90		-06 23.8		20 32 29.0
		-866		-4.27		+2.3	

Table 2d. Sun, 1991, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
AUG 1 TH	18 11 55	-902	+323.53	-4.45	-06 20.9	+3.5	20 36 25.6
2 FR	17 56 53	-919	+319.08	-4.54	-06 17.4	+4.1	20 40 22.1
3 SA	17 41 34	-937	+314.54	-4.63	-06 13.3	+4.7	20 44 18.7
4 SU	17 25 57	-954	+309.91	-4.71	-06 08.6	+5.2	20 48 15.2
5 MO	17 10 03	-971	+305.20	-4.80	-06 03.4	+5.9	20 52 11.8
6 TU	16 53 52	-988	+300.40	-4.87	-05 57.5	+6.4	20 56 08.4
7 WE	16 37 24	-1003	+295.53	-4.96	-05 51.1	+7.0	21 00 04.9
8 TH	16 20 41	-1019	+290.57	-5.03	-05 44.1	+7.6	21 04 01.5
9 FR	16 03 42	-1035	+285.54	-5.11	-05 36.5	+8.2	21 07 58.0
10 SA	15 46 27	-1050	+280.43	-5.19	-05 28.3	+8.7	21 11 54.6
11 SU	15 28 57	-1065	+275.24	-5.25	-05 19.6	+9.3	21 15 51.2
12 MO	15 11 12	-1079	+269.99	-5.33	-05 10.3	+9.9	21 19 47.7
13 TU	14 53 13	-1094	+264.66	-5.41	-05 00.4	+10.5	21 23 44.3
14 WE	14 34 59	-1107	+259.25	-5.46	-04 49.9	+11.0	21 27 40.8
15 TH	14 16 32	-1121	+253.79	-5.54	-04 38.9	+11.6	21 31 37.4
16 FR	13 57 51	-1134	+248.25	-5.60	-04 27.3	+12.1	21 35 33.9
17 SA	13 38 57	-1147	+242.65	-5.66	-04 15.2	+12.7	21 39 30.5
18 SU	13 19 50	-1159	+236.99	-5.73	-04 02.5	+13.1	21 43 27.0
19 MO	13 00 31	-1172	+231.26	-5.78	-03 49.4	+13.7	21 47 23.6
20 TU	12 40 59	-1184	+225.48	-5.85	-03 35.7	+14.2	21 51 20.1
21 WE	12 21 15	-1195	+219.63	-5.90	-03 21.5	+14.7	21 55 16.7
22 TH	12 01 20	-1206	+213.73	-5.96	-03 06.8	+15.2	21 59 13.3
23 FR	11 41 14	-1218	+207.77	-6.01	-02 51.6	+15.6	22 03 09.8
24 SA	11 20 56	-1229	+201.76	-6.07	-02 36.0	+16.0	22 07 06.4
25 SU	11 00 27	-1238	+195.69	-6.11	-02 20.0	+16.5	22 11 02.9
26 MO	10 39 49	-1250	+189.58	-6.18	-02 03.5	+16.8	22 14 59.5
27 TU	10 18 59	-1258	+183.40	-6.21	-01 46.7	+17.3	22 18 56.0
28 WE	09 58 01	-1269	+177.19	-6.27	-01 29.4	+17.6	22 22 52.6
29 TH	09 36 52	-1278	+170.92	-6.31	-01 11.8	+18.0	22 26 49.1
30 FR	09 15 34	-1286	+164.61	-6.35	-00 53.8	+18.3	22 30 45.7
31 SA	08 54 08	-1286	+158.26	-6.35	-00 35.5	+18.3	22 34 42.2

Table 2d. Sun, 1991, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
SEP 1 SU	08 32 32		+151.86		-00 16.9		22 38 38.8
		-1304		-6.44		+18.9	
2 MO	08 10 48		+145.42		00 02.0		22 42 35.3
		-1311		-6.47		+19.1	
3 TU	07 48 57		+138.95		00 21.1		22 46 31.9
		-1320		-6.52		+19.5	
4 WE	07 26 57		+132.43		00 40.6		22 50 28.4
		-1327		-6.55		+19.6	
5 TH	07 04 50		+125.88		01 00.2		22 54 25.0
		-1334		-6.59		+19.9	
6 FR	06 42 36		+119.29		01 20.1		22 58 21.6
		-1340		-6.62		+20.1	
7 SA	06 20 16		+112.67		01 40.2		23 02 18.1
		-1347		-6.65		+20.3	
8 SU	05 57 49		+106.02		02 00.5		23 06 14.7
		-1353		-6.68		+20.5	
9 MO	05 35 16		+99.34		02 21.0		23 10 11.2
		-1358		-6.71		+20.7	
10 TU	05 12 38		+92.63		02 41.7		23 14 07.8
		-1363		-6.73		+20.8	
11 WE	04 49 55		+85.90		03 02.5		23 18 04.3
		-1369		-6.76		+21.0	
12 TH	04 27 06		+79.14		03 23.5		23 22 00.9
		-1373		-6.78		+21.0	
13 FR	04 04 13		+72.36		03 44.5		23 25 57.4
		-1377		-6.80		+21.2	
14 SA	03 41 16		+65.56		04 05.7		23 29 54.0
		-1381		-6.82		+21.3	
15 SU	03 18 15		+58.74		04 27.0		23 33 50.5
		-1384		-6.83		+21.3	
16 MO	02 55 11		+51.91		04 48.3		23 37 47.1
		-1388		-6.86		+21.4	
17 TU	02 32 03		+45.05		05 09.7		23 41 43.6
		-1390		-6.86		+21.4	
18 WE	02 08 53		+38.19		05 31.1		23 45 40.2
		-1394		-6.89		+21.4	
19 TH	01 45 39		+31.30		05 52.5		23 49 36.8
		-1395		-6.89		+21.4	
20 FR	01 22 24		+24.41		06 13.9		23 53 33.3
		-1397		-6.89		+21.4	
21 SA	00 59 07		+17.52		06 35.3		23 57 29.9
		-1399		-6.91		+21.3	
22 SU	00 35 48		+10.61		06 56.6		00 01 26.4
		-1400		-6.92		+21.2	
23 MO	00 12 28		+3.69		07 17.8		00 05 23.0
		-1401		-6.91		+21.1	
24 TU	-00 10 53		-3.22		07 38.9		00 09 19.5
		-1402		-6.93		+21.0	
25 WE	-00 34 15		-10.15		07 59.9		00 13 16.0
		-1402		-6.92		+20.9	
26 TH	-00 57 37		-17.07		08 20.8		00 17 12.6
		-1402		-6.93		+20.6	
27 FR	-01 20 59		-24.00		08 41.4		00 21 09.1
		-1402		-6.92		+20.5	
28 SA	-01 44 21		-30.92		09 01.9		00 25 05.7
		-1401		-6.92		+20.2	
29 SU	-02 07 42		-37.84		09 22.1		00 29 02.3
		-1400		-6.91		+20.0	
30 MO	-02 31 02		-44.75		09 42.1		00 32 58.8
		-1400		-6.91		+20.0	

Table 2d. Sun, 1991, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
OCT 1 TU	-02 54 21	-1397	-51.66	-6.90	10 01.8	+19.4	00 36 55.4
2 WE	-03 17 38	-1395	-58.56	-6.89	10 21.2	+19.2	00 40 51.9
3 TH	-03 40 53	-1393	-65.45	-6.88	10 40.4	+18.7	00 44 48.5
4 FR	-04 04 06	-1390	-72.33	-6.86	10 59.1	+18.5	00 48 45.0
5 SA	-04 27 16	-1387	-79.19	-6.85	11 17.6	+18.0	00 52 41.6
6 SU	-04 50 23	-1383	-86.04	-6.83	11 35.6	+17.7	00 56 38.1
7 MO	-05 13 26	-1379	-92.87	-6.81	11 53.3	+17.3	01 00 34.7
8 TU	-05 36 25	-1375	-99.68	-6.79	12 10.6	+16.8	01 04 31.2
9 WE	-05 59 20	-1370	-106.47	-6.76	12 27.4	+16.5	01 08 27.8
10 TH	-06 22 10	-1365	-113.23	-6.75	12 43.9	+15.9	01 12 24.3
11 FR	-06 44 55	-1360	-119.98	-6.71	12 59.8	+15.6	01 16 20.9
12 SA	-07 07 35	-1353	-126.69	-6.68	13 15.4	+15.0	01 20 17.5
13 SU	-07 30 08	-1348	-133.37	-6.66	13 30.4	+14.6	01 24 14.0
14 MO	-07 52 36	-1340	-140.03	-6.62	13 45.0	+14.0	01 28 10.6
15 TU	-08 14 56	-1334	-146.65	-6.58	13 59.0	+13.5	01 32 07.1
16 WE	-08 37 10	-1326	-153.23	-6.55	14 12.5	+13.0	01 36 03.7
17 TH	-08 59 16	-1319	-159.78	-6.52	14 25.5	+12.4	01 40 00.2
18 FR	-09 21 15	-1310	-166.30	-6.47	14 37.9	+11.8	01 43 56.8
19 SA	-09 43 05	-1302	-172.77	-6.43	14 49.7	+11.2	01 47 53.3
20 SU	-10 04 47	-1293	-179.20	-6.38	15 00.9	+10.6	01 51 49.9
21 MO	-10 26 20	-1284	-185.58	-6.34	15 11.5	+10.0	01 55 46.4
22 TU	-10 47 44	-1274	-191.92	-6.29	15 21.5	+9.3	01 59 43.0
23 WE	-11 08 58	-1264	-198.21	-6.24	15 30.8	+8.6	02 03 39.5
24 TH	-11 30 02	-1253	-204.45	-6.19	15 39.4	+7.9	02 07 36.1
25 FR	-11 50 55	-1243	-210.64	-6.14	15 47.3	+7.3	02 11 32.6
26 SA	-12 11 38	-1232	-216.78	-6.08	15 54.6	+6.5	02 15 29.2
27 SU	-12 32 10	-1221	-222.86	-6.03	16 01.1	+5.7	02 19 25.8
28 MO	-12 52 31	-1208	-228.89	-5.97	16 06.8	+5.0	02 23 22.3
29 TU	-13 12 39	-1196	-234.86	-5.91	16 11.8	+4.2	02 27 18.9
30 WE	-13 32 35	-1184	-240.77	-5.84	16 16.0	+3.4	02 31 15.4
31 TH	-13 52 19	-1184	-246.61	-5.84	16 19.4	+3.4	02 35 12.0

Table 2d. Sun, 1991, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
NOV 1 FR	-14 11 49	-1156	-252.39	-5.71	16 22.0	+1.8	02 39 08.6
2 SA	-14 31 05	-1143	-258.10	-5.64	16 23.8	+1.0	02 43 05.1
3 SU	-14 50 08	-1128	-263.74	-5.57	16 24.8	+.1	02 47 01.7
4 MO	-15 08 56	-1114	-269.31	-5.50	16 24.9	-.7	02 50 58.2
5 TU	-15 27 30	-1098	-274.81	-5.43	16 24.2	-1.5	02 54 54.8
6 WE	-15 45 48	-1082	-280.24	-5.34	16 22.7	-2.3	02 58 51.3
7 TH	-16 03 50	-1066	-285.58	-5.26	16 20.4	-3.2	03 02 47.9
8 FR	-16 21 36	-1050	-290.84	-5.19	16 17.2	-4.0	03 06 44.4
9 SA	-16 39 06	-1033	-296.03	-5.10	16 13.2	-4.8	03 10 41.0
10 SU	-16 56 19	-1016	-301.13	-5.02	16 08.4	-5.7	03 14 37.5
11 MO	-17 13 15	-997	-306.15	-4.92	16 02.7	-6.5	03 18 34.1
12 TU	-17 29 52	-980	-311.07	-4.84	15 56.2	-7.4	03 22 30.7
13 WE	-17 46 12	-961	-315.91	-4.75	15 48.8	-8.2	03 26 27.2
14 TH	-18 02 13	-942	-320.66	-4.65	15 40.6	-9.0	03 30 23.8
15 FR	-18 17 55	-923	-325.31	-4.56	15 31.6	-9.8	03 34 20.3
16 SA	-18 33 18	-903	-329.87	-4.46	15 21.8	-10.7	03 38 16.9
17 SU	-18 48 21	-884	-334.33	-4.36	15 11.1	-11.5	03 42 13.4
18 MO	-19 03 05	-862	-338.69	-4.26	14 59.6	-12.3	03 46 10.0
19 TU	-19 17 27	-842	-342.95	-4.16	14 47.3	-13.1	03 50 06.5
20 WE	-19 31 29	-821	-347.11	-4.05	14 34.2	-13.9	03 54 03.1
21 TH	-19 45 10	-799	-351.16	-3.95	14 20.3	-14.8	03 57 59.6
22 FR	-19 58 29	-777	-355.11	-3.83	14 05.5	-15.5	04 01 56.2
23 SA	-20 11 26	-756	-358.94	-3.74	13 50.0	-16.3	04 05 52.8
24 SU	-20 24 02	-732	-362.68	-3.61	13 33.7	-17.1	04 09 49.3
25 MO	-20 36 14	-710	-366.29	-3.51	13 16.6	-17.9	04 13 45.9
26 TU	-20 48 04	-687	-369.80	-3.39	12 58.7	-18.7	04 17 42.5
27 WE	-20 59 31	-663	-373.19	-3.27	12 40.0	-19.4	04 21 39.0
28 TH	-21 10 34	-639	-376.46	-3.16	12 20.6	-20.1	04 25 35.6
29 FR	-21 21 13	-615	-379.62	-3.04	12 00.5	-20.9	04 29 32.1
30 SA	-21 31 28	-615	-382.66	-3.04	11 39.6	-20.9	04 33 28.7

Table 2d. Sun, 1991, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
DEC 1 SU	-21 41 19		-385.58		11 18.0		04 37 25.2
		-565		-2.79		-22.3	
2 MO	-21 50 44		-388.37		10 55.7		04 41 21.8
		-541		-2.67		-22.9	
3 TU	-21 59 45		-391.04		10 32.8		04 45 18.3
		-515		-2.54		-23.5	
4 WE	-22 08 20		-393.58		10 09.3		04 49 14.9
		-489		-2.42		-24.2	
5 TH	-22 16 29		-396.00		09 45.1		04 53 11.5
		-464		-2.29		-24.7	
6 FR	-22 24 13		-398.29		09 20.4		04 57 08.0
		-437		-2.15		-25.3	
7 SA	-22 31 30		-400.44		08 55.1		05 01 04.6
		-411		-2.03		-25.8	
8 SU	-22 38 21		-402.47		08 29.3		05 05 01.1
		-384		-1.90		-26.3	
9 MO	-22 44 45		-404.37		08 03.0		05 08 57.7
		-358		-1.77		-26.7	
10 TU	-22 50 43		-406.14		07 36.3		05 12 54.3
		-330		-1.63		-27.2	
11 WE	-22 56 13		-407.77		07 09.1		05 16 50.8
		-303		-1.49		-27.5	
12 TH	-23 01 16		-409.26		06 41.6		05 20 47.4
		-276		-1.37		-27.9	
13 FR	-23 05 52		-410.63		06 13.7		05 24 43.9
		-249		-1.23		-28.2	
14 SA	-23 10 01		-411.86		05 45.5		05 28 40.5
		-220		-1.08		-28.6	
15 SU	-23 13 41		-412.94		05 16.9		05 32 37.0
		-193		-.96		-28.8	
16 MO	-23 16 54		-413.90		04 48.1		05 36 33.6
		-165		-.81		-29.0	
17 TU	-23 19 39		-414.71		04 19.1		05 40 30.1
		-138		-.68		-29.2	
18 WE	-23 21 57		-415.39		03 49.9		05 44 26.7
		-109		-.54		-29.4	
19 TH	-23 23 46		-415.93		03 20.5		05 48 23.3
		-81		-.40		-29.5	
20 FR	-23 25 07		-416.33		02 51.0		05 52 19.8
		-53		-.26		-29.6	
21 SA	-23 26 00		-416.59		02 21.4		05 56 16.4
		-24		-.12		-29.7	
22 SU	-23 26 24		-416.71		01 51.7		06 00 13.0
		+3		+.01		-29.8	
23 MO	-23 26 21		-416.70		01 21.9		06 04 09.5
		+32		+.16		-29.8	
24 TU	-23 25 49		-416.54		00 52.1		06 08 06.1
		+60		+.30		-29.7	
25 WE	-23 24 49		-416.24		00 22.4		06 12 02.7
		+88		+.43		-29.8	
26 TH	-23 23 21		-415.81		-00 07.4		06 15 59.2
		+117		+.58		-29.7	
27 FR	-23 21 24		-415.23		-00 37.1		06 19 55.8
		+144		+.71		-29.5	
28 SA	-23 19 00		-414.52		-01 06.6		06 23 52.3
		+173		+.86		-29.4	
29 SU	-23 16 07		-413.66		-01 36.0		06 27 48.9
		+201		+.99		-29.3	
30 MO	-23 12 46		-412.67		-02 05.3		06 31 45.4
		+229		+1.13		-29.1	
31 TU	-23 08 57		-411.54		-02 34.4		06 35 42.0
		+256		+1.26		-28.8	
32 WE	-23 04 41		-410.28		-03 03.2		06 39 38.5

Table 2e. Sun, 1992, for Zero Hours Universal Time (GMT)

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
JAN 0 TU	-23 08 57		-411.54		-02 34.4		06 35 42.0
		+256		+1.26		-28.8	
JAN 1 WE	-23 04 41		-410.28		-03 03.2		06 39 38.5
		+285		+1.41		-28.5	
2 TH	-22 59 56		-408.87		-03 31.7		06 43 35.1
		+312		+1.54		-28.3	
3 FR	-22 54 44		-407.33		-04 00.0		06 47 31.7
		+339		+1.68		-27.8	
4 SA	-22 49 05		-405.65		-04 27.8		06 51 28.2
		+367		+1.81		-27.6	
5 SU	-22 42 58		-403.84		-04 55.4		06 55 24.8
		+393		+1.94		-27.1	
6 MO	-22 36 25		-401.90		-05 22.5		06 59 21.3
		+421		+2.08		-26.6	
7 TU	-22 29 24		-399.82		-05 49.1		07 03 17.9
		+447		+2.21		-26.2	
8 WE	-22 21 57		-397.61		-06 15.3		07 07 14.5
		+473		+2.33		-25.7	
9 TH	-22 14 04		-395.28		-06 41.0		07 11 11.0
		+500		+2.47		-25.1	
10 FR	-22 05 44		-392.81		-07 06.1		07 15 07.6
		+525		+2.59		-24.6	
11 SA	-21 56 59		-390.22		-07 30.7		07 19 04.1
		+551		+2.72		-24.0	
12 SU	-21 47 48		-387.50		-07 54.7		07 23 00.7
		+577		+2.85		-23.4	
13 MO	-21 38 11		-384.65		-08 18.1		07 26 57.2
		+601		+2.97		-22.8	
14 TU	-21 28 10		-381.68		-08 40.9		07 30 53.8
		+627		+3.10		-22.1	
15 WE	-21 17 43		-378.58		-09 03.0		07 34 50.3
		+651		+3.21		-21.5	
16 TH	-21 06 52		-375.37		-09 24.5		07 38 46.9
		+675		+3.34		-20.7	
17 FR	-20 55 37		-372.03		-09 45.2		07 42 43.5
		+699		+3.45		-20.1	
18 SA	-20 43 58		-368.58		-10 05.3		07 46 40.0
		+722		+3.56		-19.3	
19 SU	-20 31 56		-365.02		-10 24.6		07 50 36.6
		+746		+3.69		-18.6	
20 MO	-20 19 30		-361.33		-10 43.2		07 54 33.2
		+769		+3.79		-17.9	
21 TU	-20 06 41		-357.54		-11 01.1		07 58 29.7
		+791		+3.91		-17.1	
22 WE	-19 53 30		-353.63		-11 18.2		08 02 26.3
		+813		+4.02		-16.4	
23 TH	-19 39 57		-349.61		-11 34.6		08 06 22.8
		+836		+4.12		-15.6	
24 FR	-19 26 01		-345.49		-11 50.2		08 10 19.4
		+857		+4.24		-14.8	
25 SA	-19 11 44		-341.25		-12 05.0		08 14 15.9
		+879		+4.34		-14.1	
26 SU	-18 57 05		-336.91		-12 19.1		08 18 12.5
		+899		+4.44		-13.4	
27 MO	-18 42 06		-332.47		-12 32.5		08 22 09.0
		+920		+4.54		-12.5	
28 TU	-18 26 46		-327.93		-12 45.0		08 26 05.6
		+940		+4.64		-11.7	
29 WE	-18 11 06		-323.29		-12 56.7		08 30 02.2
		+960		+4.74		-11.0	
30 TH	-17 55 06		-318.55		-13 07.7		08 33 58.7
		+979		+4.84		-10.1	
31 FR	-17 38 47		-313.71		-13 17.8		08 37 55.3
		+979		+4.84		-10.1	

Table 2e. Sun, 1992, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
FEB 1 SA	-17 22 09		-308.79		-13 27.1		08 41 51.8
		+1016		+5.02		-8.6	
2 SU	-17 05 13		-303.77		-13 35.7		08 45 48.4
		+1035		+5.11		-7.7	
3 MO	-16 47 58		-298.66		-13 43.4		08 49 45.0
		+1052		+5.20		-6.9	
4 TU	-16 30 26		-293.46		-13 50.3		08 53 41.5
		+1069		+5.28		-6.1	
5 WE	-16 12 37		-288.18		-13 56.4		08 57 38.1
		+1086		+5.36		-5.3	
6 TH	-15 54 31		-282.82		-14 01.7		09 01 34.6
		+1103		+5.45		-4.4	
7 FR	-15 36 08		-277.37		-14 06.1		09 05 31.2
		+1118		+5.52		-3.7	
8 SA	-15 17 30		-271.85		-14 09.8		09 09 27.7
		+1134		+5.60		-2.8	
9 SU	-14 58 36		-266.25		-14 12.6		09 13 24.3
		+1149		+5.67		-2.0	
10 MO	-14 39 27		-260.58		-14 14.6		09 17 20.8
		+1163		+5.75		-1.2	
11 TU	-14 20 04		-254.83		-14 15.8		09 21 17.4
		+1178		+5.81		-.5	
12 WE	-14 00 26		-249.02		-14 16.3		09 25 13.9
		+1192		+5.89		+.4	
13 TH	-13 40 34		-243.13		-14 15.9		09 29 10.5
		+1205		+5.95		+1.1	
14 FR	-13 20 29		-237.18		-14 14.8		09 33 07.0
		+1218		+6.01		+1.9	
15 SA	-13 00 11		-231.17		-14 12.9		09 37 03.6
		+1230		+6.08		+2.6	
16 SU	-12 39 41		-225.09		-14 10.3		09 41 00.2
		+1243		+6.14		+3.4	
17 MO	-12 18 58		-218.95		-14 06.9		09 44 56.7
		+1254		+6.19		+4.1	
18 TU	-11 58 04		-212.76		-14 02.8		09 48 53.3
		+1266		+6.25		+4.8	
19 WE	-11 36 58		-206.51		-13 58.0		09 52 49.8
		+1276		+6.30		+5.5	
20 TH	-11 15 42		-200.21		-13 52.5		09 56 46.4
		+1288		+6.36		+6.1	
21 FR	-10 54 14		-193.85		-13 46.4		10 00 42.9
		+1297		+6.41		+6.8	
22 SA	-10 32 37		-187.44		-13 39.6		10 04 39.5
		+1308		+6.46		+7.4	
23 SU	-10 10 49		-180.98		-13 32.2		10 08 36.0
		+1317		+6.50		+8.0	
24 MO	-09 48 52		-174.48		-13 24.2		10 12 32.6
		+1326		+6.55		+8.6	
25 TU	-09 26 46		-167.93		-13 15.6		10 16 29.1
		+1335		+6.59		+9.2	
26 WE	-09 04 31		-161.34		-13 06.4		10 20 25.7
		+1343		+6.63		+9.8	
27 TH	-08 42 08		-154.71		-12 56.6		10 24 22.3
		+1351		+6.68		+10.3	
28 FR	-08 19 37		-148.03		-12 46.3		10 28 18.8
		+1358		+6.70		+10.8	
29 SA	-07 56 59		-141.33		-12 35.5		10 32 15.4
		+1358		+6.70		+10.8	

Table 2e. Sun, 1992, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
MAR 1 SU	-07 34 13		-134.58		-12 24.2		10 36 11.9
		+1371		+6.77		+11.9	
2 MO	-07 11 22		-127.81		-12 12.3		10 40 08.5
		+1378		+6.80		+12.3	
3 TU	-06 48 24		-121.01		-12 00.0		10 44 05.0
		+1384		+6.84		+12.8	
4 WE	-06 25 20		-114.17		-11 47.2		10 48 01.6
		+1389		+6.86		+13.2	
5 TH	-06 02 11		-107.31		-11 34.0		10 51 58.1
		+1394		+6.88		+13.7	
6 FR	-05 38 57		-100.43		-11 20.3		10 55 54.7
		+1399		+6.91		+14.1	
7 SA	-05 15 38		-93.52		-11 06.2		10 59 51.2
		+1403		+6.93		+14.4	
8 SU	-04 52 15		-86.59		-10 51.8		11 03 47.8
		+1406		+6.94		+14.9	
9 MO	-04 28 49		-79.65		-10 36.9		11 07 44.3
		+1410		+6.96		+15.2	
10 TU	-04 05 19		-72.69		-10 21.7		11 11 40.9
		+1412		+6.98		+15.6	
11 WE	-03 41 47		-65.71		-10 06.1		11 15 37.4
		+1416		+6.99		+15.9	
12 TH	-03 18 11		-58.72		-09 50.2		11 19 34.0
		+1417		+7.00		+16.3	
13 FR	-02 54 34		-51.72		-09 33.9		11 23 30.5
		+1419		+7.00		+16.5	
14 SA	-02 30 55		-44.72		-09 17.4		11 27 27.1
		+1421		+7.02		+16.8	
15 SU	-02 07 14		-37.70		-09 00.6		11 31 23.7
		+1421		+7.02		+17.0	
16 MO	-01 43 33		-30.68		-08 43.6		11 35 20.2
		+1423		+7.03		+17.3	
17 TU	-01 19 50		-23.65		-08 26.3		11 39 16.8
		+1422		+7.02		+17.4	
18 WE	-00 56 08		-16.63		-08 08.9		11 43 13.3
		+1423		+7.03		+17.7	
19 TH	-00 32 25		-9.60		-07 51.2		11 47 09.9
		+1423		+7.02		+17.8	
20 FR	-00 08 42		-2.58		-07 33.4		11 51 06.4
		+1422		+7.02		+17.9	
21 SA	00 15 00		+4.44		-07 15.5		11 55 03.0
		+1421		+7.02		+18.0	
22 SU	00 38 41		+11.46		-06 57.5		11 58 59.5
		+1419		+7.01		+18.1	
23 MO	01 02 20		+18.47		-06 39.4		12 02 56.1
		+1418		+7.00		+18.2	
24 TU	01 25 58		+25.47		-06 21.2		12 06 52.6
		+1417		+7.00		+18.2	
25 WE	01 49 35		+32.47		-06 03.0		12 10 49.2
		+1413		+6.98		+18.2	
26 TH	02 13 08		+39.45		-05 44.8		12 14 45.7
		+1411		+6.96		+18.2	
27 FR	02 36 39		+46.41		-05 26.6		12 18 42.3
		+1408		+6.96		+18.1	
28 SA	03 00 07		+53.37		-05 08.5		12 22 38.9
		+1405		+6.94		+18.2	
29 SU	03 23 32		+60.31		-04 50.3		12 26 35.4
		+1400		+6.91		+18.0	
30 MO	03 46 52		+67.22		-04 32.3		12 30 32.0
		+1397		+6.90		+18.0	
31 TU	04 10 09		+74.12		-04 14.3		12 34 28.5
		+1397		+6.90		+18.0	

Table 2e. Sun, 1992, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES	MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
APR 1 WE	04 33 21		+80.99		-03 56.4		12 38 25.1
		+1387		+6.85		+17.7	
2 TH	04 56 28		+87.84		-03 38.7		12 42 21.6
		+1382		+6.83		+17.6	
3 FR	05 19 30		+94.67		-03 21.1		12 46 18.1
		+1376		+6.79		+17.5	
4 SA	05 42 26		+101.46		-03 03.6		12 50 14.7
		+1370		+6.77		+17.3	
5 SU	06 05 16		+108.23		-02 46.3		12 54 11.2
		+1364		+6.73		+17.2	
6 MO	06 28 00		+114.96		-02 29.1		12 58 07.8
		+1357		+6.70		+16.9	
7 TU	06 50 37		+121.66		-02 12.2		13 02 04.4
		+1349		+6.67		+16.7	
8 WE	07 13 06		+128.33		-01 55.5		13 06 00.9
		+1343		+6.63		+16.6	
9 TH	07 35 29		+134.96		-01 38.9		13 09 57.5
		+1335		+6.59		+16.2	
10 FR	07 57 44		+141.55		-01 22.7		13 13 54.0
		+1326		+6.55		+16.1	
11 SA	08 19 50		+148.10		-01 06.6		13 17 50.6
		+1318		+6.51		+15.7	
12 SU	08 41 48		+154.61		-00 50.9		13 21 47.1
		+1309		+6.46		+15.5	
13 MO	09 03 37		+161.07		-00 35.4		13 25 43.7
		+1300		+6.42		+15.1	
14 TU	09 25 17		+167.49		-00 20.3		13 29 40.2
		+1291		+6.38		+14.9	
15 WE	09 46 48		+173.87		-00 05.4		13 33 36.8
		+1281		+6.32		+14.5	
16 TH	10 08 09		+180.19		00 09.1		13 37 33.3
		+1271		+6.28		+14.1	
17 FR	10 29 20		+186.47		00 23.2		13 41 29.9
		+1260		+6.22		+13.8	
18 SA	10 50 20		+192.69		00 37.0		13 45 26.4
		+1250		+6.17		+13.3	
19 SU	11 11 10		+198.86		00 50.3		13 49 23.0
		+1239		+6.12		+13.0	
20 MO	11 31 49		+204.98		01 03.3		13 53 19.6
		+1228		+6.07		+12.5	
21 TU	11 52 17		+211.05		01 15.8		13 57 16.1
		+1216		+6.00		+12.1	
22 WE	12 12 33		+217.05		01 27.9		14 01 12.7
		+1204		+5.95		+11.6	
23 TH	12 32 37		+223.00		01 39.5		14 05 09.2
		+1191		+5.88		+11.1	
24 FR	12 52 28		+228.88		01 50.6		14 09 05.8
		+1179		+5.82		+10.6	
25 SA	13 12 07		+234.70		02 01.2		14 13 02.3
		+1167		+5.76		+10.1	
26 SU	13 31 34		+240.46		02 11.3		14 16 58.9
		+1152		+5.69		+9.6	
27 MO	13 50 46		+246.15		02 20.9		14 20 55.5
		+1140		+5.63		+9.1	
28 TU	14 09 46		+251.78		02 30.0		14 24 52.0
		+1125		+5.56		+8.6	
29 WE	14 28 31		+257.34		02 38.6		14 28 48.6
		+1111		+5.48		+8.0	
30 TH	14 47 02		+262.82		02 46.6		14 32 45.1
		+1111		+5.48		+8.0	

Table 2e. Sun, 1992, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
MAY 1 FR	15 05 18	+1081	+268.24	+5.34	02 54.1	+7.0	14 36 41.6
2 SA	15 23 19	+1066	+273.58	+5.26	03 01.1	+6.4	14 40 38.2
3 SU	15 41 05	+1051	+278.84	+5.19	03 07.5	+5.8	14 44 34.8
4 MO	15 58 36	+1034	+284.03	+5.11	03 13.3	+5.3	14 48 31.3
5 TU	16 15 50	+1019	+289.14	+5.03	03 18.6	+4.8	14 52 27.9
6 WE	16 32 49	+1001	+294.17	+4.94	03 23.4	+4.2	14 56 24.4
7 TH	16 49 30	+985	+299.11	+4.87	03 27.6	+3.6	15 00 21.0
8 FR	17 05 55	+968	+303.98	+4.78	03 31.2	+3.1	15 04 17.6
9 SA	17 22 03	+950	+308.76	+4.69	03 34.3	+2.6	15 08 14.1
10 SU	17 37 53	+932	+313.45	+4.60	03 36.9	+2.0	15 12 10.7
11 MO	17 53 25	+914	+318.05	+4.51	03 38.9	+1.4	15 16 07.2
12 TU	18 08 39	+896	+322.56	+4.43	03 40.3	+.9	15 20 03.8
13 WE	18 23 35	+877	+326.99	+4.33	03 41.2	+.4	15 24 00.3
14 TH	18 38 12	+859	+331.32	+4.24	03 41.6	-.2	15 27 56.9
15 FR	18 52 31	+839	+335.56	+4.14	03 41.4	-.8	15 31 53.4
16 SA	19 06 30	+820	+339.70	+4.05	03 40.6	-1.4	15 35 50.0
17 SU	19 20 10	+800	+343.75	+3.95	03 39.2	-1.9	15 39 46.5
18 MO	19 33 30	+781	+347.70	+3.86	03 37.3	-2.4	15 43 43.1
19 TU	19 46 31	+760	+351.56	+3.75	03 34.9	-3.0	15 47 39.7
20 WE	19 59 11	+740	+355.31	+3.66	03 31.9	-3.6	15 51 36.2
21 TH	20 11 31	+719	+358.97	+3.55	03 28.3	-4.1	15 55 32.8
22 FR	20 23 30	+698	+362.52	+3.45	03 24.2	-4.7	15 59 29.3
23 SA	20 35 08	+677	+365.97	+3.34	03 19.5	-5.1	16 03 25.9
24 SU	20 46 25	+656	+369.31	+3.24	03 14.4	-5.7	16 07 22.5
25 MO	20 57 21	+634	+372.55	+3.13	03 08.7	-6.3	16 11 19.0
26 TU	21 07 55	+612	+375.68	+3.02	03 02.4	-6.7	16 15 15.6
27 WE	21 18 07	+590	+378.70	+2.91	02 55.7	-7.2	16 19 12.1
28 TH	21 27 57	+568	+381.61	+2.81	02 48.5	-7.7	16 23 08.7
29 FR	21 37 25	+545	+384.42	+2.69	02 40.8	-8.1	16 27 05.2
30 SA	21 46 30	+523	+387.11	+2.58	02 32.7	-8.6	16 31 01.8
31 SU	21 55 13	+523	+389.69	+2.58	02 24.1	-8.6	16 34 58.3

Table 2e. Sun, 1992, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
JUN 1 MO	22 03 32		+392.16		02 15.1		16 38 54.9
		+477		+2.35		-9.4	
2 TU	22 11 29		+394.51		02 05.7		16 42 51.5
		+453		+2.24		-9.8	
3 WE	22 19 02		+396.75		01 55.9		16 46 48.0
		+430		+2.12		-10.1	
4 TH	22 26 12		+398.87		01 45.8		16 50 44.6
		+406		+2.01		-10.5	
5 FR	22 32 58		+400.88		01 35.3		16 54 41.2
		+383		+1.89		-10.7	
6 SA	22 39 21		+402.77		01 24.6		16 58 37.7
		+359		+1.77		-11.1	
7 SU	22 45 20		+404.54		01 13.5		17 02 34.3
		+335		+1.66		-11.3	
8 MO	22 50 55		+406.20		01 02.2		17 06 30.8
		+310		+1.53		-11.6	
9 TU	22 56 05		+407.73		00 50.6		17 10 27.4
		+287		+1.42		-11.8	
10 WE	23 00 52		+409.15		00 38.8		17 14 23.9
		+262		+1.29		-12.0	
11 TH	23 05 14		+410.44		00 26.8		17 18 20.5
		+238		+1.17		-12.1	
12 FR	23 09 12		+411.61		00 14.7		17 22 17.0
		+213		+1.06		-12.4	
13 SA	23 12 45		+412.67		00 02.3		17 26 13.6
		+189		+.93		-12.5	
14 SU	23 15 54		+413.60		-00 10.2		17 30 10.2
		+164		+.81		-12.6	
15 MO	23 18 38		+414.41		-00 22.8		17 34 06.7
		+140		+.69		-12.8	
16 TU	23 20 58		+415.10		-00 35.6		17 38 03.3
		+115		+.57		-12.8	
17 WE	23 22 53		+415.67		-00 48.4		17 41 59.8
		+90		+.44		-12.9	
18 TH	23 24 23		+416.11		-01 01.3		17 45 56.4
		+66		+.33		-13.0	
19 FR	23 25 29		+416.44		-01 14.3		17 49 53.0
		+40		+.20		-13.0	
20 SA	23 26 09		+416.64		-01 27.3		17 53 49.5
		+16		+.08		-13.0	
21 SU	23 26 25		+416.72		-01 40.3		17 57 46.1
		-9		-.05		-13.0	
22 MO	23 26 16		+416.67		-01 53.3		18 01 42.6
		-34		-.17		-12.9	
23 TU	23 25 42		+416.50		-02 06.2		18 05 39.2
		-58		-.28		-12.9	
24 WE	23 24 44		+416.22		-02 19.1		18 09 35.7
		-84		-.42		-12.9	
25 TH	23 23 20		+415.80		-02 32.0		18 13 32.3
		-108		-.53		-12.7	
26 FR	23 21 32		+415.27		-02 44.7		18 17 28.8
		-133		-.66		-12.6	
27 SA	23 19 19		+414.61		-02 57.3		18 21 25.4
		-157		-.77		-12.4	
28 SU	23 16 42		+413.84		-03 09.7		18 25 22.0
		-182		-.90		-12.3	
29 MO	23 13 40		+412.94		-03 22.0		18 29 18.5
		-207		-1.02		-12.1	
30 TU	23 10 13		+411.92		-03 34.1		18 33 15.1
		-207		-1.02		-12.1	

Table 2e. Sun, 1992, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
JUL 1 WE	23 06 22		+410.78		-03 45.9		18 37 11.6
		-255		-1.26		-11.5	
2 TH	23 02 07		+409.52		-03 57.4		18 41 08.2
		-279		-1.38		-11.3	
3 FR	22 57 28		+408.14		-04 08.7		18 45 04.8
		-303		-1.50		-11.0	
4 SA	22 52 25		+406.64		-04 19.7		18 49 01.3
		-327		-1.61		-10.6	
5 SU	22 46 58		+405.03		-04 30.3		18 52 57.9
		-351		-1.74		-10.3	
6 MO	22 41 07		+403.29		-04 40.6		18 56 54.4
		-374		-1.84		-9.9	
7 TU	22 34 53		+401.45		-04 50.5		19 00 51.0
		-397		-1.96		-9.5	
8 WE	22 28 16		+399.49		-05 00.0		19 04 47.5
		-421		-2.08		-9.0	
9 TH	22 21 15		+397.41		-05 09.0		19 08 44.1
		-444		-2.20		-8.7	
10 FR	22 13 51		+395.21		-05 17.7		19 12 40.6
		-467		-2.30		-8.2	
11 SA	22 06 04		+392.91		-05 25.9		19 16 37.2
		-490		-2.42		-7.7	
12 SU	21 57 54		+390.49		-05 33.6		19 20 33.8
		-512		-2.53		-7.3	
13 MO	21 49 22		+387.96		-05 40.9		19 24 30.3
		-535		-2.64		-6.8	
14 TU	21 40 27		+385.32		-05 47.7		19 28 26.9
		-556		-2.75		-6.3	
15 WE	21 31 11		+382.57		-05 54.0		19 32 23.5
		-579		-2.86		-5.8	
16 TH	21 21 32		+379.71		-05 59.8		19 36 20.0
		-600		-2.96		-5.2	
17 FR	21 11 32		+376.75		-06 05.0		19 40 16.6
		-622		-3.07		-4.8	
18 SA	21 01 10		+373.68		-06 09.8		19 44 13.1
		-644		-3.18		-4.2	
19 SU	20 50 26		+370.50		-06 14.0		19 48 09.7
		-664		-3.28		-3.7	
20 MO	20 39 22		+367.22		-06 17.7		19 52 06.2
		-685		-3.38		-3.2	
21 TU	20 27 57		+363.84		-06 20.9		19 56 02.8
		-706		-3.49		-2.6	
22 WE	20 16 11		+360.35		-06 23.5		19 59 59.3
		-727		-3.59		-2.1	
23 TH	20 04 04		+356.76		-06 25.6		20 03 55.9
		-747		-3.69		-1.4	
24 FR	19 51 37		+353.07		-06 27.0		20 07 52.4
		-766		-3.78		-1.0	
25 SA	19 38 51		+349.29		-06 28.0		20 11 49.0
		-787		-3.89		-.3	
26 SU	19 25 44		+345.40		-06 28.3		20 15 45.6
		-805		-3.97		+.2	
27 MO	19 12 19		+341.43		-06 28.1		20 19 42.1
		-825		-4.08		+.8	
28 TU	18 58 34		+337.35		-06 27.3		20 23 38.7
		-844		-4.16		+1.4	
29 WE	18 44 30		+333.19		-06 25.9		20 27 35.2
		-862		-4.26		+2.1	
30 TH	18 30 08		+328.93		-06 23.8		20 31 31.8
		-880		-4.35		+2.6	
31 FR	18 15 28		+324.58		-06 21.2		20 35 28.4
		-880		-4.35		+2.6	

Table 2e. Sun, 1992, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
AUG 1 SA	18 00 30		+320.15		-06 18.0		20 39 24.9
		-915		-4.52		+3.9	
2 SU	17 45 15		+315.63		-06 14.1		20 43 21.5
		-933		-4.61		+4.4	
3 MO	17 29 42		+311.02		-06 09.7		20 47 18.0
		-950		-4.69		+5.1	
4 TU	17 13 52		+306.33		-06 04.6		20 51 14.6
		-967		-4.77		+5.8	
5 WE	16 57 45		+301.56		-05 58.8		20 55 11.1
		-983		-4.86		+6.3	
6 TH	16 41 22		+296.70		-05 52.5		20 59 07.7
		-998		-4.93		+7.0	
7 FR	16 24 44		+291.77		-05 45.5		21 03 04.2
		-1015		-5.01		+7.5	
8 SA	16 07 49		+286.76		-05 38.0		21 07 00.8
		-1030		-5.09		+8.2	
9 SU	15 50 39		+281.67		-05 29.8		21 10 57.4
		-1046		-5.16		+8.7	
10 MO	15 33 13		+276.51		-05 21.1		21 14 53.9
		-1060		-5.24		+9.4	
11 TU	15 15 33		+271.27		-05 11.7		21 18 50.5
		-1075		-5.30		+9.9	
12 WE	14 57 38		+265.97		-05 01.8		21 22 47.0
		-1089		-5.38		+10.4	
13 TH	14 39 29		+260.59		-04 51.4		21 26 43.6
		-1103		-5.45		+11.1	
14 FR	14 21 06		+255.14		-04 40.3		21 30 40.1
		-1116		-5.51		+11.5	
15 SA	14 02 30		+249.63		-04 28.8		21 34 36.7
		-1131		-5.59		+12.1	
16 SU	13 43 39		+244.04		-04 16.7		21 38 33.2
		-1143		-5.64		+12.6	
17 MO	13 24 36		+238.40		-04 04.1		21 42 29.8
		-1156		-5.71		+13.1	
18 TU	13 05 20		+232.69		-03 51.0		21 46 26.3
		-1169		-5.77		+13.6	
19 WE	12 45 51		+226.92		-03 37.4		21 50 22.9
		-1181		-5.83		+14.0	
20 TH	12 26 10		+221.09		-03 23.4		21 54 19.4
		-1193		-5.89		+14.6	
21 FR	12 06 17		+215.20		-03 08.8		21 58 16.0
		-1204		-5.95		+14.9	
22 SA	11 46 13		+209.25		-02 53.9		22 02 12.5
		-1216		-6.01		+15.4	
23 SU	11 25 57		+203.24		-02 38.5		22 06 09.1
		-1227		-6.05		+15.8	
24 MO	11 05 30		+197.19		-02 22.7		22 10 05.7
		-1237		-6.11		+16.3	
25 TU	10 44 53		+191.08		-02 06.4		22 14 02.2
		-1248		-6.17		+16.6	
26 WE	10 24 05		+184.91		-01 49.8		22 17 58.8
		-1257		-6.20		+17.0	
27 TH	10 03 08		+178.71		-01 32.8		22 21 55.3
		-1267		-6.26		+17.3	
28 FR	09 42 01		+172.45		-01 15.5		22 25 51.9
		-1277		-6.31		+17.8	
29 SA	09 20 44		+166.14		-00 57.7		22 29 48.4
		-1285		-6.34		+18.0	
30 SU	08 59 19		+159.80		-00 39.7		22 33 45.0
		-1294		-6.39		+18.4	
31 MO	08 37 45		+153.41		-00 21.3		22 37 41.5
		-1294		-6.39		+18.4	

Table 2e. Sun, 1992, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION		EQUATION OF TIME		SIDEREAL TIME
	DEGREES	MILS			
	° ′ ″ / DAILY CHANGE (SEC)	MILS / DAILY CHANGE (MILS)	MIN SEC / DAILY CHANGE (SEC)		HR MIN SEC
SEP 1 TU	08 16 03	+146.98	-00 02.5		22 41 38.1
	-1310	-6.47		+19.1	
2 WE	07 54 13	+140.51	00 16.6		22 45 34.6
	-1317	-6.51		+19.3	
3 TH	07 32 16	+134.00	00 35.9		22 49 31.2
	-1325	-6.54		+19.6	
4 FR	07 10 11	+127.46	00 55.5		22 53 27.8
	-1331	-6.57		+19.9	
5 SA	06 48 00	+120.89	01 15.4		22 57 24.3
	-1338	-6.61		+20.2	
6 SU	06 25 42	+114.28	01 35.6		23 01 20.9
	-1345	-6.64		+20.3	
7 MO	06 03 17	+107.64	01 55.9		23 05 17.4
	-1350	-6.67		+20.6	
8 TU	05 40 47	+100.97	02 16.5		23 09 14.0
	-1356	-6.69		+20.8	
9 WE	05 18 11	+94.28	02 37.3		23 13 10.5
	-1361	-6.72		+20.9	
10 TH	04 55 30	+87.56	02 58.2		23 17 07.1
	-1366	-6.75		+21.0	
11 FR	04 32 44	+80.81	03 19.2		23 21 03.6
	-1371	-6.77		+21.2	
12 SA	04 09 53	+74.04	03 40.4		23 25 00.2
	-1375	-6.79		+21.3	
13 SU	03 46 58	+67.25	04 01.7		23 28 56.7
	-1380	-6.82		+21.3	
14 MO	03 23 58	+60.43	04 23.0		23 32 53.3
	-1383	-6.83		+21.4	
15 TU	03 00 55	+53.60	04 44.4		23 36 49.8
	-1387	-6.84		+21.5	
16 WE	02 37 48	+46.76	05 05.9		23 40 46.4
	-1390	-6.87		+21.4	
17 TH	02 14 38	+39.89	05 27.3		23 44 42.9
	-1392	-6.87		+21.4	
18 FR	01 51 26	+33.02	05 48.7		23 48 39.5
	-1395	-6.89		+21.4	
19 SA	01 28 11	+26.13	06 10.1		23 52 36.0
	-1398	-6.91		+21.3	
20 SU	01 04 53	+19.22	06 31.4		23 56 32.6
	-1399	-6.90		+21.2	
21 MO	00 41 34	+12.32	06 52.6		00 00 29.2
	-1401	-6.92		+21.2	
22 TU	00 18 13	+5.40	07 13.8		00 04 25.7
	-1402	-6.93		+21.0	
23 WE	-00 05 09	-1.53	07 34.8		00 08 22.3
	-1403	-6.92		+20.8	
24 TH	-00 28 32	-8.45	07 55.6		00 12 18.8
	-1403	-6.93		+20.8	
25 FR	-00 51 55	-15.38	08 16.4		00 16 15.4
	-1403	-6.93		+20.5	
26 SA	-01 15 18	-22.31	08 36.9		00 20 11.9
	-1402	-6.92		+20.3	
27 SU	-01 38 40	-29.23	08 57.2		00 24 08.5
	-1403	-6.93		+20.2	
28 MO	-02 02 03	-36.16	09 17.4		00 28 05.0
	-1400	-6.92		+19.9	
29 TU	-02 25 23	-43.08	09 37.3		00 32 01.6
	-1400	-6.91		+19.7	
30 WE	-02 48 43	-49.99	09 57.0		00 35 58.1
	-1400	-6.91		+19.7	

Table 2e. Sun, 1992, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
OCT 1 TH	-03 12 01	-1395	-56.89	-6.89	10 16.4	+19.2	00 39 54.7
2 FR	-03 35 16	-1393	-63.78	-6.88	10 35.6	+18.8	00 43 51.2
3 SA	-03 58 29	-1390	-70.66	-6.87	10 54.4	+18.6	00 47 47.8
4 SU	-04 21 39	-1387	-77.53	-6.85	11 13.0	+18.2	00 51 44.3
5 MO	-04 44 46	-1384	-84.38	-6.83	11 31.2	+17.8	00 55 40.9
6 TU	-05 07 50	-1379	-91.21	-6.81	11 49.0	+17.5	00 59 37.5
7 WE	-05 30 49	-1375	-98.02	-6.79	12 06.5	+17.1	01 03 34.0
8 TH	-05 53 44	-1370	-104.81	-6.77	12 23.6	+16.7	01 07 30.6
9 FR	-06 16 34	-1366	-111.58	-6.74	12 40.3	+16.2	01 11 27.1
10 SA	-06 39 20	-1360	-118.32	-6.72	12 56.5	+15.8	01 15 23.6
11 SU	-07 02 00	-1354	-125.04	-6.68	13 12.3	+15.3	01 19 20.2
12 MO	-07 24 34	-1349	-131.72	-6.67	13 27.6	+14.8	01 23 16.7
13 TU	-07 47 03	-1342	-138.39	-6.62	13 42.4	+14.3	01 27 13.3
14 WE	-08 09 25	-1335	-145.01	-6.59	13 56.7	+13.7	01 31 09.8
15 TH	-08 31 40	-1328	-151.60	-6.56	14 10.4	+13.1	01 35 06.4
16 FR	-08 53 48	-1321	-158.16	-6.53	14 23.5	+12.6	01 39 03.0
17 SA	-09 15 49	-1312	-164.69	-6.48	14 36.1	+11.9	01 42 59.5
18 SU	-09 37 41	-1305	-171.17	-6.44	14 48.0	+11.3	01 46 56.1
19 MO	-09 59 26	-1296	-177.61	-6.40	14 59.3	+10.7	01 50 52.6
20 TU	-10 21 02	-1286	-184.01	-6.35	15 10.0	+10.0	01 54 49.2
21 WE	-10 42 28	-1278	-190.36	-6.31	15 20.0	+9.3	01 58 45.8
22 TH	-11 03 46	-1267	-196.67	-6.26	15 29.3	+8.7	02 02 42.3
23 FR	-11 24 53	-1257	-202.93	-6.21	15 38.0	+7.9	02 06 38.8
24 SA	-11 45 50	-1246	-209.14	-6.15	15 45.9	+7.2	02 10 35.4
25 SU	-12 06 36	-1236	-215.29	-6.10	15 53.1	+6.5	02 14 31.9
26 MO	-12 27 12	-1223	-221.39	-6.04	15 59.6	+5.7	02 18 28.5
27 TU	-12 47 35	-1212	-227.43	-5.99	16 05.3	+5.1	02 22 25.1
28 WE	-13 07 47	-1199	-233.42	-5.92	16 10.4	+4.2	02 26 21.6
29 TH	-13 27 46	-1187	-239.34	-5.86	16 14.6	+3.6	02 30 18.2
30 FR	-13 47 33	-1173	-245.20	-5.79	16 18.2	+2.7	02 34 14.7
31 SA	-14 07 06	-1173	-250.99	-5.79	16 20.9	+2.7	02 38 11.3

Table 2e. Sun, 1992, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION			EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS			
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
NOV 1 SU	-14 26 26		-256.72		16 22.9		02 42 07.8
		-1146		-5.66		+1.2	
2 MO	-14 45 32		-262.38		16 24.1		02 46 04.4
		-1131		-5.59		+.4	
3 TU	-15 04 23		-267.97		16 24.5		02 50 01.0
		-1117		-5.51		-.4	
4 WE	-15 23 00		-273.48		16 24.1		02 53 57.5
		-1101		-5.44		-1.2	
5 TH	-15 41 21		-278.92		16 22.9		02 57 54.1
		-1086		-5.36		-2.0	
6 FR	-15 59 27		-284.28		16 20.9		03 01 50.6
		-1069		-5.28		-2.8	
7 SA	-16 17 16		-289.56		16 18.1		03 05 47.2
		-1054		-5.21		-3.7	
8 SU	-16 34 50		-294.77		16 14.4		03 09 43.7
		-1036		-5.11		-4.5	
9 MO	-16 52 06		-299.88		16 09.9		03 13 40.3
		-1019		-5.03		-5.3	
10 TU	-17 09 05		-304.91		16 04.6		03 17 36.8
		-1002		-4.95		-6.2	
11 WE	-17 25 47		-309.86		15 58.4		03 21 33.4
		-984		-4.86		-7.0	
12 TH	-17 42 11		-314.72		15 51.4		03 25 29.9
		-965		-4.77		-7.9	
13 FR	-17 58 16		-319.49		15 43.5		03 29 26.5
		-947		-4.67		-8.7	
14 SA	-18 14 03		-324.16		15 34.8		03 33 23.1
		-928		-4.59		-9.6	
15 SU	-18 29 31		-328.75		15 25.2		03 37 19.6
		-908		-4.48		-10.5	
16 MO	-18 44 39		-333.23		15 14.7		03 41 16.2
		-889		-4.39		-11.3	
17 TU	-18 59 28		-337.62		15 03.4		03 45 12.7
		-868		-4.29		-12.2	
18 WE	-19 13 56		-341.91		14 51.2		03 49 09.3
		-847		-4.18		-13.0	
19 TH	-19 28 03		-346.09		14 38.2		03 53 05.8
		-826		-4.08		-13.9	
20 FR	-19 41 49		-350.17		14 24.3		03 57 02.4
		-805		-3.97		-14.7	
21 SA	-19 55 14		-354.14		14 09.6		04 00 58.9
		-783		-3.87		-15.5	
22 SU	-20 08 17		-358.01		13 54.1		04 04 55.5
		-761		-3.76		-16.3	
23 MO	-20 20 58		-361.77		13 37.8		04 08 52.1
		-739		-3.65		-17.2	
24 TU	-20 33 17		-365.42		13 20.6		04 12 48.6
		-715		-3.53		-17.8	
25 WE	-20 45 12		-368.95		13 02.8		04 16 45.2
		-693		-3.42		-18.7	
26 TH	-20 56 45		-372.37		12 44.1		04 20 41.7
		-668		-3.30		-19.3	
27 FR	-21 07 53		-375.67		12 24.8		04 24 38.3
		-645		-3.18		-20.1	
28 SA	-21 18 38		-378.85		12 04.7		04 28 34.9
		-621		-3.07		-20.8	
29 SU	-21 28 59		-381.92		11 43.9		04 32 31.4
		-596		-2.94		-21.4	
30 MO	-21 38 55		-384.86		11 22.5		04 36 28.0
		-596		-2.94		-21.4	

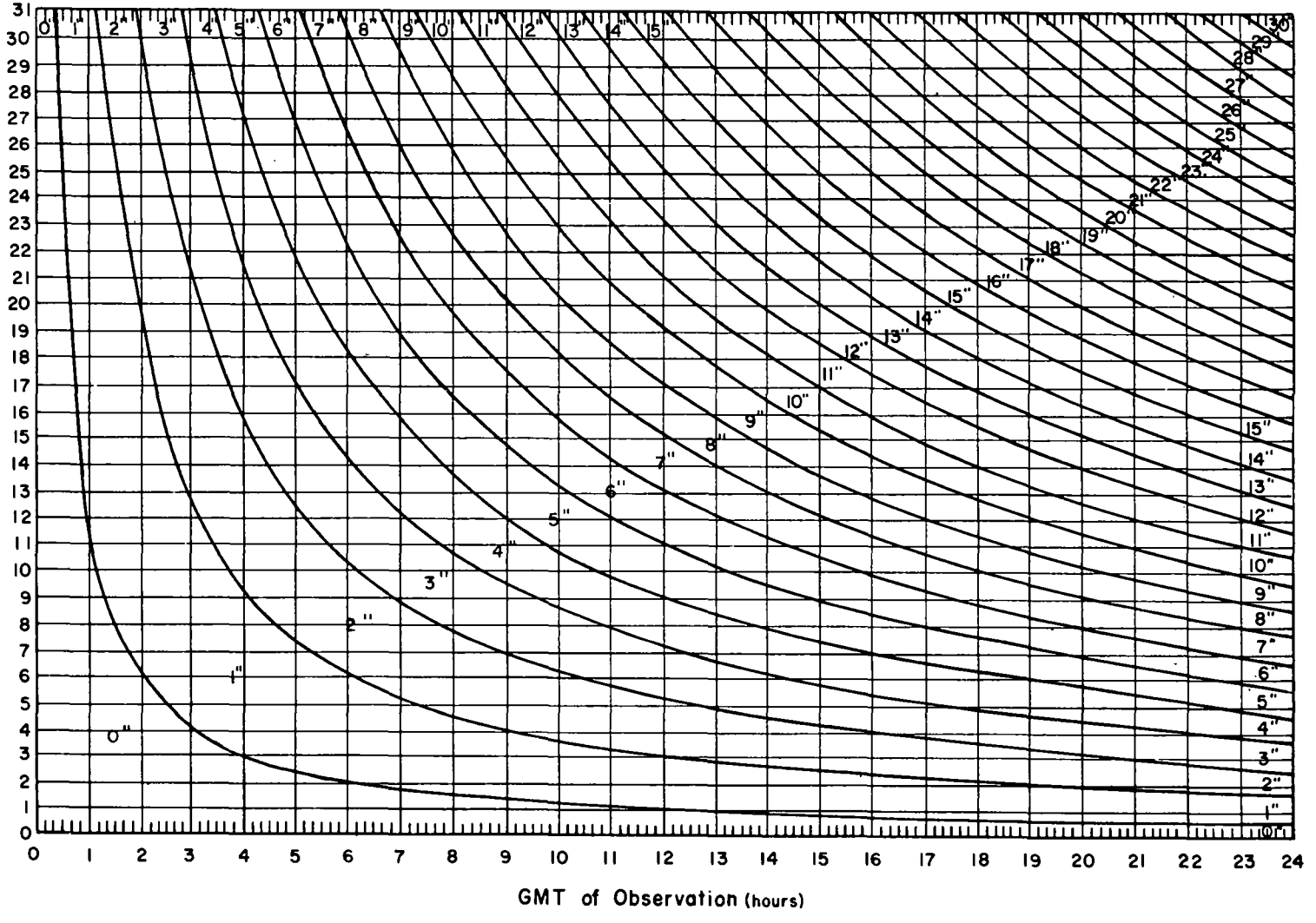
Table 2e. Sun, 1992, for Zero Hours Universal Time (GMT)—Continued

GREENWICH DATE	APPARENT DECLINATION				EQUATION OF TIME		SIDEREAL TIME
	DEGREES		MILS				
	° ′ ″	DAILY CHANGE (SEC)	MILS	DAILY CHANGE (MILS)	MIN SEC	DAILY CHANGE (SEC)	HR MIN SEC
DEC 1 TU	-21 48 27		-387.69		11 00.4		04 40 24.5
		-546		-2.70		-22.7	
2 WE	-21 57 33		-390.39		10 37.7		04 44 21.1
		-521		-2.57		-23.4	
3 TH	-22 06 14		-392.96		10 14.3		04 48 17.6
		-496		-2.45		-23.9	
4 FR	-22 14 30		-395.41		09 50.4		04 52 14.2
		-470		-2.32		-24.4	
5 SA	-22 22 20		-397.73		09 26.0		04 56 10.7
		-443		-2.19		-25.0	
6 SU	-22 29 43		-399.92		09 01.0		05 00 07.3
		-417		-2.06		-25.5	
7 MO	-22 36 40		-401.98		008 35.5		05 04 03.8
		-391		-1.93		-26.0	
8 TU	-22 43 11		-403.91		008 09.5		05 08 00.4
		-364		-1.79		-26.5	
9 WE	-22 49 15		-405.70		007 43.0		05 11 57.0
		-337		-1.67		-26.8	
10 TH	-22 54 52		-407.37		007 16.2		05 15 53.5
		-310		-1.53		-27.3	
11 FR	-23 00 02		-408.90		006 48.9		05 19 50.1
		-282		-1.39		-27.7	
12 SA	-23 04 44		-410.29		006 21.2		05 23 46.7
		-256		-1.27		-28.1	
13 SU	-23 09 00		-411.56		005 53.1		05 27 43.2
		-227		-1.12		-28.4	
14 MO	-23 12 47		-412.68		005 24.7		05 31 39.8
		-200		-.98		-28.7	
15 TU	-23 16 07		-413.66		004 56.0		05 35 36.3
		-172		-.85		-29.0	
16 WE	-23 18 59		-414.51		004 27.0		05 39 32.9
		-144		-.71		-29.2	
17 TH	-23 21 23		-415.22		003 57.8		05 43 29.4
		-116		-.58		-29.4	
18 FR	-23 23 19		-415.80		003 28.4		05 47 26.0
		-88		-.43		-29.6	
19 SA	-23 24 47		-416.23		002 58.8		05 51 22.6
		-60		-.30		-29.8	
20 SU	-23 25 47		-416.53		002 29.0		05 55 19.1
		-31		-.15		-29.9	
21 MO	-23 26 18		-416.68		001 59.1		05 59 15.7
		-3		-.02		-29.9	
22 TU	-23 26 21		-416.70		001 29.2		06 03 12.2
		+25		+.13		-30.0	
23 WE	-23 25 56		-416.57		000 59.2		06 07 08.8
		+54		+.26		-29.9	
24 TH	-23 25 02		-416.31		000 29.3		06 11 05.4
		+82		+.41		-29.9	
25 FR	-23 23 40		-415.90		-00 00.6		06 15 01.9
		+109		+.54		-29.9	
26 SA	-23 21 51		-415.36		-00 30.5		06 18 58.5
		+139		+.68		-29.7	
27 SU	-23 19 32		-414.68		-01 00.2		06 22 55.0
		+166		+.82		-29.5	
28 MO	-23 16 46		-413.86		-01 29.7		06 26 51.6
		+194		+.96		-29.3	
29 TU	-23 13 32		-412.90		-01 59.0		06 30 48.2
		+222		+1.10		-29.2	
30 WE	-23 09 50		-411.80		-02 28.2		06 34 44.7
		+250		+1.23		-28.8	
31 TH	-23 05 40		-410.57		-02 57.0		06 38 41.3
		+277		+1.37		-28.5	
32 FR	-23 01 03		-409.20		-03 25.5		06 42 37.8

Table 3. Equation of Time Graph

EQUATION OF TIME—PARTIAL DAY IN SECONDS

(Use sign of daily change.)



Note. Enter table with value of daily change to the nearest second and of GMT to the nearest 10 minutes. Do *not* interpolate for values more accurate than the nearest second.

Table 4. Correction to Greenwich Mean Time Interval to Obtain Greenwich Sidereal Time Interval

GMT	0 h	1h	2h	3h	4h	5h	6h	7h	8h	9h	10h	11h
m	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s
0	0 0.0	0 9.9	0 19.7	0 29.6	0 39.4	0 49.3	0 59 1	1 9.0	1 18.9	1 28.7	1 38.6	1 48.4
1	0.2	10.0	19.9	29.7	39.6	49.4	59.3	9.2	19.0	28.9	38.7	48.6
2	0.3	10.2	20.0	29.9	39.8	49.6	59.5	9.3	19.2	29.0	38.9	48.8
3	0.5	10.3	20.2	30 1	39.9	49.8	59.6	9.5	19.3	29.2	39.1	48.9
4	0.7	10.5	20.4	30.2	40.1	49.9	59.8	9.7	19.5	29.4	39.2	49.1
5	0 0.8	0 10.7	0 20.5	0 30.4	0 40.2	0 50.1	1 0.0	0 9.8	1 19.7	1 29.5	1 39.4	1 49.2
6	1.0	10.8	20.7	30.6	40.4	50.3	0.1	10.0	19.8	29.7	39.6	49.4
7	1.2	11 0	20.9	30.7	40.6	50.4	0.3	10.1	20.0	29.9	39.7	49.6
8	1.3	11.2	21.0	30.9	40.7	50.6	0.5	10.3	20.2	30.0	39.9	49.7
9	1.5	11.3	21.2	31.0	40.9	50.8	0.6	10 5	20.3	30.2	40.0	49.9
10	0 1.6	0 11.5	0 21.4	0 31.2	0 41.1	0 50.9	1 0.8	1 10.6	1 20.5	1 30.4	1 40.2	1 50.1
11	1.8	11.7	21.5	31.4	41.2	51.1	0.9	10.8	20.7	30.5	40.4	50.2
12	2.0	11.8	21.7	31.5	41.4	51.3	1.1	11.0	20.8	30.7	40.5	50.4
13	2.1	12.0	21.8	31.7	41.6	51.4	1.3	11.1	21.0	30.8	40.7	50.6
14	2.3	12.2	22.0	31.9	41.7	51.6	1.4	11.3	21.2	31.0	40.9	50.7
15	0 2.5	0 12.3	0 22.2	0 32.0	0 41.9	0 51.7	1 1.6	1 11.5	1 21.3	1 31.2	1 41.0	1 50.9
16	2.6	12.5	22.3	32.2	42.1	51.9	1.8	11.6	21.5	31.3	41.2	51.0
17	2.8	12.6	22.5	32.4	42.2	52.1	1.9	11.8	21.6	31.5	41.4	51.2
18	3.0	12.8	22.7	32.5	42.4	52.2	2.1	12.0	21.8	31.7	41.5	51.4
19	3.1	13.0	22.8	32.7	42.5	52.4	2.3	12.1	22.0	31.8	41.7	51.5
20	0 3.3	0 13.1	0 23.0	0 32.9	0 42.7	0 52.6	1 2.4	1 12.3	1 22.1	1 32.0	1 41.8	1 51.7
21	3.4	13.3	23.2	33.0	42.9	52.7	2.6	12.4	22.3	32.2	42.0	51.9
22	3.6	13.5	23.3	33.2	43.0	52.9	2.8	12.6	22.5	32.3	42.2	52.0
23	3.8	13.6	23.5	33.3	43.2	53.1	2.9	12.8	22.6	32.5	42.3	52.2
24	3.9	13 8	23.7	33.5	43.4	53.2	3.1	12.9	22.8	32.7	42.5	52.4
25	0 4.1	0 14.0	0 23.8	0 33.7	0 43.5	0 53.4	1 3.2	1 13.1	1 23.0	1 32.8	1 42.7	1 52.5
26	4.3	14.1	24.0	33.8	43.7	53.6	3.4	13.3	23.1	33.0	42.8	52.7
27	4.4	14.3	24.1	34.0	43.9	53.7	3.6	13.4	23.3	33.1	43.0	52.9
28	4.6	14.5	24.3	34.2	44.0	53.9	3.7	13.6	23.5	33.3	43.2	53.0
29	4.8	14.6	24.5	34.3	44.2	54.0	3.9	13.8	23.6	33.5	43.3	53.2
30	0 4.9	0 14.8	0 24.6	0 34.5	0 44.4	0 54.2	1 4.1	1 13.9	1 23.8	1 33.6	1 43.5	1 53.3
31	5.1	14.9	24.8	34.7	44.5	54.4	4.2	14.1	23.9	33.8	43.7	53.5
32	5.3	15.1	25.0	34.8	44.7	54.5	4.4	14.3	24.1	34.0	43.8	53.7
33	5.4	15.3	25.1	35.0	44.8	54.7	4.6	14.4	24.3	34.1	44.0	53.8
34	5.6	15.4	25.3	35.2	45.0	54.9	4.7	14.6	24.4	34.3	44.2	54.0
35	0 5.8	0 15.6	0 25.5	0 35 3	0 45.2	0 55.0	1 4.9	1 14.7	1 24.6	1 34.5	1 44.3	1 54.2
36	5.9	15.8	25.6	35.5	45.3	55.2	5.1	14.9	24.8	34.6	44.5	54.3
37	6.1	15.9	25.8	35.6	45.5	55.4	5.2	15.1	24.9	34.8	44.6	54.5
38	6 2	16.1	26.0	35.8	45.7	55.5	5.4	15.2	25.1	35.0	44.8	54.7
39	6.4	16.3	26.1	36.0	45 8	55.7	5.5	15.4	25.3	35.1	45.0	54.8
40	0 6.6	0 16.4	0 26.3	0 36 1	0 46.0	0 55.9	1 5.7	1 15.6	1 25.4	1 35.3	1 45.1	1 55.0
41	6.7	16.6	26.4	36.3	46.2	56.0	5.9	15.7	25.6	35.4	45.3	55.2
42	6.9	16.8	26.6	36.5	46.3	56.2	6.0	15.9	25.8	35.6	45.5	55.3
43	7.1	16.9	26.8	36.6	46.5	56.3	6.2	16.1	25.9	35.8	45.6	55.5
44	7.2	17.1	26.9	36.8	46.7	56.5	6.4	16.2	26.1	35.9	45.8	55.6
45	0 7.4	0 17.2	0 27.1	0 37.0	0 46 8	0 56.7	1 6.5	1 16.4	1 26.2	1 36.1	1 46.0	1 55.8
46	7.6	17.4	27.3	37.1	47.0	56.8	6.7	16.6	26.4	36.3	46.1	56.0
47	7.7	17.6	27.4	37.3	47.1	57.0	6.9	16.7	26.6	36.4	46.3	56.1
48	7 9	17.7	27 6	37.5	47.3	57.2	7.0	16.9	26.7	36.6	46.4	56.3
49	8.0	17.9	27.8	37.6	47.5	57.3	7.2	17.0	26.9	36.8	46.6	56.5
50	0 8.2	0 18.1	0 27.9	0 37.8	0 47.6	0 57.5	1 7.4	1 17.2	1 27.1	1 36.9	1 46.8	1 56.6
51	8.4	18.2	28.1	37.9	47.8	57.7	7.5	17.4	27.2	37.1	46.9	56.8
52	8.5	18.4	28.3	38.1	48.0	57.8	7.7	17.5	27.4	37.3	47.1	57.0
53	8.7	18.6	28.4	38.3	48.1	58.0	7.8	17.7	27.6	37.4	47.3	57.1
54	8.9	18.7	28.6	38.4	48.3	58.2	8.0	17.9	27.7	37.6	47.4	57.3
55	0 9.0	0 18.9	0 28.7	0 38.6	0 48.5	0 58.3	1 8.2	1 18.0	1 27.9	1 37.7	1 47.6	1 57.5
56	9.2	19.1	28.9	38.8	48.6	58.5	8.3	18.2	28.1	37.9	47.8	57.6
57	9.4	19.2	29.1	38.9	48.8	58.6	8.5	18.4	28.2	38.1	47.9	57.8
58	9.5	19.4	29.2	39.1	49.0	58.8	8.7	18.5	28.4	38.2	48.1	57.9
59	9.7	19.5	29.4	39.3	49.1	59.0	8.8	18.7	28.5	38.4	48.3	58.1

Table 4. Correction to Greenwich Mean Time Interval to Obtain Greenwich Sidereal Time Interval—Continued

GMT	12h	13h	14h	15h	16h	17h	18h	19h	20h	21h	22h	23h
m	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s	m s
0	1 58.3	2 8.1	2 18.0	2 27.8	2 37.7	2 47.6	2 57.4	3 7.3	3 17.1	3 27.0	3 36.8	3 46.7
1	58.4	8.3	18.2	28.0	37.9	47.7	57.6	7 4	17.3	27.2	37.0	46.9
2	58.6	8.5	18.3	28.2	38.0	47.9	57.7	7.6	17.5	27.3	37.2	47.0
3	58.8	8.6	18.5	28.3	38.2	48.1	57.9	7.8	17.6	27.5	37.3	47.2
4	58.9	8.8	18.6	28.5	38.4	48.2	58.1	7.9	17.8	27.6	37.5	47.4
5	1 59.1	2 9.0	2 18.8	2 28.7	2 38.5	2 48.4	2 58.2	3 8.1	3 18.0	3 27.8	3 37.7	3 47.5
6	59.3	9.1	19.0	28.8	38.7	48.5	58.4	8.3	18.1	28.0	37.8	47 7
7	59.4	9.3	19.1	29.0	38.9	48.7	58.6	8.4	18.3	28 1	38.0	47.8
8	59.6	9.4	19.3	29.2	39.0	48.9	58.7	8.6	18.4	28.3	38.2	48.0
9	59.8	9.6	19.5	29.3	39.2	49.0	58.9	8.8	18.6	28.5	38.3	48.2
10	1 59.9	2 9.8	2 19.6	2 29.5	2 39.3	2 49.2	2 59.1	3 8.9	3 18.8	3 28 6	3 38.5	3 48.3
11	2 0.1	9.9	19.8	29.7	39.5	49.4	59.2	9.1	18.9	28.8	38.6	48.5
12	0.2	10.1	20.0	29.8	39.7	49.5	59.4	9.2	19.1	29.0	38.8	48.7
13	0.4	10.3	20.1	30.0	39.8	49.7	59.6	9.4	19.3	29.1	39.0	48.8
14	0.6	10.4	20.3	30.1	40.0	49.9	59.7	9.6	19.4	29.3	39.1	49.0
15	2 0.7	2 10.6	2 20.5	2 30.3	2 40.2	2 50.0	2 59.9	3 9.7	3 19.6	3 29.4	3 39.3	3 49.2
16	0.9	10.8	20.6	30.5	40.3	50.2	3 0.0	9.9	19.8	29.6	39.5	49.3
17	1.1	10.9	20.8	30.6	40.5	50.4	0.2	10.1	19.9	29.8	39.6	49.5
18	1.2	11.1	20.9	30.8	40.7	50.5	0.4	10.2	20.1	29.9	39.8	49.7
19	1.4	11.3	21.1	31.0	40.8	50.7	0.5	10.4	20.3	30.1	40.0	49.8
20	2 1.6	2 11.4	2 21.3	2 31.1	2 41.0	2 50.8	3 0.7	3 10.6	3 20.4	3 30.3	3 40.1	3 50.0
21	1.7	11.6	21.4	31.3	41.2	51.0	0.9	10.7	20.6	30.4	40.3	50.1
22	1.9	11.7	21.6	31.5	41.3	51.2	1.0	10.9	20.7	30.6	40.5	50.3
23	2.1	11.9	21.8	31.6	41.5	51.3	1.2	11.1	20.9	30.8	40.6	50.5
24	2.2	12.1	21.9	31.8	41.6	51.5	1.4	11 2	21.1	30.9	40.8	50.6
25	2 2.4	2 12.2	2 22.1	2 32.0	2 41.8	2 51.7	3 1.5	3 11.4	3 21.2	3 31.1	3 40.9	3 50.8
26	2.5	12.4	22.3	32.1	42.0	51.8	1.7	11.5	21.4	31.3	41.1	51.0
27	2.7	12.6	22.4	32.3	42.1	52.0	1.9	11.7	21.6	31 4	41.3	51.1
28	2.9	12.7	22.6	32.4	42.3	52.2	2.0	11.9	21.7	31.6	41.4	51.3
29	3.0	12.9	22.8	32.6	42.5	52.3	2.2	12.0	21.9	31.8	41.6	51.5
30	2 3.2	2 13.1	2 22.9	2 32.8	2 42.6	2 52.5	3 2.3	3 12.2	3 22.1	3 31.9	3 41.8	3 51.6
31	3.4	13 2	23.1	32.9	42.8	52.7	2.5	12.4	22.2	32.1	41.9	51.8
32	3.5	13.4	23.2	33.1	43.0	52.8	2.7	12.5	22.4	32.2	42.1	52.0
33	3.7	13.6	23.4	33.3	43 1	53.0	2.8	12.7	22.6	32.4	42.3	52.1
34	3.9	13.7	23.6	33.4	43.3	53.1	3.0	12.9	22.7	32.6	42.4	52.3
35	2 4.0	2 13.9	2 23.7	2 33.6	2 43.5	2 53.3	3 3.2	3 13.0	3 22.9	3 32.7	3 42.6	3 52.4
36	4.2	14.0	23.9	33.8	43.6	53.5	3.3	13.2	23.0	32.9	42.8	52.6
37	4.4	14.2	24.1	33.9	43.8	53.6	3.5	13.4	23.2	33.1	42.9	52.8
38	4.5	14.4	24.2	34.1	43.9	53.8	3.7	13.5	23.4	33.2	43.1	52.9
39	4.7	14.5	24.4	34.3	44.1	54.0	3.8	13.7	23.5	33.4	43.2	53.1
40	2 4.8	2 14.7	2 24.6	2 34.4	2 44.3	2 54.1	3 4.0	3 13.8	3 23.7	3 33.6	3 43.4	3 53.3
41	5.0	14.9	24.7	34.6	44.4	54.3	4.2	14.0	23.9	33.7	43.6	53.4
42	5 2	15.0	24.9	34.7	44.6	54.5	4.3	14.2	24.0	33 9	43.7	53.6
43	5.3	15.2	25.1	34.9	44.8	54.6	4.5	14.3	24.2	34.0	43.9	53.8
44	5.5	15.4	25.2	35.1	44.9	54.8	4.6	14.5	24.4	34.2	44.1	53.9
45	2 5.7	2 15.5	2 25.4	2 35.2	2 45.1	2 55.0	3 4.8	3 14.7	3 24.5	3 34.4	3 44.2	3 54.1
46	5.8	15.7	25.5	35.4	45.3	55.1	5.0	14.8	24.7	34.5	44.4	54.3
47	6.0	15.9	25.7	35.6	45.4	55.3	5.1	15.0	24.8	34.7	44.6	54.4
48	6.2	16.0	25.9	35.7	45.6	55.4	5 3	15.2	25.0	34.9	44.7	54.6
49	6.3	16.2	26.0	35.9	45 8	55.6	5.5	15.3	25.2	35.0	44.9	54.7
50	2 6.5	2 16.3	2 26.2	2 36.1	2 45.9	2 55.8	3 5.6	3 15.5	3 25.3	3 35.2	3 45.1	3 54.9
51	6.7	16.5	26.4	36.2	46.1	55.9	5.8	15.7	25.5	35.4	45.2	55.1
52	6.8	16.7	26.5	36.4	46.2	56.1	6.0	15.8	25.7	35.5	45.4	55.2
53	7.0	16.8	26.7	36.6	46.4	56.3	6.1	16.0	25.8	35.7	45.5	55.4
54	7.1	17.0	26.9	36.7	46.6	56.4	6.3	16.1	26.0	35.9	45.7	55.6
55	2 7.3	2 17 2	2 27.0	2 36.9	2 46.7	2 56.6	3 6.5	3 16.3	3 26.2	3 36.0	3 45.9	3 55.7
56	7.5	17.3	27.2	37.0	46 9	56.8	6.6	16.5	26.3	36.2	46.0	55.9
57	7.6	17.5	27.4	37 2	47.1	56.9	6.8	16.6	26.5	36.4	46.2	56.1
58	7.8	17.7	27.5	37.4	47.2	57.1	6.9	16.8	26.7	36.5	46.4	56.2
59	8.0	17.8	27.7	37.5	47.4	57.3	7.1	17.0	26.8	36.7	46.5	56.4

Table 5a. Conversion of Time to Arc

Time	Arc		Time	Arc			Time	Arc			Time	Arc		
Hours	°	Mils	Min	°	′	Mils	Min	°	′	Mils	Min	°	′	Mils
1	15	266.67	1	0	15	4.44	21	5	15	93.33	41	10	15	182.22
2	30	533.33	2	0	30	8.89	22	5	30	97.78	42	10	30	186.67
3	45	800.00	3	0	45	13.33	23	5	45	102.22	43	10	45	191.11
4	60	1066.67	4	1	00	17.78	24	6	00	106.67	44	11	00	195.56
5	75	1333.33	5	1	15	22.22	25	6	15	111.11	45	11	15	200.00
6	90	1600.00	6	1	30	26.67	26	6	30	115.56	46	11	30	204.44
7	105	1866.67	7	1	45	31.11	27	6	45	120.00	47	11	45	208.89
8	120	2133.33	8	2	00	35.56	28	7	00	124.44	48	12	00	213.33
9	135	2400.00	9	2	15	40.00	29	7	15	128.89	49	12	15	217.78
10	150	2666.67	10	2	30	44.44	30	7	30	133.33	50	12	30	222.22
11	165	2933.33	11	2	45	48.89	31	7	45	137.78	51	12	45	226.67
12	180	3200.00	12	3	00	53.33	32	8	00	142.22	52	13	00	231.11
13	195	3466.67	13	3	15	57.78	33	8	15	146.67	53	13	15	235.56
14	210	3733.33	14	3	30	62.22	34	8	30	151.11	54	13	30	240.00
15	225	4000.00	15	3	45	66.67	35	8	45	155.56	55	13	45	244.44
16	240	4266.67	16	4	00	71.11	36	9	00	160.00	56	14	00	248.89
17	255	4533.33	17	4	15	75.56	37	9	15	164.44	57	14	15	253.33
18	270	4800.00	18	4	30	80.00	38	9	30	168.89	58	14	30	257.78
19	285	5066.67	19	4	45	84.44	39	9	45	173.33	59	14	45	262.22
20	300	5333.33	20	5	00	88.89	40	10	00	177.78	60	15	00	266.67
21	315	5600.00												
22	330	5866.67												
23	345	6133.33												
24	360	6400.00												

Time	Arc			Time	Arc			Time	Arc			Time	Arc		
Sec	′	″	Mils	Sec	′	″	Mils	Sec	′	″	Mils	Sec	′	″	Mils
1	0	15	.07	16	4	00	1.19	31	7	45	2.30	46	11	30	3.41
2	0	30	.15	17	4	15	1.26	32	8	00	2.37	47	11	45	3.48
3	0	45	.22	18	4	30	1.33	33	8	15	2.44	48	12	00	3.56
4	1	00	.30	19	4	45	1.41	34	8	30	2.52	49	12	15	3.63
5	1	15	.37	20	5	00	1.48	35	8	45	2.59	50	12	30	3.70
6	1	30	.44	21	5	15	1.56	36	9	00	2.67	51	12	45	3.78
7	1	45	.52	22	5	30	1.63	37	9	15	2.74	52	13	00	3.85
8	2	00	.59	23	5	45	1.70	37	9	30	2.81	53	13	15	3.93
9	2	15	.67	24	6	00	1.78	39	9	45	2.89	54	13	30	4.00
10	2	30	.74	25	6	15	1.85	40	10	00	2.96	55	13	45	4.07
11	2	45	.81	26	6	30	1.93	41	10	15	3.04	56	14	00	4.15
12	3	00	.89	27	6	45	2.00	42	10	30	3.11	57	14	15	4.22
13	3	15	.96	28	7	00	2.07	43	10	45	3.19	58	14	30	4.30
14	3	30	1.04	29	7	15	2.15	44	11	00	3.26	59	14	45	4.37
15	3	45	1.11	30	7	30	2.22	45	11	15	3.33	60	15	00	4.44

Example: Time is 22 hours , 46 minutes, 37 seconds. Convert to arc.

22 hours time = 330° arc
46 minutes time = 11° 30′ arc
37 seconds time = 9′ 15″ arc

22h 46M 37S 341° 39′ 15″ arc

Table 5b. Conversion of Arc to Time

DEGREES						MINUTES		SECONDS					
°	h m	°	h m	°	h m	′	m s	″	s	″	S	″	s
0	0 00	60	4 00	120	8 00	0	0 00	0	0.000	0.00	0.000	0.50	0.033
1	0 04	61	4 04	121	8 04	1	0 04	1	0.067	.01	.001	.51	.034
2	0 08	62	4 08	122	8 08	2	0 08	2	0.133	.02	.001	.52	.035
3	0 12	63	4 12	123	8 12	3	0 12	3	0.200	.03	.002	.53	.035
4	0 16	64	4 16	124	8 16	4	0 16	4	0.267	.04	.003	.54	.036
5	0 20	65	4 20	125	8 20	5	0 20	5	0.333	0.05	0.003	0.55	0.037
6	0 24	66	4 24	126	8 24	6	0 24	6	0.400	.06	.004	.56	.037
7	0 28	67	4 28	127	8 28	7	0 28	7	0.467	.07	.005	.57	.038
8	0 32	68	4 32	128	8 32	8	0 32	8	0.533	.08	.005	.58	.039
9	0 36	69	4 36	129	8 36	9	0 36	9	0.600	.09	.006	.59	.039
10	0 40	70	4 40	130	8 40	10	0 40	10	0.667	0.10	0.007	0.60	0.040
11	0 44	71	4 44	131	8 44	11	0 44	11	0.733	.11	.007	.61	.041
12	0 48	72	4 48	132	8 48	12	0 48	12	0.800	.12	.008	.62	.041
13	0 52	73	4 52	133	8 52	13	0 52	13	0.867	.13	.009	.63	.042
14	0 56	74	4 56	134	8 56	14	0 56	14	0.933	.14	.009	.64	.043
15	1 00	75	5 00	135	9 00	15	1 00	15	1.000	0.15	0.010	0.65	0.043
16	1 04	76	5 04	136	9 04	16	1 04	16	1.067	.16	.011	.66	.044
17	1 08	77	5 08	137	9 08	17	1 08	17	1.133	.17	.011	.67	.045
18	1 12	78	5 12	138	9 12	18	1 12	18	1.200	.18	.012	.68	.045
19	1 16	79	5 16	139	9 16	19	1 16	19	1.267	.19	.013	.69	.046
20	1 20	80	5 20	140	9 20	20	1 20	20	1.333	0.20	0.013	0.70	0.047
21	1 24	81	5 24	141	9 24	21	1 24	21	1.400	.21	.014	.71	.047
22	1 28	82	5 28	142	9 28	22	1 28	22	1.467	.22	.015	.72	.048
23	1 32	83	5 32	143	9 32	23	1 32	23	1.533	.23	.015	.73	.049
24	1 36	84	5 36	144	9 36	24	1 36	24	1.600	.24	.016	.74	.049
25	1 40	85	5 40	145	9 40	25	1 40	25	1.667	0.25	0.017	0.75	0.056
26	1 44	86	5 44	146	9 44	26	1 44	26	1.733	.26	.017	.76	.051
27	1 48	87	5 48	147	9 48	27	1 48	27	1.800	.27	.018	.77	.051
28	1 52	88	5 52	148	9 52	28	1 52	28	1.867	.28	.019	.78	.052
29	1 56	89	5 56	149	9 56	29	1 56	29	1.933	.29	.019	.79	.053
30	2 00	90	6 00	150	10 00	30	2 00	30	2.000	0.30	0.020	0.80	0.053
31	2 04	91	6 04	151	10 04	31	2 04	31	2.067	31	.021	.81	.054
32	2 08	92	6 08	152	10 08	32	2 08	32	2.133	.32	.021	.82	.055
33	2 12	93	6 12	153	10 12	33	2 12	33	2.200	.33	.022	.83	.055
34	2 16	94	6 16	154	10 16	34	2 16	34	2.267	.34	.023	.84	.056
35	2 20	95	6 20	155	10 20	35	2 20	35	2.333	0.35	0.023	0.85	0.057
36	2 24	96	6 24	156	10 24	36	2 24	36	2.400	.36	.024	.86	.057
37	2 28	97	6 28	157	10 28	37	2 28	37	2.467	.37	.025	.87	.058
38	2 32	98	6 32	158	10 32	38	2 32	38	2.533	38	.025	.88	.059
39	2 36	99	6 36	159	10 36	39	2 36	39	2.600	.39	.026	.89	.059
40	2 40	100	6 40	160	10 40	40	2 40	40	2.667	0.40	0.027	0.90	0.060
41	2 44	101	6 44	161	10 44	41	2 44	41	2.733	.41	.027	.91	.061
42	2 48	102	6 48	162	10 48	42	2 48	42	2.800	.42	.028	.92	.061
43	2 52	103	6 52	163	10 52	43	2 52	43	2.867	.43	.029	.93	.062
44	2 56	104	6 56	164	10 56	44	2 56	44	2.933	.44	.029	.94	.063
45	3 00	105	7 00	165	11 00	45	3 00	45	3.000	0.45	0.030	0.95	0.063
46	3 04	106	7 04	166	11 04	46	3 04	46	3.007	.46	.031	.96	.064
47	3 08	107	7 08	167	11 08	47	3 08	47	3.133	.47	.031	.97	.065
48	3 12	108	7 12	168	11 12	48	3 12	48	3.200	.48	.032	.98	.065
49	3 16	109	7 16	169	11 16	49	3 16	49	3.267	.49	.033	0.99	.066
50	3 20	110	7 20	170	11 20	50	3 20	50	3.333	0.50	0.033	1.00	0.067
51	3 24	111	7 24	171	11 24	51	3 24	51	3.400				
52	3 28	112	7 28	172	11 28	52	3 28	52	3.467				
53	3 32	113	7 32	173	11 32	53	3 32	53	3.533				
54	3 36	114	7 36	174	11 36	54	3 36	54	3.600				
55	3 40	115	7 40	175	11 40	55	3 40	55	3.667				
56	3 44	116	7 44	176	11 44	56	3 44	56	3.733				
57	3 48	117	7 48	177	11 48	57	3 48	57	3.800				
58	3 52	118	7 52	178	11 52	58	3 52	58	3.865				
59	3 56	119	7 56	179	11 56	59	3 56	59	3.933				

90° = 6h

180° = 12h

270° = 18h

Table 5c. Conversion of Degrees, Minutes, and Seconds to Mils

Degrees

Deg	Mils	Deg	Mils	Deg	Mils	Deg	Mils	Deg	Mils	Deg	Mils
1	17.78	31	551.11	61	1084.44	91	1617.78	121	2151.11	151	2684.44
2	35.56	32	568.89	62	1102.22	92	1635.56	122	2168.89	152	2702.22
3	53.33	33	586.67	63	1120.00	93	1653.33	123	2186.67	153	2720.00
4	71.11	34	604.44	64	1137.78	94	1671.11	124	2204.44	154	2737.78
5	88.89	35	622.22	65	1155.56	95	1688.89	125	2222.22	155	2755.56
6	106.67	36	640.00	66	1173.33	96	1706.67	126	2240.00	156	2773.33
7	124.44	37	657.78	67	1191.11	97	1724.44	127	2257.78	157	2791.11
8	142.22	38	675.56	68	1208.89	98	1742.22	128	2275.56	158	2808.89
9	160.00	39	693.33	69	1226.67	99	1760.00	129	2293.33	159	2826.67
10	177.78	40	711.11	70	1244.44	100	1777.78	130	2311.11	160	2844.44
11	195.56	41	728.89	71	1262.22	101	1795.56	131	2328.89	161	2862.22
12	213.33	42	746.67	72	1280.00	102	1813.33	132	2346.67	162	2880.00
13	231.11	43	764.44	73	1297.78	103	1831.11	133	2364.44	163	2897.78
14	248.89	44	782.22	74	1315.56	104	1848.89	134	2382.22	164	2915.56
15	266.67	45	800.00	75	1333.33	105	1866.67	135	2400.00	165	2933.33
16	284.44	46	817.78	76	1351.11	106	1884.44	136	2417.78	166	2951.11
17	302.22	47	835.56	77	1368.89	107	1902.22	137	2435.56	167	2968.89
18	320.00	48	853.33	78	1386.67	108	1920.00	138	2453.33	168	2986.67
19	337.78	49	871.11	79	1404.44	109	1937.78	139	2471.11	169	3004.44
20	355.56	50	888.89	80	1422.22	110	1955.56	140	2488.89	170	3022.22
21	373.33	51	906.67	81	1440.00	111	1973.33	141	2506.67	171	3040.00
22	391.11	52	924.44	82	1457.78	112	1991.11	142	2524.44	172	3057.78
23	408.89	53	942.22	83	1475.56	113	2008.89	143	2542.22	173	3075.56
24	426.67	54	960.00	84	1493.33	114	2026.67	144	2560.00	174	3093.33
25	444.44	55	977.78	85	1511.11	115	2044.44	145	2577.78	175	3111.11
26	462.22	56	995.56	86	1528.89	116	2062.22	146	2595.56	176	3128.89
27	480.00	57	1013.33	87	1546.67	117	2080.00	147	2613.33	177	3146.67
28	497.78	58	1031.11	88	1564.44	118	2097.78	148	2631.11	178	3164.44
29	515.56	59	1048.89	89	1582.22	119	2115.56	149	2648.89	179	3182.22
30	533.33	60	1066.67	90	1600.00	120	2133.33	150	2666.67	180	3200.00

Minutes						Seconds					
Min	Mils	Min	Mils	Min	Mils	Sec	Mils	Sec	Mils	Sec	Mils
1	0.30	21	6.22	41	12.15	1	0.00	21	0.10	41	0.20
2	0.59	22	6.52	42	12.44	2	0.01	22	0.11	42	0.21
3	0.89	23	6.81	43	12.74	3	0.01	23	0.11	43	0.21
4	1.19	24	7.11	44	13.04	4	0.02	24	0.12	44	0.22
5	1.48	25	7.41	45	13.33	5	0.02	25	0.12	45	0.22
6	1.78	26	7.70	46	13.63	6	0.03	26	0.13	46	0.23
7	2.07	27	8.00	47	13.93	7	0.03	27	0.13	47	0.23
8	2.37	28	8.30	48	14.22	8	0.04	28	0.14	48	0.24
9	2.67	29	8.59	49	14.52	9	0.04	29	0.14	49	0.24
10	2.96	30	8.89	50	14.81	10	0.05	30	0.15	50	0.25
11	3.26	31	9.19	51	15.11	11	0.05	31	0.15	51	0.25
12	3.56	32	9.48	52	15.41	12	0.06	32	0.16	52	0.26
13	3.85	33	9.78	53	15.70	13	0.06	33	0.16	53	0.26
14	4.15	34	10.07	54	16.00	14	0.07	34	0.17	54	0.27
15	4.44	35	10.37	55	16.30	15	0.07	35	0.17	55	0.27
16	4.74	36	10.67	56	16.59	16	0.08	36	0.18	56	0.28
17	5.04	37	10.96	57	16.89	17	0.08	37	0.18	57	0.28
18	5.33	38	11.26	58	17.19	18	0.09	38	0.19	58	0.29
19	5.63	39	11.56	59	17.48	19	0.09	39	0.19	59	0.29
20	5.93	40	11.85	60	17.78	20	0.10	40	0.20	60	0.30

Table 6. Convergence

Northing = UTM grid northing coordinate of station in meters.
If in Northern Hemisphere, enter table with northing.
If in Southern Hemisphere, subtract northing of station from 10,000,000; enter table with resulting northing.
Enter table using northing to nearest 100 meters and interpolate.
Log XV = Log of function XV (sign always +).

Northing	Function XV	Diff.	Log XV	Diff.
0	0		0	
		5.109		70834
1,000	5.109	5.109	0 70834	30103
2,000	10.218	5.109	1.00937	17609
3,000	15.327	5.109	1.18546	12494
4,000	20.430		1.31040	
		5.109		9691
5,000	25.545	5.109	1.40731	7918
6,000	30.654	5.109	1.48649	6694
7,000	35.763	5.109	1 55343	5800
8,000	40.872	5.109	1.61143	5115
9,000	45.981		1.66258	
		5.109		4576
10,000	51.090	51.09	1.70834	30103
20,000	102.18	51.09	2.00937	17609
30,000	153.27	51.09	2.18546	12494
40,000	204.36	51.10	2.31040	9692
50,000	255.46		2.40732	
		51.09		7918
60,000	306.55	51.10	2.48650	6696
70,000	357.65	51.09	2 55346	5799
80,000	408.74	51.10	2.61145	5116
90,000	459.84	51.10	2.66261	4576
100,000	510.94		2.70837	
		51.11		4141
110,000	562.05	51.10	2.74978	3779
120,000	613.15	51.11	2.78757	3477
130,000	664.26	51.12	2.82234	3220
140,000	715.38	51.11	2.85454	2997
150,000	766.49		2.88451	
		51.12		2804
160,000	817.61	51.13	2.91255	2634
170,000	868.74	51.13	2.93889	2484
180,000	919.87	51.13	2.96373	2349
190,000	971.00	51.1	2.98722	2227
200,000	1022.1		3.00949	
		51.2		2123
210,000	1073.3	51.1	3 03072	2020
220,000	1124.4	51.2	3.05092	1934
230,000	1175.6	51.1	3.07026	1848
240,000	1226.7	51.2	3.08874	1776
250,000	1277.9		3.10650	
		51.2		1706
260,000	1329.1	51.2	3.12356	1641
270,000	1380.3	51.1	3.13997	1579
280,000	1431.4	51.2	3.15576	1526
290,000	1482.6	51.2	3.17102	1475
300,000	1533.8		3.18577	

Northing	Function XV	Diff.	Log XV	Diff.
		51.2		1426
310,000	1585.0	51.3	3.20003	1383
320,000	1636.3	51.2	3.21386	1338
330,000	1687.5	51.2	3.22724	1298
340,000	1738.7	51.2	3.24022	1261
350,000	1789.9		3.25283	
		51.3		1227
360,000	1841.2	51.2	3.26510	1191
370,000	1892.4	51.3	3.27701	1162
380,000	1943.7	51.3	3.28863	1131
390,000	1995.0	51.3	3.29994	1103
400,000	2046.3		3.31097	
		51.3		1075
410,000	2097.6	51.3	3.32172	1050
420,000	2148.9	51.3	3.33222	1024
430,000	2200.2	51.3	3.34246	1001
440,000	2251.5	51.4	3.35247	981
450,000	2302.9		3.36228	
		51.3		956
460,000	2354.2	51.4	3.37184	938
470,000	2405.6	51.3	3.38122	917
480,000	2456.9	51.4	3.39039	899
490,000	2508.3	51 4	3 39938	881
500,000	2559.7		3.40819	
		51.4		863
510,000	2611 1	51.5	3.41682	849
520,000	2662.6	51.4	3.42531	830
530,000	2714 0	51.4	3.43361	815
540,000	2765.4	51.5	3.44176	801
550,000	2816.9		3.44977	
		51.5		787
560,000	2868.4	51.5	3.45764	773
570,000	2919.9	51.5	3.46537	759
580,000	2971.4	51 5	3.47296	746
590,000	3022.9	51.5	3.48042	734
600,000	3074.4		3.48776	
		51.6		723
610,000	3126.0	51.5	3.49499	710
620,000	3177.5	51.6	3.50209	699
630,000	3229.1	51.6	3.50908	689
640,000	3280.7	51 6	3.51597	677
650,000	3332.3		3.52274	
		51.7		669
660,000	3384.0	51.6	3.52943	657
670,000	3435.6	51.7	3.53600	649
680,000	3487.3	51.7	3 54249	639
690,000	3539 0	51.7	3.54888	630
700,000	3590.7		3.55518	

Table 6. Convergence—Continued

Northing	Function XV	Diff.	Log XV	Diff.
		51.7		621
710,000	3642.4	51.7	3.56139	612
720,000	3694.1	51.8	3.56751	605
730,000	3745.9	51.7	3.57356	595
740,000	3797.6	51.8	3.57951	588
750,000	3849.4		3.58539	
		51.8		581
760,000	3901.2	51.9	3.59120	574
770,000	3953.1	51.8	3.59694	565
780,000	4004.9	51.9	3.60259	559
790,000	4056.8	51.9	3.60818	552
800,000	4108.7		3.61370	
		51.9		546
810,000	4160.6	51.9	3.61916	538
820,000	4212.5	51.9	3.62454	532
830,000	4264.4	52.0	3.62986	526
840,000	4316.4	52.0	3.63512	520
850,000	4368.4		3.64032	
		52.0		514
860,000	4420.4	52.1	3.64546	509
870,000	4472.5	52.0	3.65055	502
880,000	4524.5	52.1	3.65557	497
890,000	4576.6	52.1	3.66054	492
900,000	4628.7		3.66546	
		52.1		486
910,000	4680.8	52.2	3.67032	482
920,000	4733.0	52.2	3.67514	476
930,000	4785.2	52.1	3.67990	470
940,000	4837.3	52.3	3.68460	467
950,000	4889.6		3.68927	
		52.2		462
960,000	4941.8	52.3	3.69389	457
970,000	4994.1	52.3	3.69846	452
980,000	5046.4	52.3	3.70298	448
990,000	5098.7	52.4	3.70746	444
1,000,000	5151.1		3.71190	
		52.3		439
1,010,000	5203.4	52.4	3.71629	435
1,020,000	5255.8	52.4	3.72064	431
1,030,000	5308.2	52.5	3.72495	427
1,040,000	5360.7	52.5	3.72922	423
1,050,000	5413.2		3.73345	

Northing	Function XV	Diff.	Log XV	Diff
		52.5		420
1,060,000	5465.7	52.5	3.73765	415
1,070,000	5518.2	52.6	3.74180	412
1,080,000	5570.8	52.6	3.74592	408
1,090,000	5623.4	52.6	3.75000	404
1,100,000	5676.0		3.75404	
		52.6		401
1,110,000	5728.6	52.7	3.75805	398
1,120,000	5781.3	52.7	3.76203	394
1,130,000	5834.0	52.7	3.76597	390
1,140,000	5886.7	52.8	3.76987	388
1,150,000	5939.5		3.77375	
		52.8		384
1,160,000	5992.3	52.8	3.77759	381
1,170,000	6045.1	52.9	3.78140	379
1,180,000	6098.0	52.9	3.78519	375
1,190,000	6150.9	52.9	3.78894	372
1,200,000	6203.8		3.79266	
		52.9		369
1,210,000	6256.7	53.0	3.79635	366
1,220,000	6309.7	53.0	3.80001	363
1,230,000	6362.7	53.1	3.80364	361
1,240,000	6415.8	53.0	3.80725	357
1,250,000	6468.8		3.81082	
		53.1		355
1,260,000	6521.9	53.2	3.81437	353
1,270,000	6575.1	53.2	3.81790	350
1,280,000	6628.3	53.2	3.82140	347
1,290,000	6681.5	53.2	3.82487	345
1,300,000	6734.7		3.82832	
		53.3		342
1,310,000	6788.0	53.3	3.83174	340
1,320,000	6841.3	53.4	3.83514	338
1,330,000	6894.7	53.3	3.83852	334
1,340,000	6948.0	53.5	3.84186	333
1,350,000	7001 5		3.84519	
		53.4		330
1,360,000	7054.9	53.5	3.84849	328
1,370,000	7108.4	53.5	3.85177	326
1,380,000	7161.9	53.6	3.85503	324
1,390,000	7215.5	53.6	3.85827	321
1,400,000	7269.1		3.86148	

Table 6. Convergence—Continued

Northing	Function XV	Diff.	Log XV	Diff.
1,410,000	7322.7	53.6	3.86467	319
1,420,000	7376.4	53.7	3.86784	317
1,430,000	7430.1	53.7	3.87099	315
1,440,000	7483.9	53.8	3.87413	314
1,450,000	7537.7	53.8	3.87724	311
1,460,000	7591.5	53.8	3.88033	309
1,470,000	7645.4	53.9	3.88340	307
1,480,000	7699.3	53.9	3.88645	305
1,490,000	7753.2	53.9	3.88948	303
1,500,000	7807.2	54.0	3.89250	302
1,510,000	7861.2	54.0	3.89549	299
1,520,000	7915.3	54.1	3.80847	298
1,530,000	7969.4	54.1	3.90143	296
1,540,000	8023.6	54.2	3.90437	294
1,550,000	8077.8	54.2	3.90729	292
1,560,000	8132.0	54.2	3,91020	291
1,570,000	8186.3	54.3	3.91309	289
1,580,000	8240.6	54.3	3.91596	287
1.590,000	8294.9	54.3	3.91881	285
1,600,000	8349.3	54.4	3.92165	284
1,610,000	8403.8	54.5	3.92448	283
1,620,000	8458.3	54.5	3.92728	280
1,630,000	8512.8	54.5	3.93007	279
1,640,000	8567.4	54.6	3.93285	278
1,650,000	8622.0	54.6	3.93581	276
1,660,000	8676.7	54.7	3.93835	274
1,670,000	8731.4	54.7	3.94108	273
1,680,000	8786.2	54.8	3.94380	272
1,690,000	8841.0	54.8	3.94650	270
1,700,000	8895.9	54.9	3.94919	269
1,710,000	8950.8	54.9	3.95186	267
1,720,000	9005.7	54.9	3.95452	266
1,730,000	9060.7	55.0	3.95716	264
1,740,000	9115.7	55.0	3.95979	263
1,750,000	9170.8	55.1	3.96241	262

Northing	Function XV	Diff.	Log XV	Diff.
1,760,000	9226.0	55.2	3.96501	260
1,770,000	9281.2	55.2	3.96760	259
1,780,000	9336.4	55.2	3.97018	258
1,790,000	9391.7	55.3	3.97274	256
1,800,000	9447.0	55.3	3.97529	255
1,810,000	9502.4	55.4	3.97783	254
1,820,000	9557.9	55.5	4.98036	253
1,830,000	9613.4	55.5	3,98288	252
1,840,000	9668.9	55.5	3.98538	250
1,850,000	9724.5	55.6	3.98787	249
1,860,000	9780.1	55.6	3.99034	247
1,870,000	9835.8	55.7	3.99281	247
1,880,000	9891.6	55.8	3.99527	246
1,890,000	9947.4	55.8	3.99771	244
1,900,000	10008	55.6	4.00013	242
1,910,000	10059	56	4.00255	242
1,920,000	10115	56	4.00497	242
1,930,000	10171	56	4.00736	239
1,940,000	10227	56	4.00975	239
1,950,000	10283	56	4.01212	237
1,960,000	10339	56	4.01448	236
1,970,000	10396	57	4.01687	239
1,980,000	10452	56	4.01920	233
1,990,000	10508	56	4.02152	232
2,000,000	10565	57	4.02387	235
2,010,000	10621	56	4.02617	230
2,020,000	10678	57	4.02849	232
2,030,000	10734	56	4.03076	227
2,040,000	10791	57	4.03306	230
2,050,000	10848	57	4.03535	229
2,060,000	10904	56	4.03759	224
2,070,000	10961	57	4.03985	226
2,080,000	11018	57	4.04210	225
2,090,000	11075	57	4.04434	224
2,100,000	11132	57	4.04657	223

Table 6. Convergence—Continued

Northing	Function XV	Diff.	Log XV	Diff.
2,110,000	11189		4.04879	
		57		222
2,120,000	11246		4.05100	
		57		221
2,130,000	11303		4.05319	
		57		219
2,140,000	11361		4.05542	
		58		223
2,150,000	11418		4.05759	
		57		217
2,160,000	11475		4.05975	
		57		216
2,170,000	11533		4.06194	
		58		219
2,180,000	11590		4.06408	
		57		214
2,190,000	11648		4.06625	
		58		217
2,200,000	11705		4.06837	
		57		212
2,210,000	11763		4.07052	
		58		215
2,220,000	11821		4.07265	
		58		213
2,230,000	11879		4.07478	
		58		213
2,240,000	11937		4.07690	
		58		212
2,250,000	11995		4.07900	
		58		210
2,260,000	12053		4.08110	
		58		210
2,270,000	12111		4.08318	
		58		208
2,280,000	12169		4.08525	
		58		207
2,290,000	12227		4.08732	
		58		207
2,300,000	12285		4.08938	
		58		206
2,310,000	12344		4.09146	
		59		208
2,320,000	12402		4.09349	
		58		203
2,330,000	12461		4.09555	
		59		206
2,340,000	12519		4.09757	
		58		202
2,350,000	12578		4.09961	
		59		204
2,360,000	12636		4.10161	
		58		200
2,370,000	12695		4.10363	
		59		202
2,380,000	12754		4.10565	
		59		202
2,390,000	12813		4.10765	
		59		200
2,400,000	12872		4.10965	
		59		200
2,410,000	12931		4.11163	
		59		198
2,420,000	12990		4.11361	
		59		198
2,430,000	13049		4.11558	
		60		197
2,440,000	13109		4.11757	
		59		199
2,450,000	13168		4.11952	
				195

Northing	Function XV	Diff.	Log XV	Diff.
2,460,000	13228		4.12149	
		60		197
2,470,000	13287		4 12343	
		59		194
2,480,000	13347		4.12538	
		60		195
2,490,000	13406		4.12730	
		59		192
2,500,000	13466		4.12924	
		60		194
2,510,000	13526		4.13117	
		60		193
2,520,000	13586		4.13309	
		60		192
2,530,000	13646		4.13501	
		60		192
2,540,000	13706		4.13691	
		60		190
2,550,000	13766		4.13881	
		60		190
2,560,000	13826		4.14070	
		60		189
2,570,000	13886		4.14258	
		61		188
2,580,000	13947		4.14448	
		60		190
2,590,000	14007		4.14635	
		61		187
2,600,000	14068		4.14823	
		60		188
2,610,000	14128		4.15008	
		61		185
2,620,000	14189		4.15195	
		61		187
2,630,000	14250		4.15381	
		61		186
2,640,000	14311		4.15567	
		61		186
2,650,000	14372		4.15752	
		61		185
2,660,000	14433		4.15936	
		61		184
2,670,000	14494		4.16119	
		61		183
2,680,000	14555		4.16301	
		61		182
2,690,000	14616		4.16483	
		62		182
2,700,000	14678		4 16667	
		61		184
2,710,000	14739		4.16847	
		62		180
2,720,000	14801		4.17029	
		61		182
2,730,000	14862		4.17208	
		62		179
2,740,000	14924		4.17389	
		62		181
2,750,000	14986		4.17569	
		62		180
2,760,000	15048		4.17748	
		62		179
2,770,000	15110		4.17926	
		62		178
2,780,000	15172		4.18104	
		62		178
2,790,000	15234		4.18281	
		62		177
2,800,000	15296		4.18458	
				177

Table 6. Convergence—Continued

Northing	Function XV	Diff	Log XV	Diff
2,810,000	15359	63	4.18636	178
2,820,000	15421	62	4.18811	175
2,830,000	15484	63	4.18988	177
2,840,000	15546	62	4.19162	174
2,850,000	15609	63	4.19338	176
2,860,000	15672	63	4.19512	174
2,870,000	15735	63	4 19687	175
2,880,000	15798	63	4.19860	173
2,890,000	15861	63	4.20033	173
2,900,000	15924	63	4 20205	172
2,910,000	15987	63	4.20377	172
2,920,000	16051	64	4.20550	173
2,930,000	16114	63	4.20720	170
2,940,000	16178	64	4.20892	172
2,950,000	16242	64	4.21064	172
2,960,000	16305	63	4.21232	168
2,970,000	16369	64	4.21402	170
2,980,000	16433	64	4.21572	170
2,990,000	16497	64	4.21740	168
3,000,000	16561	64	4.21909	160
3,010,000	16626	65	4.22079	170
3,020,000	16690	64	4.22246	167
3,030,000	16755	65	4.22414	168
3,040,000	16819	64	4.22580	166
3,050,000	16884	65	4 22748	168
3,060,000	16949	65	4.22914	166
3,070,000	17014	65	4.23081	167
3,080,000	17079	65	4.23246	165
3,090,000	17144	65	4.23411	165
3,100,000	17209	65	4.23576	165
3,110,000	17274	65	4.23739	163
3,120,000	17340	66	4.23905	166
3.130,000	17406	66	4.24070	165
3,140,000	17471	65	4.24232	162
3,150,000	17537	66	4.24396	164

Northing	Function XV	Diff	Log XV	Diff.
3,160,000	17603	66	4.24559	163
3,170,000	17669	66	4.24721	162
3,180,000	17735	66	4.24883	162
3,190,000	17801	66	4.25044	161
3,200,000	17868	67	4.25208	164
3,210,000	17934	66	4.25368	160
3,220,000	18001	67	4.25530	162
3,230,000	18067	66	4.25689	159
3,240,000	18134	67	4.25849	160
3,250,000	18201	67	4.26010	161
3,260,000	18268	67	4.26169	159
3,270,000	18335	67	4.26328	159
3,280,000	18403	68	4.26489	161
3,290,000	18470	67	4.26647	158
3,300,000	18538	68	4.26806	159
3,310,000	18605	67	4.26963	157
3,320,000	18673	68	4.27121	158
3,330,000	18741	68	4.27279	158
3,340,000	18809	68	4.27437	158
3,350,000	18877	68	4.27593	156
3,360,000	18945	68	4.27749	156
3,370,000	19014	69	4.27907	158
3,380,000	19082	68	4.28062	155
3,390,000	19151	69	4.28219	157
3,400,000	19219	68	4.28373	154
3,410,000	19288	69	4.28529	156
3,420,000	19357	69	4.28684	155
3,430,000	19427	70	4.28841	157
3,440,000	19496	69	4.28995	154
3,450,000	19565	69	4.29148	153
3,460,000	19635	70	4.29303	155
3,470,000	19704	69	4.29455	152
3,480,000	19774	70	4.29609	154
3,490,000	19844	70	4.29763	154
3,500,000	19914	70	4.29916	153

Table 6. Convergence—Continued

Northing	Function XV	Diff.	Log XV	Diff.
3,510,000	19984			
		70		152
3,520,000	20055		4.30068	
		71		154
3,350,000	20125		4.30222	
		70		152
3,540,000	20196		4.30374	
		71		153
3,550,000	20267		4.30527	
		71		152
			4.30679	
3,560,000	20337	70		150
		71	4.30829	
3,570,000	20408			151
		72	4.30980	
3,580,000	20480			153
		71	4.31133	
3,590,000	20551			150
		71	4.31283	
3,600,000	20622			150
			4.31433	
3,610,000	20694	72		151
		72	4.31584	
3,620,000	20766			151
		71	4.31735	
3,630,000	20837			149
		72	4.31884	
3,640.000	20909			149
		73	4 32033	
3,650,000	20982			152
			4.32185	
3,660,000	21054	72		148
		72	4.32333	
3,670,000	21126			149
		73	4.32482	
3,680,000	21199			150
		73	4.32632	
3,690,000	21272			149
		73	4.32781	
3,700,000	21345			149
			4.32930	
3,710,000	21418	73		148
		73	4.33078	
3,720,000	21491			148
		73	4.33226	
3,730,000	21564			147
		74	4.33373	
3,740,000	21638			149
		73	4.33522	
3,750,000	21711			146
			4.33668	
3,760,000	21785	74		148
		74	4.33816	
3,770,000	21859			147
		74	4.33963	
3,780,000	21933			147
		75	4.34110	
3,790,000	22008			148
		74	4.34258	
3,800,000	22082			146
			4.34404	
3,810,000	22157	75		147
		74	4.34551	
3,820,000	22231			145
		75	4.34696	
3,830,000	22306			146
		75	4.34842	
3,840,000	22381			146
		76	4.34988	
3,850,000	22457			147
			4.35135	

Northing	Function XV	Diff.	Log XV	Diff.
3,860,000	22532	75		145
			4.35280	
3,870,000	22608	76		146
			4.35426	
3,880,000	22683	75		144
			4.35570	
3,890,000	22759	76		145
			4 35715	
3,900,000	22835	76		145
			4 35860	
3,910,000	22911	76		144
		77	4.36004	
3,920,000	22988	76		146
			4.36150	
3,930,000	23064	77		143
			4.36293	
3,940,000	23141	77		145
			4.36438	
3,950,000	23218			144
			4.36582	
3,960,000	23295	77		144
		77	4.36726	
3,970,000	23372	78		144
			4 36870	
3,980,000	23450	77		144
			4.37014	
3,990,000	23527	78		143
			4.37157	
4,000,000	23605			143
			4.37300	
4,010,000	23683	78		144
		78	4.37444	
4,020,000	23761	79		142
			4.37586	
4,030,000	23840	78		145
			4.37731	
4,040,000	23918	79		141
			4.37872	
4,050,000	23997			144
			4.38016	
4,060,000	24076	79		142
		79	4.38158	
4,070,000	24155	79		143
			4.38301	
4,080,000	24234	79		142
			4.38443	
4,090,000	24313	79		141
			4.38584	
4,100,000	24393	80		143
			4.38727	
4,110,000	24473	80		142
		80	4.38869	
4,120,000	24553	80		141
			4.39010	
4.130,000	24633	80		142
			4.39152	
4,140,000	24713	80		141
			4.39293	
4,150,000	24794	81		142
			4.39435	
4,160,000	24874	80		140
		81	4.39575	
4,170,000	24955	81		141
			4.39716	
4,180,000	25036	82		140
			4.39856	
4,190,000	25118	81		143
			4.39999	
4,200,000	25199			139
			4.40138	

Table 6. Convergence—Continued

Northing	Function XV	Diff.	Log XV	Diff.
4,210,000	25281	82	4.40279	141
4,220,000	25363	82	4.40420	141
4,230,000	25445	82	4.40560	140
4,240,000	25527	82	4.40700	140
4,250,000	25610	83	4 40841	141
4,260,000	25692	82	4.40980	139
4,270,000	25775	83	4.41120	140
4,280,000	25859	84	4.41261	141
4,290,000	25942	83	4.41400	139
4,300,000	26025	83	4.41539	139
4,310,000	26109	84	4.41679	140
4,320,000	26193	84	4 41819	140
4,330,000	26277	84	4.41958	139
4,340,000	26362	85	4.42098	140
4,350,000	26446	84	4.42236	138
4,360,000	26531	85	4.42375	139
4,370,000	26616	85	4.42514	139
4,380,000	26702	86	4 42654	140
4,390,000	26787	85	4 42792	138
4,400,000	26873	86	4.42932	140
4,410,000	26959	86	4.43076	138
4,420,000	27045	86	4.43209	139
4,430,000	27131	86	4 43347	138
4,440,000	27218	87	4 43486	139
4,450,000	27305	87	4.43624	138
4,460,000	27392	87	4.43762	138
4,470,000	27479	87	4 43900	138
4,480,000	27567	88	4 44039	139
4,490,000	27654	87	4.44176	137
4,500,000	27742	88	4.44314	138
4,510,000	27831	89	4.44453	139
4,520,000	27919	88	4 44590	137
4,530,000	28008	89	4.44728	138
4,540,000	28097	89	4.44866	138
4,550,000	28186	89	4 45003	137

Northing	Function XV	Diff.	Log XV	Diff
4,560,000	28275	89	4.45140	137
4,570,000	28365	90	4.45278	138
4,580,000	28455	90	4.45416	138
4,590,000	28545	90	4.45553	137
4,600,000	28635	90	4.45690	137
4,610,000	28726	91	4.45828	138
4,620,000	28817	91	4.45965	137
4,630,000	28908	91	4.46102	137
4,640,000	29000	92	4.46240	138
4,650,000	29091	91	4.46376	136
4,660,000	29183	92	4.46513	137
4,670,000	29276	93	4.46651	138
4,680,000	29368	92	4.46787	136
4,690,000	29461	93	4.46925	138
4,700,000	29554	93	4.47062	137
4,710,000	29647	93	4.47198	136
4,720,000	29740	93	4.47334	136
4,730,000	29834	94	4.47471	137
4,740,000	29928	94	4.47608	137
4,750,000	30023	95	4.47745	137
4,760,000	30117	94	4.47881	136
4,770,000	30212	95	4.48018	137
4,780,000	30307	95	4.48154	136
4,790,000	30403	96	4.48292	138
4,800,000	30498	95	4.48427	135
4,810,000	30594	96	4 48564	137
4,820,000	30691	97	4.48701	137
4,830,000	30787	96	4.48837	136
4,840,000	30884	97	4.48973	136
4,850,000	30981	97	4.49110	137
4,860,000	31079	98	4.49247	137
4,870,000	31177	98	4 49383	136
4,880,000	31275	98	4 49520	137
4,890,000	31373	98	4.49656	136
4,900,000	31472	99	4 49792	136

Table 6. Convergence—Continued

Northing	Function XV	Diff	Log XV	Diff.
4,910,000	31570	98	4.49927	135
4,920,000	31670	100	4.50065	138
4,930,000	31769	99	4.50200	135
4,940,000	31869	100	4.50337	137
4,950,000	31969	100	4.50473	136
4,960,000	32070	101	4.50610	137
4,970,000	32170	100	4.50745	135
4,980,000	32272	102	4.50883	138
4,990,000	32373	101	4.51018	135
5,000,000	32475	102	4.51155	137
5,010,000	32577	102	4.51291	136
5,020,000	32679	102	4.51427	136
5,030,000	32782	103	4.51564	137
5,040,000	32885	103	4.51700	136
5,050,000	32988	103	4.51836	136
5,060,000	33092	104	4.51972	136
5,070,000	33196	104	4.52109	137
5,080,000	33300	104	4.52244	135
5,090,000	33405	105	4.52381	137
5,100,000	33510	105	4.52517	136
5,110,000	33615	105	4.52653	136
5,120,000	33721	106	4.52790	137
5,130,000	33827	106	4.52926	136
5,140,000	33933	106	4 53062	136
5,150,000	34040	107	4.53199	137
5,160,000	34147	107	4.53335	136
5,170,000	34251	107	4.53471	136
5,180,000	34362	108	4.53608	137
5,190,000	34470	108	4.53744	136
5,200,000	34579	109	4.53881	137
5,210,000	34688	109	4.54018	137
5,220,000	34797	109	4.54154	136
5,230,000	34907	110	4 54291	137
5,240,000	35017	110	4.54428	137
5,250,000	35127	110	4 54564	136

Northing	Function XV	Diff.	Log XV	Diff
5,260,000	35238	111	4.54701	137
5,270,000	35349	111	4.54838	137
5,280,000	35460	111	4.54974	136
5,290,000	35572	112	4.55111	137
5,300,000	35684	112	4.55247	136
5,310,000	35797	113	4.55385	138
5,320,000	35910	113	4.55522	137
5,330,000	36023	113	4.55658	136
5,340,000	36137	114	4.55795	137
5,350,000	36252	115	4.55933	138
5,360,000	36366	114	4.56070	137
5,370,000	36481	115	4.56207	137
5,380,000	36597	116	4 56345	138
5,390,000	36712	115	4.56481	136
5,400,000	36829	117	4.56619	138
5,410,000	36945	116	4.56756	137
5,420,000	37062	117	4.56893	137
5,430,000	37180	118	4.57031	138
5.440,000	37298	118	4.57169	138
5,450,000	37416	118	4.57306	137
5,460,000	37535	119	4.57444	138
5,470,000	37654	119	4.57581	137
5,480,000	37774	120	4.57719	138
5,490,000	37894	120	4.57857	138
5,500,000	38015	121	4.57996	139
5,510,000	38136	121	4.58134	138
5,520,000	38257	121	4.58271	137
5,530,000	38379	122	4.58409	138
5,540,000	38501	122	4.48547	138
5,550,000	38624	123	4.58686	139
5,560,000	38747	123	4.58824	138
5,570,000	38871	124	4.58963	139
5,580,000	38995	124	4.59101	138
5.590,000	39120	125	4.59240	139
5,600,000	39245	125	4.59378	138

Table 6. Convergence—Continued

Northing	Function XV	Diff.	Log XV	Diff.
5,610,000	39370			
		125		139
5,620,000	39496	126	4.59517	138
		127	4.59655	140
5,630,000	39623	127	4.59795	139
5,640,000	39750	128	4.59934	139
5,650,000	39878		4.60073	
		128		140
5,660,000	40006	128	4.60213	138
5,670,000	40134	129	4 60351	140
5,680,000	40263	130	4.60491	140
5,690,000	40393	130	4.60631	139
5,700,000	40523		4.60770	
		130		139
5,710,000	40653	131	4.60909	140
5,720,000	40784	132	4.61049	140
5,730,000	40916	132	4.61189	140
5,740,000	41048	133	4 61329	141
5,750,000	41181		4.61470	
		133		140
5,760,000	41314	133	4.61610	139
5,770,000	41447	135	4 61749	142
5,780,000	41582	134	4.61891	139
5,790,000	41716	136	4 62030	142
5,800,000	41852		4 62172	
		136		141
5,810,000	41988	136	4.62313	140
5,820,000	42124	137	4 62453	141
5,830,000	42261	137	4.62594	141
5,840,000	42398	139	4.62735	142
5,850,000	42537		4.62877	
		138		140
5,860,000	42675	139	4.63017	142
5,870,000	42814	140	4.63159	141
5,880,000	42954	141	4.63300	143
5,890,000	43095	141	4 63443	142
5,900,000	43236		4.63585	
		141		141
5,910,000	43377	142	4 63726	142
5,920,000	43519	143	4.63868	142
5,930,000	43662	143	4.64010	142
5,940,000	43805	145	4 64152	144
5,950,000	43950		4 64296	

Northing	Function XV	Diff	Log XV	Diff.
5,960,000	44094			
		144	4.64438	142
5,970,000	44239	145	4.64581	143
5,980,000	44385	146	4.64724	143
5,990,000	44532	147	4.64867	143
6,000,000	44679	147	4.65010	
		147		143
6,010,000	44826	149	4.65153	144
6,020,000	44975	149	4.65297	144
6,030,000	45124	150	4.65441	144
6,040,000	45274	150	4.65585	144
6,050,000	45424		4.65729	
		151		144
6,060,000	45575	152	4.65873	144
6,070,000	45727	152	4.66017	144
6,080,000	45879	153	4.66161	145
6,090,000	46032	154	4.66306	145
6,100,000	46186		4.66451	
		154		145
6,110,000	46340	155	4.66596	145
6,120,000	46495	156	4.66741	145
6,130,000	46651	156	4.66886	145
6,140,000	46807	158	4.67031	146
6,150,000	46965		4.67177	
		158		146
6,160,000	47123	158	4.67323	146
6,170,000	47281	160	4.67469	146
6,180,000	47441	160	4.67615	147
6,190,000	47601	160	4 67762	145
6,200,000	47761		4 67907	
		162		147
6,210,000	47923	155	4.68054	141
6,220,000	48078	163	4.68195	147
6,230,000	48241	164	4.68342	147
6,240,000	48405	165	4.68489	148
6,250,000	48570		4 68637	
		165		147
6,260,000	48735	166	4.68784	148
6,270,000	48901	167	4 68932	148
6,280,000	49068	168	4.69080	148
6,290,000	49236	168	4.69228	148
6,300,000	49404		4.69376	

Table 6. Convergence—Continued

Northing	Function XV	Diff	Log XV	Diff.
6,310,000	49574	170	4.69525	149
6,320,000	49744	170	4.69674	149
6,330,000	49915	171	4.69823	149
6,340,000	50087	172	4.69973	150
6,350,000	50259	172	4.70121	148
6,360,000	50433	174	4.70271	150
6,370,000	50607	174	4.70421	150
6,380,000	50782	175	4.70571	150
6,390,000	50958	176	4.70721	150
6,400,000	51135	177	4.70872	151
6,410,000	51313	178	4.71023	151
6,420,000	51492	179	4.71174	151
6,430,000	51671	179	4.71325	151
6,440,000	51852	181	4.71477	152
6,450,000	52033	181	4.71628	151
6,460,000	52215	182	4 71780	152
6,470,000	52399	184	4.71932	152
6,480,000	52583	184	4.72085	153
6,490,000	52768	185	4.72237	152
6,500,000	52954	186	4.72390	153
6,510,000	53141	187	4.72543	153
6,520,000	53329	188	4.72696	153
6,530,000	53518	189	4.72850	154
6,540,000	53708	190	4.73004	154
6,550,000	53899	191	4.73158	154
6,560,000	54091	192	4.73313	155
6,570,000	54284	193	4.73467	154
6,580,000	54478	194	4.73622	155
6,590,000	54673	195	4.73777	155
6,600,000	54869	196	4.73933	156
6,610,000	55066	197	4.74088	155
6,620,000	55264	198	4.74244	156
6,630,000	55463	199	4.74400	156
6,640,000	55663	200	4.74557	157
6,650,000	55864	201	4.74713	156

Northing	Function XV	Diff.	Log XV	Diff.
6,660,000	56067	203	4.74871	158
6,670,000	56270	203	4.75028	157
6,680,000	56475	205	4.75186	158
6,690,000	56681	206	4.75344	158
6,700,000	56888	207	4.75502	158
6,710,000	57096	208	4.75661	159
6,720,000	57305	209	4.75819	158
6,730,000	57515	210	4.75978	159
6,740,000	57727	212	4.76138	160
6,750,000	57940	213	4.76298	160
6,760,000	58153	213	4.76457	159
6,770,000	58369	216	4.76618	161
6,780,000	58585	216	4.76779	161
6,790,000	58803	218	4.76940	161
6,800,000	59021	218	4.77101	161
6,810,000	59241	220	4.77262	161
6,820,000	59463	222	4.77425	163
6,830,000	59685	222	4.77587	162
6,840,000	59909	224	4.77749	162
6,850,000	60134	225	4.77912	163
6,860,000	60361	227	4.78076	164
6,870,000	60589	228	4.78239	163
6,880,000	60818	229	4.78403	164
6,890,000	61049	231	4.78568	165
6,900,000	61281	232	4.78733	165
6,910,000	61514	233	4.78897	164
6,920,000	61749	235	4.79063	166
6,930,000	61985	236	4.79229	166
6,940,000	62222	237	4.79394	165
6,950,000	62461	239	4.79561	167
6,960,000	62702	241	4.79728	167
6,970,000	62943	241	4.79895	167
6,980,000	63187	244	4.80063	168
6,990,000	63432	245	4.80231	168
7,000,000	63678	246	4.80399	168

Table 6. Convergence—Continued

Northing	Function XV	Diff.	Log XV	Diff.
7,010,000	63926		4.80568	
		248		169
7,020,000	64175		4.80737	
		249		169
7,030,000	64426		4.80906	
		251		169
7,040,000	64679		4.81076	
		253		170
7,050,000	64933		4 81247	
		254		171
7,060,000	65189		4.81417	
		256		170
7,070,000	65446		4.81588	
		257		171
7,080,000	65705		4 81760	
		259		172
7,090,000	65966		4.81932	
		261		172
7,100,000	66228		4.82104	
		262		172
7,110,000	66492		4.82277	
		264		173
7,120,000	66758		4.82450	
		266		173
7,130,000	67025		4.82624	
		267		174
7,140,000	67295		4 82798	
		270		174
7,150,000	67566		4.82973	
		271		175
7,160,000	67838		4 83147	
		272		174
7,170,000	68113		4.83323	
		275		176
7,180,000	68389		4.83499	
		276		176
7,190,000	68667		4.83675	
		278		176
7,200,000	68947		4.83852	
		280		177
7,210,000	69229		4.84029	
		282		177
7,220,000	69513		4.84207	
		284		178
7,230,000	69799		4.84385	
		286		178
7,240,000	70087		4 84564	
		288		179
7,250,000	70376		4.84742	
		289		178
7,260,000	70668		4.84922	
		292		180
7,270,000	70962		4.85103	
		294		181
7,280,000	71257		4 85283	
		295		180
7,290,000	71555		4.85464	
		298		181
7,300,000	71855		4.85646	
		300		182
7,310,000	72157		4.85828	
		302		182
7,320,000	72461		4.86010	
		304		182
7,330,000	72767		4.86193	
		306		183
7,340,000	73075		4.86377	
		308		184
7,350,000	73386		4.86561	
		311		184

Northing	Function XV	Diff.	Log XV	Diff
7,360,000	73698		4.86746	
		312		185
7,370,000	74013		4.86931	
		315		185
7,380,000	74330		4.87116	
		317		185
7,390,000	74650		4.87303	
		320		187
7,400,000	74972		4 87490	
		322		187
7,410,000	75296		4.87677	
		324		187
7,420,000	75623		4.87865	
		327		188
7,430,000	75952		4.88054	
		329		189
7,440,000	76283		4 88243	
		331		189
7,450,000	76617		4 88433	
		334		190
7,460,000	76953		4.88623	
		336		190
7,470,000	77292		4.88813	
		339		190
7,480,000	77633		4.89005	
		341		192
7,490,000	77977		4.89197	
		344		192
7,500,000	78324		4.89389	
		347		192
7,510,000	78673		4.89583	
		349		194
7,520,000	79025		4.89776	
		352		193
7,530,000	79380		4 89971	
		355		195
7,540,000	79737		4.90166	
		357		195
7,550,000	80097		4.90362	
		360		196
7,560,000	80460		4.90558	
		363		196
7,570,000	80826		4 90755	
		366		197
7,580,000	81195		4.90953	
		369		198
7,590,000	81566		4.91151	
		371		198
7,600,000	81941		4.91350	
		375		199
7,610,000	82318		4.91549	
		377		199
7,620,000	82699		4.91750	
		381		201
7,630,000	83082		4.91951	
		383		201
7,640.000	83469		4 92153	
		387		202
7,650,000	83859		4.92355	
		390		202
7,660,000	84252		4 92558	
		393		203
7,670,000	84648		4.92762	
		396		204
7,680,000	85048		4 92966	
		400		204
7,690,000	85450		4.93171	
		402		205
7,700,000	85857		4 93378	
		407		207

Table 6. Convergence—Continued

Northing	Function XV	Diff.	Log XV	Diff.
7,710,000	86266	409	4.93584	206
7,720,000	86679	413	4.93791	207
7,730,000	87096	417	4.94000	209
7,740,000	87516	420	4.94209	209
7,750,000	87939	423	4 94418	209
7,760,000	88367	428	4.94629	211
7,770,000	88797	430	4.94840	211
7,780,000	89232	435	4.95052	212
7,790,000	89670	438	4.95265	213
7,800,000	90113	443	4.95479	214
7,810,000	90559	446	4.95693	214
7,820,000	91009	450	4 95908	215
7,830,000	91463	454	4.96125	217
7,840,000	91921	458	4.96341	216
7,850,000	92383	462	4.96559	218
7,860,000	92849	466	4.96778	219
7,870,000	93320	471	4.96997	219
7,880,000	93795	475	4.97218	221
7,890,000	94274	479	4.97439	221
7,900,000	94758	484	4.97662	223
7,910,000	95246	488	4,97885	223
7,920,000	95738	492	4.98108	223
7,930,000	96235	497	4.98333	225
7,940,000	96737	502	4.98559	226
7,950,000	97244	507	4.98786	227
7,960,000	97755	511	4.99014	228
7,970,000	98271	516	4.99243	229
7,980,000	98792	521	4.99472	229
7,990,000	99318	526	4.99703	231
8,000,000	99850	532	4.99935	232
8,010,000	100386	536	5.001673	2323
8,020,000	100928	542	5.004012	2339
8,030,000	101475	547	5.006359	2347
8,040,000	102027	552	5.008715	2356
8,050,000	102585	558	5.011084	2369

Northing	Function XV	Diff.	Log XV	Diff.
8,060,000	103149	564	5.013465	2381
9,070,000	103718	569	5.015854	2389
8,080,000	104293	575	5.018255	2401
8,090,000	104873	580	5.020664	2409
8,100,000	105460	587	5.023088	2424
8,110,000	106053	593	5.025523	2435
8,120,000	106651	598	5.027965	2442
8,130,000	107256	605	5.030422	2457
8,140,000	107868	612	5.032893	2471
8,150,000	108486	618	5.035374	2481
8,160,000	109110	624	5.037865	2491
8,170,000	109741	631	5.040369	2504
8,180,000	110379	638	5.042886	2517
8,190,000	111023	644	5.045413	2527
8,200,000	111675	652	5.047956	2543
8,210,000	112333	658	5.050507	2551
8,220,000	112999	666	5.053075	2568
8,230.000	113672	673	5.055654	2579
8,240,000	114353	681	5.058248	2594
8,250,000	115041	688	5.060853	2605
8,260,000	115737	2619 696	5.063472	2634
8,270,000	116441	704	5.066106	2647
8,280,000	117153	712	5.068753	2661
8,290,000	117873	720	5.071414	2674
8,300,000	118601	728	5.074088	
8,310,000	119338	737	5.076779	2691
8,320,000	120083	745	5.079482	2703
8,330,000	120837	754	5.082200	2718
8,340,000	121600	763	5.084934	2734
8,350,000	122371	771	5.087679	2745
8,360,000	123153	782	5.090445	2766
8,370,000	123943	790	5.093222	2777
8,380,000	124743	800	5.096016	2794
8,390,000	125553	810	5.098827	2811
8,400,000	126372	819	5.101651	2824

Table 6. Convergence—Continued

Northing	Function XV	Diff.	Log XV	Diff.
8,410,000	127202	830	5.104494	2843
8,420,000	128042	840	5 107352	2858
8,430,000	128893	851	5.110229	2877
8,440,000	129754	861	5.113121	2892
8,450,000	130626	872	5.116030	2909
8,460,000	131510	884	5.118959	2929
8,470,000	132404	894	5.121901	2942
8,480,000	133310	906	5.124863	2962
8,490,000	134228	918	5.127843	2980
8,500,000	135158	930	5.130842	2999
8,510,000	136101	943	5.133861	3019
8,520,000	137055	954	5.136895	3034
8,530,000	138023	968	5.139951	3056
8,540,000	139003	980	5.143024	3073
8,550,000	139997	994	5.146119	3095
8,560,000	141005	1008	5.149235	3116
8,570,000	142026	1021	5.152368	3133
8,580,000	143062	1036	5.155524	3156
8,590,000	144112	1050	5.158700	3176
8,600,000	145176	1064	5.161895	3195
8,610,000	146256	1080	5.165114	3219
8,620,000	147351	1095	5.168353	3239
8,630,000	148462	1111	5.171615	3262
8,640,000	149590	1128	5.174903	3288
8,650,000	150733	1143	5.178208	3305

Northing	Function XV	Diff	Log XV	Diff.
8,660,000	151894	1161	5.181541	3333
8,670,000	153071	1177	5.184893	3352
8,680,000	154267	1196	5.188273	3380
8,690,000	155480	1213	5 191675	3402
8,700,000	156712	1232	5.195102	3427
8,710,000	157962	1250	5.198553	3451
8,720,000	159232	1270	5.202030	3477
8,730,000	160522	1290	5.205535	3505
8,740,000	161831	1309	5.209062	3527
8,750,000	163162	1331	5.212619	3557
8,760,000	164514	1352	5.216203	3584
8,770,000	165887	1373	5 219812	3609
8,780,000	167283	1396	5.223452	3640
8,790,000	168702	1419	5.227120	3668
8,800,000	170144	1442	5.230817	3697
8,810,000	171610	1466	5.234543	3726
8,820,000	173100	1490	5.238297	3754
8,830,000	174616	1516	5.242084	3787
8,840,000	176158	1542	5.245902	3818
8,850,000	177726	1568	5.249751	3849
8,860,000	179322	1596	5.253634	3883
8,870,000	180945	1623	5.257547	3913
8,880,000	182597	1652	5.261494	3947
8,890,000	184279	1682	5.265476	3982
8,900,000	185991	1712	5.269492	4016

Table 6a. Grid Coverage Nomograph

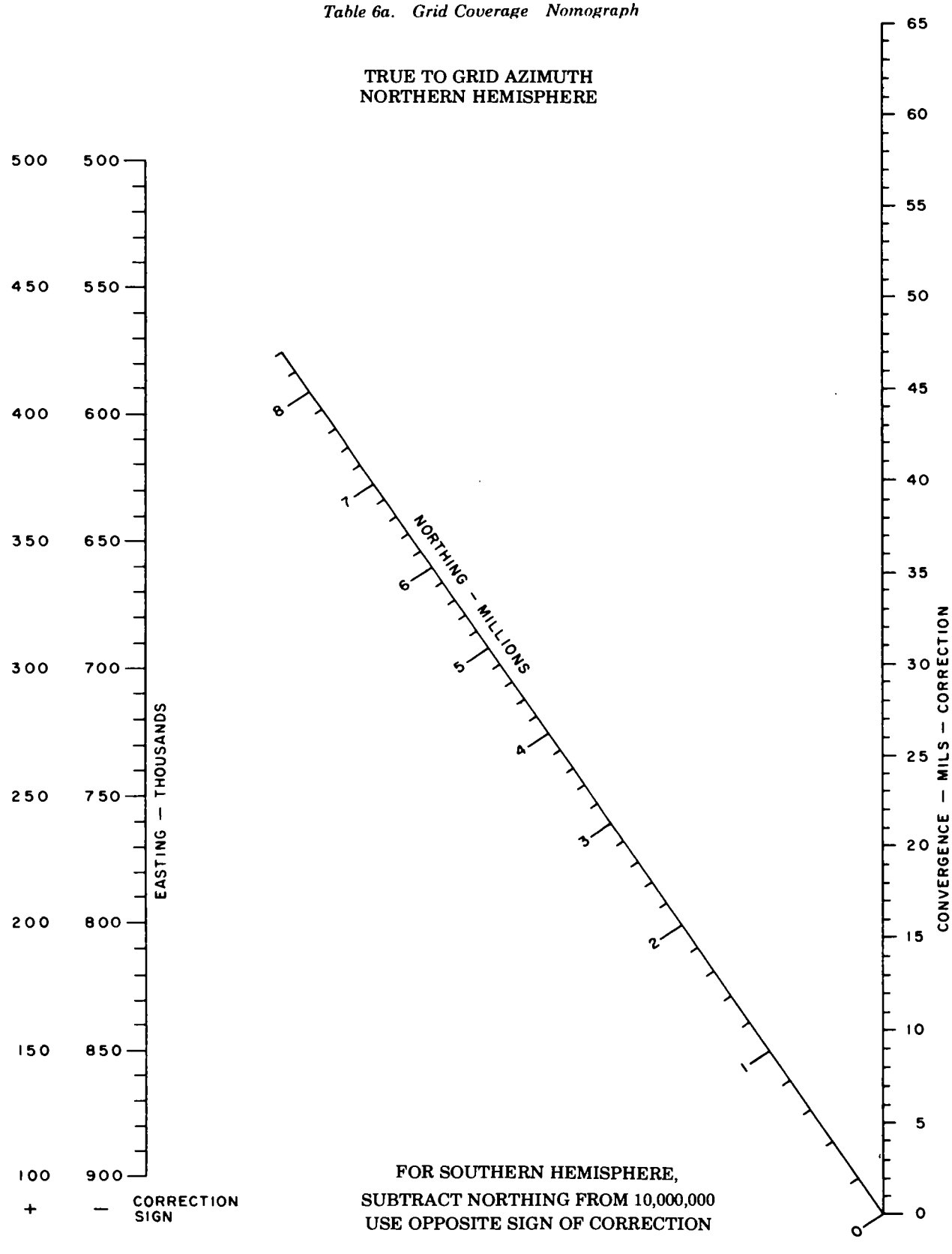


Table 7. Second Term in Convergence Computation. UTM Coordinates

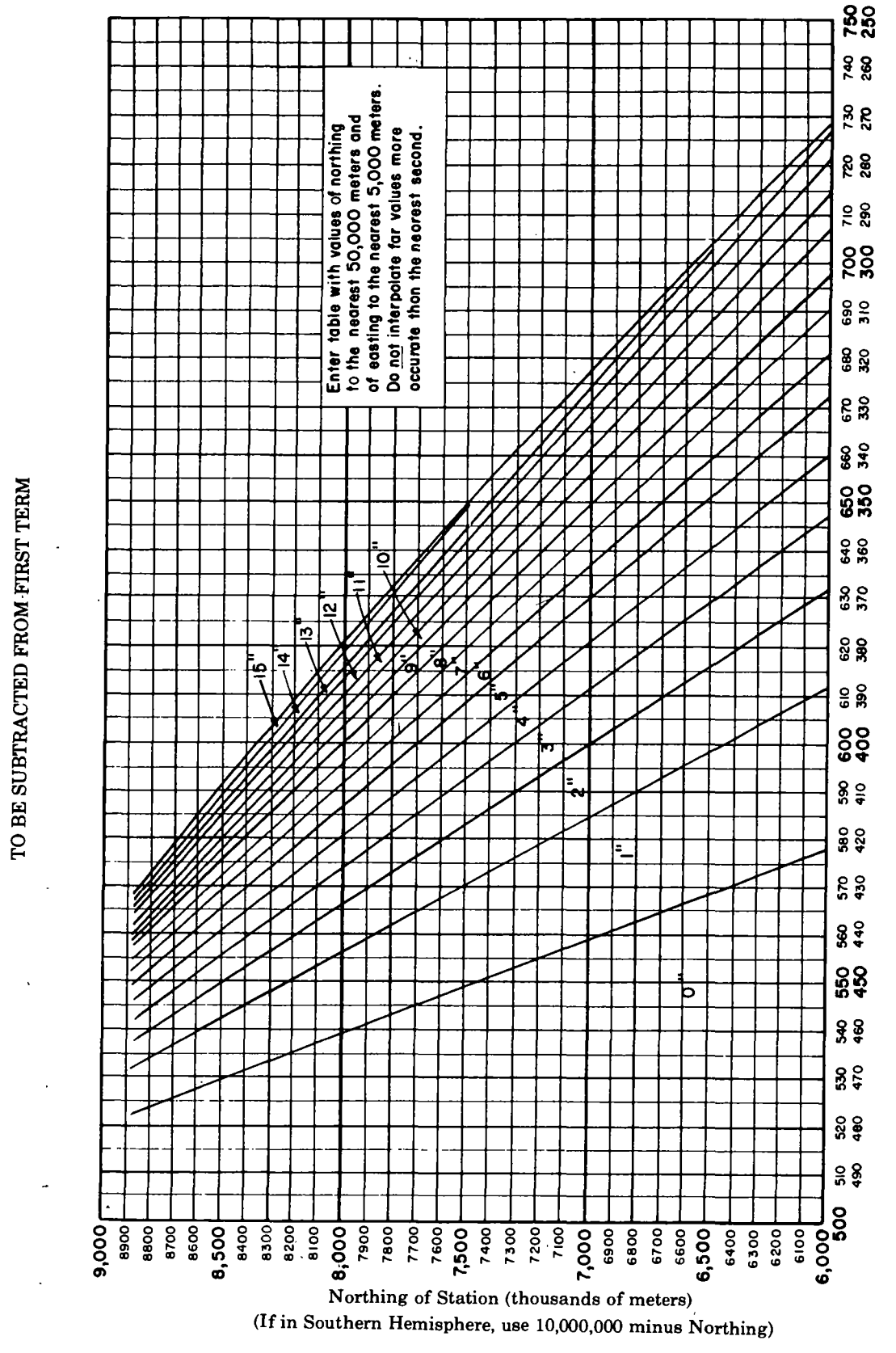


Table 7. Second Term in Convergence Computation, UTM Coordinates—Continued

CONVERSION TABLE	
1"	0.00 m
2"	0.01 m
3"	0.01 m
4"	0.02 m
5"	0.02 m
6"	0.03 m
7"	0.03 m
8"	0.04 m
9"	0.04 m
10"	0.05 m
11"	0.05 m
12"	0.06 m
13"	0.06 m
14"	0.07 m
15"	0.07 m

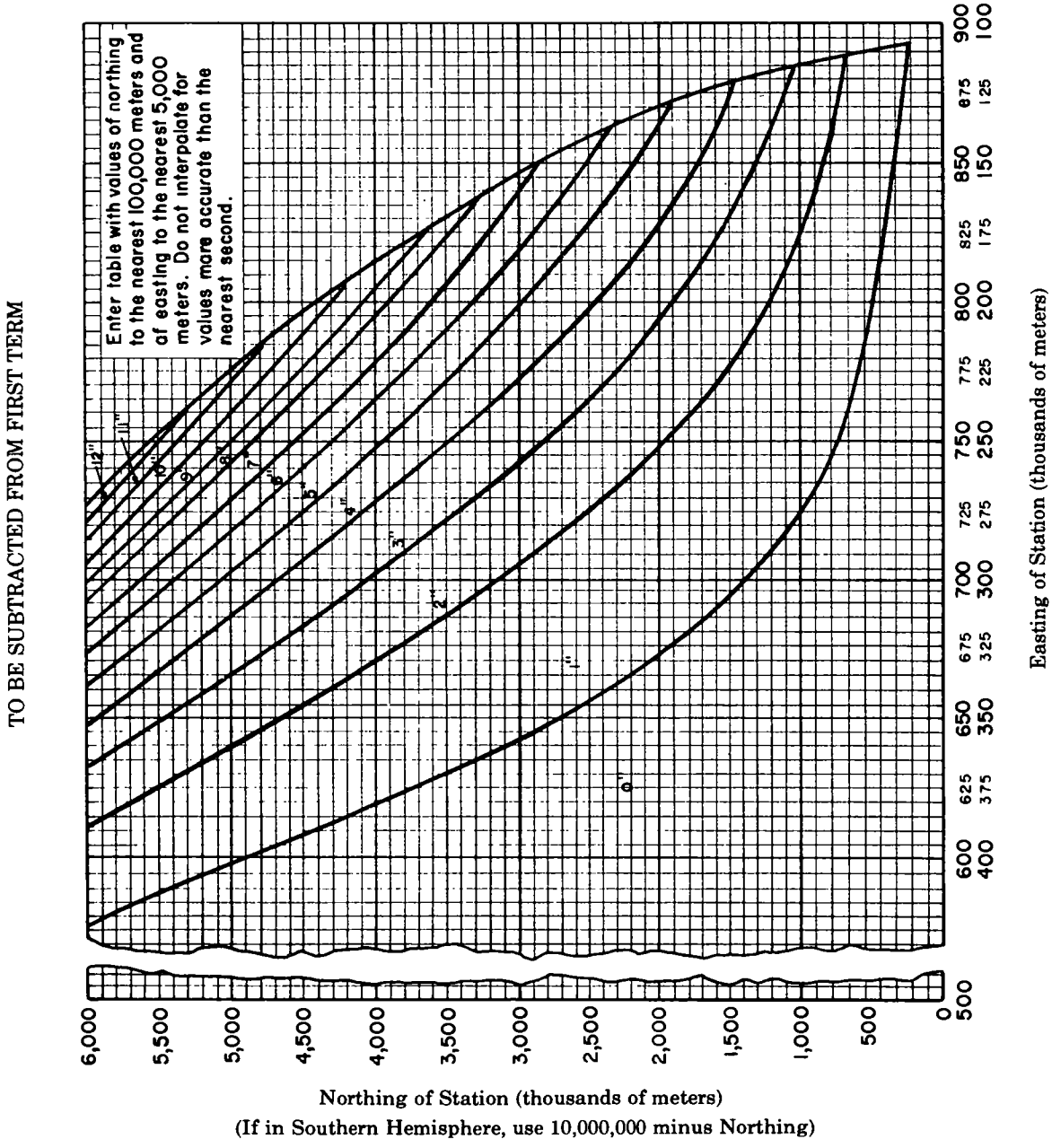


Table 8a. Second Term in Convergence Computation, Geographic Coordinates (Degrees)

TO BE ADDED TO FIRST TERM

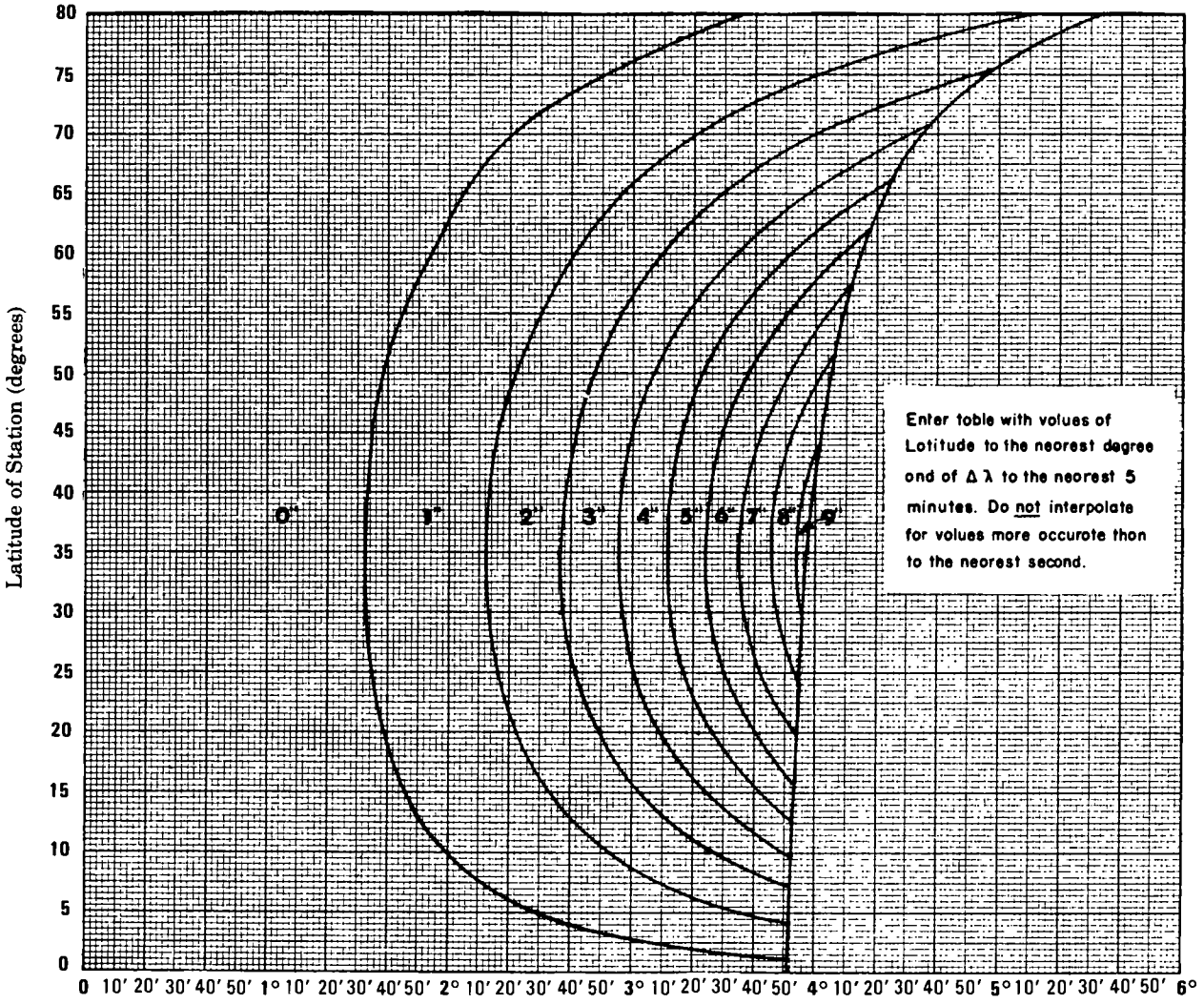


Table 8b. Second Term in Convergence Computation, Geographic Coordinates (Mils)

TO BE ADDED TO FIRST TERM

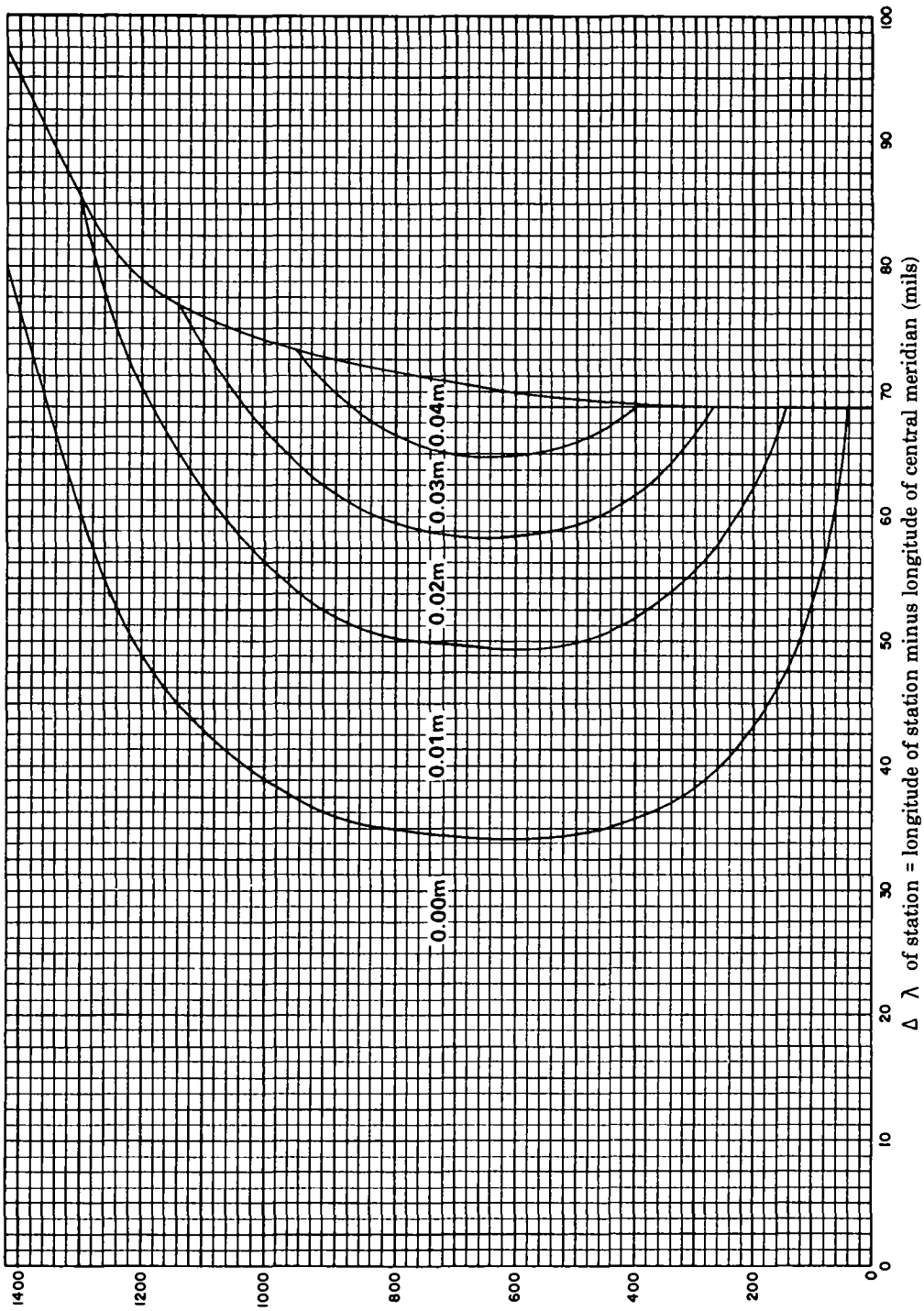


Table 9. Alphabetical Star List

Star	Constellation	No.	Magnitude
Acamar, Theta (θ) Eradani	Eridanus	12	3.4
Achernar, Alpha (α) Eridani	Eridanus	9	0.6
Acrux, Alpha (α) Crucis	Crux	42	1.0
Adhara, Epsilon (ϵ) Canis Majoris	Canis Major	26	1.6
Aldebaran, Alpha (α) Tauri	Taurus	15	1.1
Alhena, Gamma (γ) Geminorum*	Gemini	24	1.9
Alioth, Epsilon (ϵ) Ursae Majoris	Ursa Major	45	1.7
Alkaid, (Benetnasch), Eta (η) Ursae Majoris	Ursa Major	48	1.9
Al Na'ir, Alpha (α) Gruis	Grus	71	2.2
Alnilam, Epsilon (ϵ) Orionis	Orion	20	1.7
Alnitak, Zeta (ζ) Orionis*	Orion	21	2.0
Alpha (α) Ceti, Menkar**	Cetus	13	2.8
Alpha (α) Persei, Mirfak	Perseus	14	1.9
Alpha (α) Tri Aust, Atria	Triangulum Australe	58	1.9
Alphard, Alpha (α) Hydrae	Hydra	35	2.2
Alphecca, Alpha (α) Coronae Bor	Corona Borealis	55	2.3
Alpheratz, Alpha (α) Andromedae	Andromeda	1	2.1
(Al Suhail), Suhail, Lambda (λ) Velorum	Vela (Argo)	33	2.2
Altair, Alpha (α) Aquilae	Aquila	66	0.9
Ankaa, Alpha (α) Phoenicis**	Phoenix	4	2.4
Antares, Alpha (α) Scorpii	Scorpius	57	1.2
Arcturus, Alpha (α) Bootis	Bootes	51	0.2
Atria, Alpha (α) Tri Aust	Triangulum Australe	58	1.9
Avior, Epsilon (ϵ) Carinae	Carina (Argo, Vela)	32	1.7
Bellatrix, Gamma (γ) Orionis	Orion	18	1.7
Beta (β) Centauri, Hadar	Centaurus	49	0.9
Beta (β) Crucis, Mimosa*	Crux	44	1.5
Beta (β) Hydrus	Hydra	3	2.9
Betelgeuse, (Betelgeux), Alpha (α) Orionis	Orion	22	0.1
Canopus, Alpha (α) Carinea	Carina (Argo, Vela)	23	-0.9
Capella, Alpha (α) Aurigae	Auriga	17	0.2
Caph, Beta (β) Cassiopeiae*	Cassiopeia	2	2.4
Castor, Alpha (α) Geminorum*	Gemini	28	1.6
Delta (δ) Canis Majoris, Wezen*	Canis Major	27	2.0
Deneb, Alpha (α) Cygni	Cygnus	68	1.3
Denebola, Beta (β) Leonis	Leo	39	2.2
Diphda, (Deneb Kaitos), Beta (β) Ceti	Cetus	6	2.2
Dschubba, Delta (δ) Scorpii**	Scorpius	56	2.5
Dubhe, Alpha (α) Ursae Majoris	Ursa Major	38	1.9
Elnath, (El Nath), Beta (β) Tauri	Taurus	19	1.8
Eltanin, (Eltamin), Gamma (γ) Draconis	Draco	62	2.4
Enif, Epsilan (ϵ) Pegasi	Pegasus	70	2.5
Epsilon (ϵ) Carinae, Avior	Carina (Argo, Vela)	32	1.7
Fomalhaut, Alpha (α) Piscis Austrini	Piscis Austrinus	72	1.3
Gacrux, Gamma (γ) Crucis	Crux	43	1.6
Gamma (γ) Cassiopeiae*	Cassiopeia	7	1.6—2.8
Gamma (γ) Velorum, (Gamma Argus)*	Vela (Argo)	31	1.9
Gamma (γ) Geminorum, Alhena*	Gemini	24	1.9
Gienah, Gamma (γ) Corvi**	Corvus	41	2.8
Hadar, Beta (β) Centauri	Centaurus	49	0.9
Hamal, Alpha (α) Arietis	Aries	11	2.2
Kaus Australis, Epsilon (ϵ) Sagittarii	Sagittarius	63	1.9

Table 9. Alphabetical Star List—Continued

Star	Constellation	No.	Magnitude
Kochab, Beta (β) Ursae Minoris	Ursa Minor	54	2.2
Markab, Alpha (α) Pegasi	Pegasus	73	2.6
Menkar, Alpha (α) Ceti**	Cetus	13	2.8
Menkent, Theta (θ) Centauri	Centaurus	50	2.3
Merak, Beta (β) Ursae Majoris*	Ursa Major	37	2.4
Miaplacidus, Beta (β) Carinae	Carina (Argo)	34	1.8
Mimosa, Beta (β) Crucis*	Crux	44	1.5
Mirfak, (Marfak), Alpha (α) Persei	Perseus	14	1.9
Mizar, Zeta (ζ) Ursae Majoris*	Ursa Major	46	2.4
Nunki, Sigma (σ) Sagittarii	Sagittarius	65	2.1
(Octantis), Nu (ν) Octantis***	Octans	69	3.7
Peacock, Alpha (α) Pavonis	Pavo	67	2.1
Phecda, Gamma (γ) Ursae Majoris*	Ursa Major	40	2.5
Polaris, Alpha (α) Ursae Minoris***	Ursa Minor	10	2.1
Pollux, Beta (β) Geminorum	Gemini	30	1.2
Procyon, Alpha (α) Canis Minoris	Canis Minor	29	0.5
Rasalhague, Alpha (α) Ophiuchi	Ophiuchus	61	2.1
Regulus, Alpha (α) Leonis	Leo	36	1.3
Rigel, Beta (β) Orionis	Orion	16	0.3
Rigil Kentaurus, Alpha (α) Centauri	Centaurus	52	0.1
Ruchbah, Delta (δ) Cassiopeiae*	Cassiopeia	8	2.8
Sabik, Eta (η) Ophiuchi	Ophiuchus	59	2.6
Scaula, (Shaula), Lambda (λ) Scorpii	Scorpius	60	1.7
Schedar, (Schedir), Alpha (α) Cassiopeiae	Cassiopeia	5	2.3
Sirius, Alpha (α) Canis Majoris	Canis Major	25	-1.6
Spica, Alpha (α) Virginis	Virgo	47	1.2
Suhail, (Al Suhail), Lambda (λ) Velorum	Vela (Argo)	33	2.2
Theta (θ) Centauri, Menkent	Centaurus	50	2.3
Vega, Alpha (α) Lyrae	Lyra	64	0.1
Wezen, Delta (δ) Canis Majoris*	Canis Major	27	2.0
Zeta (ζ) Orionis, Alnitak*	Orion	21	2.0
Zebenelgenubi, Alpha (α) Librae**	Libra	53	2.9

Note. Sirius (magnitude—1.6) is the brightest star listed, Octantis (magnitude 3.7 is the dimmest star listed. Brightness of other stars listed is indicated by their magnitude.

Spelled out names in parentheses are names sometimes used but not recommended.

*Indicates star not on identifier 2012D.
**Indicates star not on identifier 2012C.
***Indicates star not on either identifier.

The constellation Argus has been replaced by its three modern divisions carina, Puppis, and Vela.

Table 10a (1). Apparent Places of Stars, 1988 (Degrees)

Star No.	Right Ascension / Declination	(Hr Min) (° ′)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
1	RA	00 07	45.5	45.1	44.9	45.0	45.6	46.5	47.6	48.6	49.3	49.6	49.6	49.4	48.9
	DEC	29 01	37	33	29	25	23	25	30	38	46	52	57	60	59
2	RA	00 08	30.8	29.9	29.3	29.4	30.2	31.6	33.2	34.6	35.6	36.1	35.9	35.3	34.4
	DEC	59 04	79	75	68	60	54	53	56	64	74	84	94	99	101
3	RA	00 25	10.5	08.0	06.6	06.2	07.3	09.6	12.7	15.9	18.3	19.2	18.4	16.4	13.6
	DEC	-77 18	98	92	83	72	60	51	46	46	51	60	69	74	75
4	RA	00 25	42.1	41.6	41.3	41.3	41.8	42.7	43.9	45.1	45.9	46.3	46.3	45.9	45.3
	DEC	-42 21	90	88	82	74	65	56	49	46	48	53	60	66	68
5	RA	00 39	48.5	47.7	47.1	47.0	47.6	48.9	50.4	51.8	52.9	53.5	53.6	53.1	52.4
	DEC	56 28	36	34	28	20	15	12	15	21	31	40	50	56	58
6	RA	00 42	59.5	59.2	59.0	59.0	59.4	60.1	61.1	62.1	62.9	63.3	63.4	63.2	62.9
	DEC	-18 02	74	75	73	69	63	55	48	43	41	42	46	50	53
7	RA	00 55	58.0	57.0	56.2	56.0	56.6	57.9	59.5	61.2	62.4	63.2	63.3	62.9	62.1
	DEC	60 39	27	25	20	12	05	02	03	09	18	28	38	45	48
8	RA	01 24	61.2	60.2	59.4	59.0	59.4	60.6	62.2	63.9	65.3	66.2	66.6	66.3	65.6
	DEC	60 10	44	43	39	31	24	21	21	26	34	43	53	61	65
9	RA	01 37	17.7	16.7	16.0	15.5	15.6	16.3	17.6	19.1	20.4	21.2	21.4	21.0	20.1
	DEC	-57 17	64	64	59	49	39	28	20	16	17	23	32	40	45
10	SEE TABLE 11. APPARENT PLACES OF POLARIS,1988														
11	RA	02 06	30.1	29.8	29.4	29.1	29.3	29.9	30.9	31.9	32.9	33.6	34.0	34.1	33.9
	DEC	23 24	33	32	30	27	26	26	30	35	41	45	49	51	51
12	RA	02 57	49.8	49.2	48.6	48.0	47.9	48.2	49.0	50.1	51.1	52.0	52.5	52.6	52.3
	DEC	-40 20	75	78	76	71	62	52	43	36	34	37	44	52	59
13	RA	03 01	39.9	39.6	39.2	38.9	38.9	39.3	40.1	41.0	41.9	42.7	43.2	43.5	43.4
	DEC	04 02	41	40	39	39	41	44	50	55	59	61	61	59	57
14	RA	03 23	28.8	28.3	27.6	26.9	26.8	27.3	28.4	29.7	31.1	32.3	33.2	33.7	33.6
	DEC	49 49	27	29	28	24	19	14	12	14	17	23	29	36	41
15	RA	04 35	15.1	15.0	14.6	14.1	13.8	14.0	14.6	15.5	16.4	17.4	18.2	18.7	19.0
	DEC	16 29	19	18	17	17	17	17	19	22	25	27	27	27	26
16	RA	05 13	59.0	58.9	58.5	58.0	57.6	57.6	58.1	58.8	59.6	60.5	61.4	62.0	62.2
	DEC	-08 12	48	52	54	54	51	47	41	35	32	31	34	38	44
17	RA	05 15	49.9	49.8	49.3	48.5	48.0	48.1	48.7	49.8	51.0	52.3	53.6	54.4	54.9
	DEC	45 59	25	29	31	30	27	22	19	17	16	17	20	24	28
18	RA	05 24	30.6	30.6	30.2	29.7	29.3	29.3	29.8	30.5	31.4	32.3	33.2	33.8	34.2
	DEC	06 20	30	28	27	27	27	29	33	36	39	40	38	36	33
19	RA	05 25	33.5	33.5	33.1	32.5	32.1	32.2	32.7	33.5	34.5	35.5	36.6	37.3	37.7
	DEC	28 36	03	05	05	05	04	02	01	02	02	03	04	05	06
20	RA	05 35	37.6	37.6	37.3	36.7	36.4	36.3	36.7	37.4	38.2	39.1	40.0	40.7	41.0
	DEC	-01 12	25	29	30	30	29	26	21	17	14	13	15	19	24
21	RA	05 40	10.6	10.5	10.2	09.7	09.3	09.2	09.6	10.3	11.1	12.0	12.9	13.6	13.9
	DEC	-01 56	48	51	53	53	51	48	44	39	36	35	37	41	46
22	RA	05 54	32.8	32.8	32.5	32.0	31.6	31.5	31.9	32.5	33.4	34.3	35.2	35.9	36.4
	DEC	07 24	28	25	24	24	25	27	29	33	35	35	34	31	27
23	RA	06 23	43.4	43.2	42.4	41.3	40.3	39.7	39.7	40.2	41.2	42.4	43.6	44.5	44.9
	DEC	-52 40	73	83	89	91	88	81	71	61	54	53	57	65	76
24	RA	06 37	02.7	02.9	02.6	02.1	01.7	01.5	01.8	02.4	03.2	04.1	05.1	06.0	06.5
	DEC	16 24	44	43	43	43	43	44	44	46	46	46	44	42	40
25	RA	06 44	38.7	38.8	38.5	37.9	37.4	37.2	37.3	37.8	38.5	39.3	40.3	41.1	41.6
	DEC	-16 41	50	57	61	62	60	56	51	44	40	39	42	48	56

Table 10a (1). Apparent Places of Stars, 1988 (Degrees)—Continued

Star No.	Right ascension / Declination	(Hr Min) (° ′)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
26	RA	06 58	10.8	10.9	10.6	09.9	09.3	09.0	09.0	09.4	10.1	11.0	12.0	12.9	13.4
	DEC	−28 56	71	80	85	87	86	81	74	66	60	58	61	68	77
27	RA	07 07	55.7	55.8	55.5	54.9	54.3	54.0	54.0	54.4	55.1	56.0	57.0	57.8	58.4
	DEC	−26 22	17	26	31	33	32	27	21	13	08	06	09	15	24
28	RA	07 33	51.9	52.3	52.2	51.7	51.1	50.8	50.9	51.4	52.1	53.1	54.3	55.3	56.2
	DEC	31 54	59	61	63	65	66	65	63	60	57	55	52	50	50
29	RA	07 38	41.9	42.2	42.1	41.7	41.2	40.9	41.0	41.4	42.0	42.8	43.8	44.7	45.4
	DEC	05 15	29	25	23	23	23	25	27	29	31	30	27	23	18
30	RA	07 44	36.7	37.1	37.0	36.5	36.0	35.7	35.8	36.2	36.9	37.8	38.9	39.9	40.7
	DEC	28 03	24	25	27	29	29	29	27	26	23	21	17	15	14
31	RA	08 09	11.4	11.7	11.4	10.6	09.8	09.1	08.7	08.8	09.3	10.3	11.5	12.6	13.5
	DEC	−47 17	51	63	71	77	78	74	68	59	51	46	47	54	64
32	RA	08 22	18.1	18.4	17.9	16.9	15.7	14.6	14.0	13.8	14.4	15.5	17.0	18.4	19.5
	DEC	−59 27	61	72	82	89	91	88	82	72	63	58	58	64	74
33	RA	09 07	34.4	35.0	35.0	34.5	33.8	33.1	32.7	32.6	32.9	33.7	34.7	35.9	36.9
	DEC	−43 22	48	60	69	76	78	77	72	64	56	51	51	56	65
34	RA	09 13	06.4	07.2	06.8	05.5	03.8	02.1	0 .8	0 .1	0 .3	01.5	03.5	05.6	07.2
	DEC	−69 39	47	59	70	79	83	83	79	70	61	54	51	55	64
35	RA	09 27	0 .9	01.5	01.7	01.4	01.0	0 .7	0 .5	0 .6	0 .8	01.4	02.3	03.3	04.2
	DEC	−08 36	17	24	29	31	31	30	27	24	21	20	22	28	35
36	RA	10 07	45.1	45.8	46.2	46.1	45.7	45.4	45.2	45.1	45.3	45.8	46.6	47.6	48.6
	DEC	12 01	33	29	28	28	30	32	33	33	32	29	24	19	13
37	RA	11 01	09.3	10.7	11.4	11.4	10.8	10.0	09.3	08.9	08.8	09.2	10.2	11.6	13.3
	DEC	56 26	34	35	41	48	54	57	56	51	43	33	23	16	12
38	RA	11 03	01.9	03.5	04.3	04.3	03.6	02.6	01.7	01.1	01.0	01.4	02.6	04.2	06.0
	DEC	61 48	41	43	49	57	64	67	65	59	50	40	30	23	20
39	RA	11 48	27.4	28.4	29.0	29.2	29.1	28.8	28.5	28.3	28.2	28.4	28.9	29.8	30.8
	DEC	14 37	74	70	68	69	72	74	76	76	75	71	65	59	52
40	RA	11 53	13.5	14.9	15.8	16.0	15.7	15.0	14.4	13.8	13.4	13.6	14.3	15.4	16.9
	DEC	53 45	24	23	27	35	42	46	47	43	36	27	16	07	02
41	RA	12 15	11.3	12.3	13.0	13.2	13.2	13.0	12.8	12.5	12.3	12.3	12.8	13.7	14.7
	DEC	−17 28	27	35	41	46	49	49	48	46	43	40	41	44	50
42	RA	12 25	54.6	56.4	57.5	58.0	57.9	57.2	56.3	55.3	54.5	54.4	55.2	56.6	58.5
	DEC	−63 01	41	49	58	69	78	85	87	85	78	71	64	61	63
43	RA	12 30	29.0	30.5	31.5	32.0	31.9	31.5	30.8	30.0	29.4	29.3	29.9	31.2	32.8
	DEC	−57 02	31	39	48	58	67	73	75	73	66	59	53	51	53
44	RA	12 46	59.9	61.6	62.7	63.3	63.3	62.9	62.2	61.2	60.5	60.3	60.9	62.2	63.9
	DEC	−59 37	09	16	25	35	44	51	54	52	46	39	32	29	31
45	RA	12 53	30.9	32.5	33.6	34.2	34.1	33.5	32.8	32.0	31.3	31.1	31.4	32.4	33.8
	DEC	56 00	69	67	69	77	85	91	94	92	86	77	65	55	48
46	RA	13 23	27.0	28.5	29.7	30.3	30.4	30.0	29.3	28.5	27.7	27.3	27.5	28.3	29.6
	DEC	54 58	55	52	54	60	69	76	79	78	73	65	54	43	35
47	RA	13 24	33.2	34.3	35.1	35.6	35.8	35.8	35.6	35.3	35.0	34.9	35.1	35.8	36.8
	DEC	−11 05	57	64	69	72	74	73	73	71	69	68	69	72	78
48	RA	13 47	04.1	05.5	06.6	07.3	07.5	07.2	06.7	06.0	05.3	04.9	05.0	05.6	06.7
	DEC	49 21	63	58	59	64	72	80	84	84	81	73	63	52	43
49	RA	14 02	56.4	58.3	59.8	60.8	61.4	61.4	60.9	60.0	59.0	58.5	58.7	59.6	61.2
	DEC	−60 18	45	48	55	64	73	81	86	87	83	77	70	65	64

Table 10a (1). Apparent Places of Stars, 1988 (Degrees)—Continued

Ster No.	Right ascension / Declination	(Hr Min) (° ′)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH											
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or erc of declinetion)												
50	RA	14 05	57.5	58.7	59.7	60.5	60.8	60.9	60.8	60.3	59.8	59.5	59.7	60.4	61.4
	DEC	-36 18	36	41	47	54	59	63	65	65	62	58	55	53	55
51	RA	14 15	06.4	07.5	08.4	09.0	09.3	09.4	09.2	08.8	08.4	08.1	08.2	08.6	09.5
	DEC	19 14	28	21	19	20	24	29	32	34	33	30	24	16	07
52	RA	14 38	44.7	46.6	48.2	49.4	50.1	50.3	49.9	49.1	48.0	47.3	47.2	47.9	49.4
	DEC	-60 47	02	04	09	18	26	34	39	41	39	34	26	21	18
53	RA	14 50	11.9	13.0	14.0	14.7	15.2	15.4	15.4	15.1	14.7	14.3	14.4	14.8	15.7
	DEC	-15 59	35	41	45	49	50	51	50	49	48	46	46	48	52
54	RA	14 50	42.5	45.1	47.5	49.5	50.2	49.6	48.0	45.8	43.4	41.5	40.5	40.7	42.4
	DEC	74 11	53	48	48	54	63	73	79	80	77	70	59	47	37
55	RA	15 34	09.9	10.9	11.9	12.7	13.3	13.5	13.5	13.1	12.6	12.1	11.9	12.1	12.7
	DEC	26 44	62	54	51	53	58	65	71	74	75	72	66	58	49
56	RA	15 59	36.1	37.2	38.2	39.1	39.8	40.3	40.4	40.2	39.8	39.3	39.2	39.4	40.1
	DEC	-22 35	21	24	28	31	32	33	34	34	33	32	31	31	32
57	RA	16 28	38.9	39.9	40.9	41.9	42.7	43.3	43.5	43.4	42.9	42.4	42.2	42.3	43.0
	DEC	-26 24	26	28	31	33	35	36	38	38	38	37	35	34	35
58	RA	16 47	19.6	21.7	24.0	26.4	28.2	29.5	29.9	29.3	28.0	26.5	25.6	25.6	26.7
	DEC	-69 00	25	21	20	23	29	37	44	51	53	52	46	38	31
59	RA	17 09	40.0	40.8	41.8	42.7	43.5	44.2	44.5	44.5	44.1	43.6	43.3	43.3	43.8
	DEC	-15 42	45	47	50	51	51	49	48	48	47	47	47	47	49
60	RA	17 32	46.0	46.9	48.0	49.2	50.2	51.1	51.5	51.5	51.1	50.5	50.1	50.0	50.5
	DEC	-37 05	51	50	50	51	52	54	57	60	61	61	59	56	54
61	RA	17 34	21.3	22.1	22.9	23.8	24.6	25.3	25.6	25.5	25.1	24.6	24.2	24.1	24.4
	DEC	12 33	54	48	44	43	47	52	58	63	66	66	64	59	52
62	RA	17 56	17.5	18.2	19.2	20.5	21.6	22.3	22.6	22.3	21.4	20.4	19.5	19.0	19.0
	DEC	51 28	72	62	56	55	60	69	79	88	93	94	90	82	72
63	RA	18 23	21.0	21.8	22.8	23.9	25.0	25.9	26.6	26.7	26.4	25.9	25.4	25.2	25.5
	DEC	-34 23	37	35	34	33	33	33	35	37	39	40	39	37	35
64	RA	18 36	30.1	30.7	31.5	32.5	33.5	34.3	34.8	34.7	34.3	33.6	32.8	32.4	32.4
	DEC	38 45	70	61	54	53	57	65	74	83	89	91	89	83	74
65	RA	18 54	29.9	30.6	31.4	32.4	33.4	34.4	35.0	35.3	35.1	34.6	34.1	33.9	34.1
	DEC	-26 18	55	54	53	52	50	48	48	49	50	51	51	50	49
66	RA	19 50	10.6	10.9	11.5	12.3	13.2	14.1	14.8	15.2	15.1	14.7	14.2	13.9	13.8
	DEC	08 49	62	57	54	53	56	62	68	74	79	81	80	78	73
67	RA	20 24	40.6	41.0	41.9	43.2	44.8	46.4	47.7	48.4	48.4	47.8	46.9	46.2	45.8
	DEC	-56 46	43	35	28	22	18	17	19	24	30	35	37	35	29
68	RA	20 40	59.4	59.4	59.8	60.7	61.8	62.9	63.8	64.2	64.1	63.6	62.8	62.1	61.6
	DEC	45 13	74	65	58	53	53	59	68	79	88	95	97	95	89
69	RA	21 40	08.5	07.9	08.8	11.0	14.0	17.5	20.8	23.1	23.6	22.5	20.2	17.6	15.6
	DEC	-77 26	58	48	38	28	21	18	20	26	34	42	46	46	40
★70	RA	21 43	34.8	34.8	35.1	35.6	36.4	37.4	38.3	39.0	39.2	39.1	38.7	38.3	38.0
	DEC	09 49	07	04	01	00	02	08	14	21	26	30	31	29	26
★71	RA	22 07	28.3	28.2	28.5	29.1	30.2	31.5	32.8	33.8	34.2	34.1	33.5	32.9	32.4
	DEC	-47 00	87	81	75	66	59	54	51	53	57	63	67	69	67
72	RA	22 56	59.1	59.0	59.0	59.4	60.1	61.2	62.3	63.2	63.7	63.8	63.6	63.2	62.8
	DEC	-29 40	82	80	76	70	63	56	51	49	50	53	57	60	61
73	RA	23 04	09.1	08.9	08.9	09.3	09.9	10.9	11.9	12.7	13.2	13.3	13.1	12.8	12.4
	DEC	15 08	28	24	21	19	20	25	32	39	45	50	52	52	49

Table 10a (2). Apparent Places of Stars, 1989 (Degrees)

Star No.	Right ascension Oecli-nation	(Hr Min) (° ′)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST OAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
1	RA	00 07	48.9	48.6	48.4	48.5	49.1	50.0	51.1	52.1	52.8	53.1	53.1	52.8	52.4
	DEC	29 01	59	55	51	47	45	47	52	60	68	74	79	81	81
2	RA	00 08	34.4	33.5	33.0	33.1	33.9	35.2	36.9	38.4	39.3	39.7	39.6	39.0	38.1
	DEC	59 05	41	37	30	22	17	15	18	26	36	46	55	61	63
3	RA	00 25	13.6	11.1	09.6	09.3	10.4	12.7	15.6	18.9	21.3	22.2	21.3	19.3	16.6
	DEC	-77 18	75	70	61	49	38	29	24	24	29	38	47	52	53
4	RA	00 25	45.3	44.8	44.5	44.5	45.0	45.9	47.1	48.2	49.1	49.5	49.4	49.0	48.5
	DEC	-42 21	68	66	61	53	43	34	28	25	27	32	39	44	47
5	RA	00 39	52.4	51.5	51.0	50.9	51.5	52.7	54.2	55.7	56.8	57.4	57.4	57.1	56.3
	DEC	56 28	58	55	50	42	36	34	36	43	52	62	71	77	80
6	RA	00 43	02.9	02.5	02.3	02.3	02.7	03.4	04.4	05.4	06.2	06.6	06.6	06.5	06.2
	DEC	-18 02	53	53	51	47	41	33	27	21	20	21	25	28	31
7	RA	00 56	02.1	01.1	0 .3	0 .2	0 .7	02.0	03.7	05.4	06.6	07.3	07.5	07.1	06.3
	DEC	60 39	48	46	41	33	26	23	24	30	39	49	59	66	69
8	RA	01 25	05.6	04.6	03.8	03.5	03.9	05.1	06.7	08.4	09.8	10.7	11.0	10.8	10.1
	DEC	60 10	65	64	59	52	45	41	41	46	54	63	73	80	85
9	RA	01 37	20.1	19.1	18.3	17.9	18.0	18.7	19.9	21.4	22.7	23.5	23.7	23.3	22.4
	DEC	-57 16	105	104	99	90	79	68	60	56	58	64	73	81	85
10	SEE TABLE 11. APPARENT PLACES OF POLARIS, 1989														
11	RA	02 06	33.9	33.5	33.1	32.9	33.1	33.7	34.6	35.7	36.7	37.3	37.7	37.8	37.7
	DEC	23 24	51	50	48	45	44	45	48	53	59	63	67	69	69
12	RA	02 57	52.3	51.7	51.1	50.5	50.4	50.7	51.4	52.5	53.6	54.4	55.0	55.1	54.8
	DEC	-40 20	59	62	61	56	47	37	28	21	19	22	29	38	44
13	RA	03 01	43.4	43.1	42.7	42.4	42.4	42.7	43.5	44.5	45.4	46.1	46.7	46.9	46.9
	DEC	04 02	57	54	53	54	56	59	64	69	74	75	75	73	71
14	RA	03 23	33.6	33.0	32.4	31.8	31.6	32.1	33.1	34.5	35.9	37.1	38.0	38.4	38.4
	DEC	49 49	41	43	42	38	32	28	25	26	30	36	42	48	53
15	RA	04 35	19.0	18.8	18.4	17.9	17.7	17.8	18.4	19.3	20.2	21.1	22.0	22.5	22.8
	DEC	16 29	26	25	24	24	24	24	26	29	32	33	34	33	32
16	RA	05 14	02.2	02.1	01.7	01.2	0 .8	0 .8	01.2	02.0	02.8	03.7	04.5	05.1	05.4
	DEC	-08 12	44	48	50	50	48	43	38	32	28	28	31	36	41
17	RA	05 15	54.9	54.7	54.2	53.5	53.0	53.0	53.6	54.7	55.9	57.2	58.4	59.3	59.8
	DEC	45 59	28	32	34	33	30	25	21	19	19	20	22	26	31
18	RA	05 24	34.2	34.1	33.7	33.2	32.9	32.9	33.3	34.1	34.9	35.8	36.7	37.4	37.7
	DEC	06 20	33	30	29	29	30	32	35	38	41	42	40	38	35
19	RA	05 25	37.7	37.6	37.3	36.7	36.3	36.3	36.8	37.7	38.7	39.7	40.7	41.5	41.9
	DEC	28 36	06	07	08	07	06	04	03	03	04	05	06	06	08
20	RA	05 35	41.0	41.0	40.6	40.1	39.8	39.7	40.1	40.8	41.6	42.5	43.3	44.0	44.4
	DEC	-01 12	24	27	29	29	27	24	20	16	12	12	14	18	23
21	RA	05 40	13.9	13.9	13.5	13.0	12.7	12.6	12.9	13.6	14.5	15.3	16.2	16.9	17.3
	DEC	-01 56	46	50	52	52	50	47	43	38	35	35	37	41	46
22	RA	05 54	36.4	36.4	36.1	35.6	35.2	35.1	35.4	36.1	37.0	37.8	38.7	39.5	40.0
	DEC	07 24	27	25	24	24	24	26	29	32	34	34	33	30	26
23	RA	06 23	44.9	44.6	43.9	42.8	41.8	41.2	41.1	41.7	42.6	43.8	45.1	46.0	46.4
	DEC	-52 40	76	86	92	94	91	84	75	65	58	56	60	69	80
24	RA	06 37	06.5	06.7	06.4	06.0	05.5	05.3	05.6	06.2	07.0	07.9	08.9	09.7	10.4
	DEC	16 24	40	38	38	38	39	39	40	41	41	41	39	36	34
25	RA	06 44	41.6	41.7	41.4	40.8	40.3	40.1	40.2	40.7	41.4	42.2	43.2	44.0	44.5
	DEC	-16 41	56	63	67	69	67	63	57	51	47	46	49	55	63

Table 10a (2). Apparent Places of Stars, 1989 (Degrees)—Continued

Star No.	Right Ascansion Declination	(Hr Min) (° ′)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
26	RA	06 58	13.4	13.5	13.2	12.5	12.0	11.6	11.6	12.0	12.7	13.6	14.6	15.5	16.0
	DEC	-28 57	17	26	31	34	32	27	20	13	07	05	08	15	24
27	RA	07 07	58.4	58.5	58.2	57.7	57.1	56.7	56.7	57.1	57.8	58.7	59.6	60.5	61.1
	DEC	-26 22	24	33	38	41	39	35	28	21	15	13	16	23	32
28	RA	07 33	56.2	56.5	56.4	55.9	55.4	55.0	55.1	55.6	56.4	57.3	58.4	59.5	60.3
	DEC	31 54	50	51	54	55	56	55	53	50	47	45	42	40	40
29	RA	07 38	45.4	45.7	45.6	45.2	44.7	44.4	44.5	44.8	45.4	46.2	47.2	48.1	48.8
	DEC	05 15	18	14	12	12	12	14	16	18	19	19	15	11	06
30	RA	07 44	40.7	41.1	41.0	40.6	40.1	39.7	39.8	40.2	40.9	41.8	42.8	43.9	44.8
	DEC	28 03	14	15	16	18	19	18	17	15	12	10	07	04	03
31	RA	08 09	13.5	13.7	13.4	12.7	11.9	11.1	10.8	10.9	11.4	12.3	13.5	14.7	15.6
	DEC	-47 17	64	75	84	89	90	87	81	72	64	59	60	67	77
32	RA	08 22	19.5	19.8	19.3	18.3	17.1	16.0	15.4	15.3	15.8	16.9	18.4	19.9	20.9
	DEC	-59 28	14	26	36	43	45	42	35	26	17	12	12	18	28
33	RA	09 07	36.9	37.5	37.4	37.0	36.3	35.6	35.2	35.1	35.4	36.1	37.2	38.4	39.4
	DEC	-43 23	05	16	25	32	35	34	29	21	14	08	08	13	22
34	RA	09 13	07.2	08.0	07.6	06.4	04.7	03.0	01.6	01.0	01.2	02.4	04.4	06.5	08.2
	DEC	-69 40	04	16	26	36	40	40	36	27	18	11	08	12	21
35	RA	09 27	04.2	04.8	04.9	04.7	04.3	04.0	03.8	03.8	04.1	04.7	05.5	06.5	07.4
	DEC	-08 36	35	42	46	49	50	48	45	42	39	38	40	46	53
36	RA	10 07	48.6	49.4	49.7	49.6	49.3	48.9	48.7	48.7	48.8	49.3	50.1	51.1	52.1
	DEC	12 00	73	69	68	68	70	72	73	73	72	69	65	59	53
37	RA	11 01	13.3	14.6	15.2	15.3	14.7	13.9	13.1	12.7	12.6	13.0	14.0	15.4	17.1
	DEC	56 25	72	74	79	86	93	96	94	89	81	71	62	54	51
38	RA	11 03	06.0	07.5	08.2	08.2	07.6	06.5	05.6	05.0	04.9	05.3	06.4	08.0	09.8
	DEC	61 47	80	82	88	96	102	105	103	97	89	79	69	61	58
39	RA	11 48	30.8	31.8	32.3	32.6	32.5	32.2	31.9	31.7	31.6	31.7	32.2	33.1	34.2
	DEC	14 37	52	47	46	47	49	52	54	54	53	49	44	37	30
40	RA	11 53	16.9	18.3	19.1	19.4	19.1	18.4	17.7	17.1	16.8	16.9	17.5	18.7	20.2
	DEC	53 44	62	61	65	72	79	84	85	81	74	65	54	45	39
41	RA	12 15	14.7	15.7	16.4	16.7	16.7	16.5	16.2	15.9	15.7	15.8	16.2	17.1	18.2
	DEC	-17 28	50	57	63	68	71	71	70	68	65	62	62	65	72
42	RA	12 25	58.5	60.3	61.3	61.9	61.7	61.1	60.2	59.2	58.4	58.3	59.0	60.5	62.4
	DEC	-63 02	03	11	20	31	41	47	49	47	40	32	25	22	25
43	RA	12 30	32.8	34.3	35.3	35.8	35.8	35.3	34.6	33.8	33.2	33.1	33.7	35.0	36.6
	DEC	-57 02	53	61	70	81	89	95	97	95	89	81	75	72	75
44	RA	12 47	03.9	05.6	06.7	07.3	07.4	06.9	06.2	05.3	04.6	04.3	04.9	06.2	08.0
	DEC	-59 37	31	37	46	57	66	72	75	73	68	60	53	50	52
45	RA	12 53	33.8	35.3	36.4	37.0	36.9	36.3	35.5	34.7	34.1	33.8	34.1	35.1	36.5
	DEC	56 00	48	45	48	55	63	70	72	70	64	55	44	34	26
46	RA	13 23	29.6	31.1	32.2	32.9	33.0	32.5	31.8	31.0	30.3	29.9	30.0	30.8	32.1
	DEC	54 58	35	31	33	40	48	55	59	58	53	45	34	23	15
47	RA	13 24	36.8	37.8	38.6	39.2	39.4	39.3	39.1	38.8	38.5	38.4	38.6	39.3	40.3
	DEC	-11 06	18	24	29	33	34	34	33	31	29	28	29	32	38
48	RA	13 47	06.7	08.1	09.1	09.9	10.1	09.8	09.2	08.5	07.8	07.4	07.4	08.0	09.2
	DEC	49 21	43	38	39	45	53	60	65	65	61	54	44	33	24
49	RA	14 03	01.2	03.1	04.5	05.7	06.2	06.2	05.7	04.8	03.9	03.3	03.5	04.4	06.1
	DEC	-60 19	04	07	14	23	32	40	44	45	42	35	28	23	22

Table 10a (2). Apparent Places of Stars, 1989 (Degrees)—Continued

Star No.	Right ascension / Declination	(Hr Min) (° ′)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA	14 06	01.4	02.7	03.7	04.5	04.8	04.9	04.7	04.3	03.8	03.5	03.6	04.3	05.4
	DEC	-36 18	55	60	66	73	78	82	84	84	81	77	73	71	73
51	RA	14 15	09.5	10.5	11.4	12.1	12.4	12.4	12.2	11.8	11.4	11.1	11.1	11.6	12.5
	DEC	19 13	67	61	59	60	64	69	73	74	74	70	64	57	48
52	RA	14 38	49.4	51.3	52.8	54.1	54.8	55.0	54.6	53.8	52.7	51.9	51.8	52.6	54.1
	DEC	-60 47	18	20	25	33	42	49	55	57	55	49	42	36	33
53	RA	14 50	15.7	16.7	17.6	18.4	18.9	19.1	19.1	18.8	18.4	18.0	18.0	18.5	19.3
	DEC	-15 59	52	56	61	64	66	66	66	65	63	62	61	63	67
54	RA	14 50	42.4	44.9	47.2	49.1	49.9	49.3	47.7	45.4	43.1	41.2	40.1	40.3	41.9
	DEC	74 11	37	32	32	38	47	57	63	65	62	55	44	32	22
55	RA	15 34	12.7	13.7	14.7	15.5	16.1	16.3	16.3	15.9	15.4	14.8	14.6	14.8	15.5
	DEC	26 44	49	42	39	40	45	52	58	62	63	60	54	46	37
56	RA	15 59	40.1	41.1	42.1	43.1	43.8	44.2	44.4	44.2	43.7	43.3	43.0	43.3	44.1
	DEC	-22 35	32	35	38	41	43	44	44	44	44	42	40	40	42
57	RA	16 28	43.0	44.0	45.0	46.0	46.8	47.4	47.6	47.5	47.0	46.5	46.2	46.4	47.1
	DEC	-26 24	35	36	39	41	43	44	45	46	46	44	42	41	42
58	RA	16 47	26.7	28.8	31.0	33.5	35.4	36.6	37.0	36.5	35.1	33.6	32.6	32.6	33.8
	DEC	-69 00	31	27	26	29	35	43	50	56	59	57	51	44	37
59	RA	17 09	43.8	44.6	45.5	46.5	47.4	48.0	48.3	48.3	47.9	47.4	47.0	47.1	47.6
	DEC	-15 42	49	52	54	55	54	53	52	51	51	50	50	50	52
60	RA	17 32	50.5	51.5	52.5	53.7	54.8	55.6	56.0	56.1	55.6	55.0	54.5	54.5	55.0
	DEC	-37 05	54	52	52	53	54	56	58	61	63	62	60	57	55
61	RA	17 34	24.4	25.2	26.0	26.9	27.7	28.3	28.7	28.6	28.2	27.7	27.2	27.2	27.5
	DEC	12 33	52	46	42	42	45	51	57	62	64	65	62	58	51
62	RA	17 56	19.0	19.7	20.7	22.0	23.1	23.9	24.1	23.8	23.0	22.0	21.0	20.5	20.6
	DEC	51 28	72	62	56	56	61	70	80	89	94	95	91	84	73
63	RA	18 23	25.5	26.2	27.2	28.3	29.4	30.3	30.9	31.1	30.8	30.2	29.7	29.5	29.8
	DEC	-34 23	35	32	31	30	30	30	32	34	36	36	35	33	31
64	RA	18 36	32.4	32.9	33.7	34.8	35.8	36.6	37.0	37.0	36.5	35.8	35.1	34.6	34.7
	DEC	38 45	74	65	59	58	61	69	79	88	94	96	94	89	79
65	RA	18 54	34.1	34.7	35.5	36.5	37.5	38.4	39.1	39.4	39.2	38.7	38.2	37.9	38.1
	DEC	-26 18	49	48	47	45	44	42	42	42	44	44	44	43	43
66	RA	19 50	13.8	14.2	14.7	15.6	16.5	17.4	18.0	18.4	18.3	17.9	17.4	17.1	17.1
	DEC	08 50	13	09	05	05	08	13	20	26	30	32	32	30	25
67	RA	20 24	45.8	46.2	47.0	48.4	50.0	51.5	52.8	53.6	53.6	52.9	52.0	51.2	51.0
	DEC	-56 46	29	22	15	08	04	03	05	10	16	21	23	21	15
68	RA	20 41	01.6	01.7	02.1	03.0	04.1	05.2	06.1	06.6	06.4	05.9	05.1	04.4	04.0
	DEC	45 14	29	20	12	08	08	14	23	34	43	50	53	51	44
69	RA	21 40	15.6	14.9	15.7	17.9	21.0	24.5	27.7	30.0	30.6	29.4	27.0	24.4	22.4
	DEC	-77 26	40	30	20	10	03	00	01	07	15	23	28	27	21
★70	RA	21 43	38.0	38.0	38.3	38.9	39.7	40.7	41.6	42.2	42.5	42.3	41.9	41.6	41.3
	DEC	09 49	26	22	19	19	21	26	33	40	45	48	49	48	45
★71	RA	22 07	32.4	32.3	32.5	33.2	34.3	35.6	36.8	37.8	38.3	38.1	37.6	36.9	36.5
	DEC	-47 00	67	62	55	47	39	34	31	33	37	43	48	49	47
72	RA	22 57	02.8	02.6	02.6	03.0	03.8	04.8	05.8	06.8	07.3	07.4	07.1	06.7	06.4
	DEC	-29 40	61	59	55	48	41	34	29	27	28	32	36	39	39
73	RA	23 04	12.4	12.2	12.2	12.6	13.3	14.2	15.2	16.0	16.5	16.6	16.4	16.1	15.8
	DEC	15 08	49	46	43	41	42	47	53	61	67	71	74	74	71

Table 10a(3). Apparent Places of Stars, 1990 (Degrees)

Star No.	Right ascension Oecli-nation	(Hr Min) (° ′)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	OEC	JAN
			Seconds (time of RA or erc of declinetion)												
1	RA	00 07	52.4	52.0	51.8	52.0	52.5	53.5	54.5	55.5	56.2	56.5	56.5	56.2	55.9
	DEC	29 02	21	17	13	08	07	09	14	21	29	36	40	42	42
2	RA	00 08	38.1	37.2	36.7	36.8	37.6	39.0	40.5	42.0	43.1	43.5	43.3	42.7	41.9
	DEC	59 05	63	59	52	44	38	36	40	47	57	67	76	82	84
3	RA	00 25	16.6	14.0	12.5	12.1	13.1	15.4	18.4	21.5	23.9	24.8	24.0	21.9	19.1
	DEC	-77 18	53	48	40	28	16	07	02	02	07	16	25	31	32
4	RA	00 25	48.5	47.9	47.6	47.6	48.1	49.0	50.1	51.3	52.2	52.6	52.5	52.1	51.5
	DEC	-42 21	47	45	40	32	22	13	07	04	06	11	18	24	26
5	RA	00 39	56.3	55.4	54.9	54.8	55.5	56.7	58.1	59.6	60.8	61.3	61.3	61.0	60.3
	DEC	56 28	80	77	71	63	58	55	57	64	73	83	92	98	100
6	RA	00 43	06.2	05.8	05.5	05.6	05.9	06.7	07.6	08.6	09.4	09.8	09.8	09.6	09.3
	DEC	-18 01	91	92	90	86	80	72	66	61	59	60	64	68	70
7	RA	00 56	06.3	05.2	04.5	04.4	04.9	06.2	07.8	09.5	10.8	11.5	11.7	11.3	10.5
	DEC	60 39	69	67	62	54	47	44	45	51	60	70	79	86	90
8	RA	01 25	10.1	09.1	08.3	08.0	08.4	09.6	11.2	12.9	14.3	15.2	15.5	15.3	14.7
	DEC	60 11	25	24	19	11	05	01	01	05	13	23	32	39	44
9	RA	01 37	22.4	21.4	20.6	20.1	20.2	21.0	22.2	23.6	24.9	25.7	25.9	25.4	24.6
	DEC	-57 16	85	85	80	71	60	49	41	37	39	45	54	62	67
10	SEE TABLE 11. APPARENT PLACES OF POLARIS,1990														
11	RA	02 06	37.7	37.3	36.9	36.7	36.8	37.4	38.3	39.4	40.4	41.1	41.4	41.5	41.4
	DEC	23 25	09	08	05	03	01	02	05	10	16	21	24	26	26
12	RA	02 57	54.8	54.1	53.5	52.9	52.8	53.1	53.8	54.9	56.0	56.8	57.3	57.4	57.1
	DEC	-40 20	44	48	47	41	33	23	14	08	05	08	15	24	31
13	RA	03 01	46.9	46.5	46.1	45.8	45.8	46.2	46.9	47.9	48.8	49.6	50.0	50.3	50.3
	DEC	04 03	11	09	08	08	09	13	18	23	27	29	28	26	24
14	RA	03 23	38.4	37.8	37.1	36.5	36.4	36.9	37.9	39.3	40.7	41.9	42.7	43.2	43.2
	DEC	49 49	53	55	54	50	45	40	38	38	42	47	54	60	65
15	RA	04 35	22.8	22.6	22.2	21.7	21.5	21.6	22.1	23.0	24.0	24.9	25.7	26.2	26.5
	DEC	16 29	32	31	31	30	29	30	32	34	37	39	39	38	38
16	RA	05 14	05.4	05.3	04.9	04.3	04.0	04.0	04.3	05.0	05.9	06.8	07.6	08.2	08.5
	DEC	-08 12	41	45	48	48	45	41	35	30	26	26	28	34	39
17	RA	05 15	59.8	59.6	59.1	58.3	57.9	57.9	58.4	59.5	60.8	62.0	63.2	64.1	64.6
	DEC	45 59	31	34	36	35	31	27	23	21	20	21	24	28	32
18	RA	05 24	37.7	37.6	37.3	36.8	36.4	36.4	36.8	37.5	38.4	39.3	40.1	40.8	41.2
	DEC	06 20	35	32	31	30	31	33	36	40	42	43	42	39	35
19	RA	05 25	41.9	41.8	41.4	40.9	40.5	40.5	40.9	41.8	42.8	43.8	44.8	45.5	46.0
	DEC	28 36	08	09	09	08	07	06	05	04	05	06	07	07	08
20	RA	05 35	44.4	44.3	43.9	43.4	43.1	43.0	43.4	44.0	44.9	45.8	46.6	47.3	47.7
	DEC	-01 12	23	26	28	29	27	24	20	15	12	12	14	18	23
21	RA	05 40	17.3	17.2	16.8	16.3	16.0	15.9	16.2	16.9	17.7	18.6	19.4	20.1	20.5
	DEC	-01 56	46	50	52	52	51	47	43	39	36	35	37	42	47
22	RA	05 54	40.0	39.9	39.6	39.1	38.7	38.7	39.0	39.6	40.5	41.4	42.2	43.0	43.4
	DEC	07 24	26	24	23	22	23	25	27	30	32	33	31	28	24
23	RA	06 23	46.4	46.1	45.3	44.3	43.3	42.7	42.6	43.1	44.1	45.3	46.5	47.4	47.8
	DEC	-52 41	20	30	36	38	35	28	19	09	02	00	04	13	24
24	RA	06 37	10.4	10.5	10.2	09.7	09.3	09.1	09.3	09.9	10.7	11.6	12.6	13.4	14.1
	DEC	16 24	34	33	33	33	33	34	34	35	36	35	33	31	29
25	RA	06 44	44.5	44.6	44.3	43.7	43.2	43.0	43.1	43.5	44.3	45.1	46.0	46.8	47.4
	DEC	-16 41	63	70	74	76	74	70	65	59	54	53	56	63	71

Table 10a (3). Apparent Places of Stars, 1990 (Degrees)—Continued

Star No.	Right ascension / Declination	(Hr Min) (° ′)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
26	RA	06 58	16.0	16.1	15.8	15.1	14.6	14.2	14.2	14.6	15.3	16.2	17.2	18.0	18.6
	DEC	-28 57	24	33	38	41	40	35	28	20	14	12	15	23	32
27	RA	07 07	61.1	61.2	60.9	60.3	59.8	59.4	59.4	59.8	60.5	61.3	62.3	63.1	63.8
	DEC	-26 22	32	41	46	49	48	43	36	29	24	22	25	32	41
28	RA	07 33	60.3	60.7	60.5	60.0	59.5	59.2	59.2	59.7	60.4	61.4	62.5	63.5	64.4
	DEC	31 54	40	41	43	45	45	44	42	40	37	34	31	29	29
29	RA	07 38	48.8	49.1	49.0	48.6	48.1	47.8	47.9	48.2	48.8	49.6	50.5	51.4	52.2
	DEC	05 14	66	62	60	60	60	62	64	66	67	66	64	59	54
30	RA	07 44	44.8	45.1	45.0	44.6	44.1	43.7	43.7	44.1	44.8	45.7	46.8	47.8	48.7
	DEC	28 02	63	64	65	67	67	67	65	63	61	58	55	52	51
31	RA	08 09	15.6	15.8	15.5	14.8	14.0	13.2	12.9	13.0	13.5	14.4	15.6	16.8	17.6
	DEC	-47 18	17	28	37	43	44	40	34	25	17	13	13	20	31
32	RA	08 22	20.9	21.2	20.8	19.8	18.6	17.5	16.8	16.7	17.3	18.4	19.9	21.3	22.4
	DEC	-59 28	28	40	49	57	59	56	50	41	32	26	26	32	43
33	RA	09 07	39.4	39.9	39.9	39.5	38.8	38.1	37.7	37.6	37.9	38.6	39.7	40.9	41.9
	DEC	-43 23	22	33	42	50	53	51	46	39	31	26	25	30	40
34	RA	09 13	08.2	08.9	08.6	07.4	05.7	03.9	02.6	01.9	02.2	03.4	05.3	07.5	09.2
	DEC	-69 40	21	33	44	53	58	58	53	45	36	28	26	29	39
35	RA	09 27	07.4	08.0	08.2	08.0	07.6	07.2	07.0	07.0	07.3	07.9	08.7	09.6	10.6
	DEC	-08 36	53	60	65	67	68	66	64	60	57	56	59	64	71
36	RA	10 07	52.1	52.8	53.1	53.0	52.7	52.4	52.1	52.1	52.3	52.7	53.5	54.4	55.5
	DEC	12 00	53	49	48	48	50	51	53	53	52	49	45	39	33
37	RA	11 01	17.1	18.4	19.0	19.0	18.5	17.6	16.9	16.4	16.3	16.7	17.7	19.0	20.7
	DEC	56 25	51	52	58	65	71	74	73	68	59	50	40	33	29
38	RA	11 03	09.8	11.3	12.1	12.0	11.4	10.3	09.4	08.7	08.6	09.0	10.1	11.6	13.5
	DEC	61 47	58	60	66	74	80	83	82	76	67	57	47	40	36
39	RA	11 48	34.2	35.1	35.7	35.9	35.8	35.5	35.2	34.9	34.8	35.0	35.5	36.3	37.4
	DEC	14 37	30	25	24	25	27	30	32	32	31	27	22	15	08
40	RA	11 53	20.2	21.6	22.4	22.7	22.4	21.7	21.0	20.3	20.0	20.1	20.7	21.9	23.4
	DEC	53 44	39	39	43	50	57	62	63	59	52	43	33	24	18
41	RA	12 15	18.2	19.2	19.8	20.1	20.1	19.9	19.6	19.3	19.1	19.2	19.6	20.4	21.5
	DEC	-17 29	12	19	25	30	32	33	32	29	26	24	24	27	33
42	RA	12 26	02.4	04.1	05.2	05.8	05.7	05.0	04.1	03.1	02.3	02.2	02.9	04.4	06.3
	DEC	-63 02	25	32	42	53	62	68	70	68	62	54	47	43	46
43	RA	12 30	36.6	38.1	39.1	39.7	39.6	39.1	38.4	37.6	37.1	36.9	37.5	38.8	40.5
	DEC	-57 03	15	23	32	42	51	57	59	56	50	43	36	34	36
44	RA	12 47	08.0	09.6	10.7	11.4	11.4	11.0	10.2	09.3	08.6	08.4	09.0	10.2	12.0
	DEC	-59 37	52	58	67	78	87	93	96	94	88	81	74	70	72
45	RA	12 53	36.5	38.0	39.1	39.6	39.6	39.0	38.2	37.4	36.7	36.5	36.8	37.7	39.1
	DEC	56 00	26	24	27	34	42	49	52	50	44	35	24	14	06
46	RA	13 23	32.1	33.6	34.7	35.4	35.5	35.0	34.3	33.4	32.7	32.3	32.4	33.1	34.5
	DEC	54 57	75	71	73	80	88	95	99	99	94	85	75	64	55
47	RA	13 24	40.3	41.3	42.1	42.6	42.8	42.8	42.6	42.3	42.0	41.8	42.0	42.7	43.7
	DEC	-11 06	38	44	49	52	54	54	52	51	49	48	48	51	57
48	RA	13 47	09.2	10.5	11.6	12.3	12.5	12.2	11.7	10.9	10.2	09.8	09.8	10.4	11.6
	DEC	49 21	24	19	20	26	34	41	46	47	43	36	26	15	06
49	RA	14 03	06.1	07.9	09.4	10.5	11.1	11.0	10.5	09.7	08.7	08.2	08.3	09.2	10.9
	DEC	-60 19	22	25	32	41	50	57	62	63	59	53	46	40	39

Table 10a (3). Apparent Places of Stars, 1990 (Degrees)—Continued

Star No.	Right Ascension / Declination	(Hr Min) (° ′)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA	14 06	05.4	06.6	07.6	08.4	08.8	08.9	08.6	08.2	07.7	07.4	07.5	08.2	09.3
	DEC	-36 19	13	18	24	31	36	40	42	42	39	35	31	29	31
51	RA	14 15	12.5	13.5	14.4	15.0	15.3	15.4	15.1	14.8	14.3	14.0	14.0	14.5	15.4
	DEC	19 13	48	42	40	41	45	50	54	56	55	52	46	38	30
52	RA	14 38	54.1	55.9	57.5	58.8	59.6	59.7	59.3	58.4	57.4	56.6	56.5	57.2	58.8
	DEC	-60 47	33	35	40	48	57	64	70	71	69	64	56	50	47
53	RA	14 50	19.3	20.4	21.3	22.1	22.6	22.8	22.7	22.4	22.0	21.7	21.6	22.0	22.9
	DEC	-16 00	07	12	16	19	21	21	21	19	18	17	16	17	21
54	RA	14 50	41.9	44.4	46.8	48.7	49.4	48.8	47.2	45.0	42.6	40.7	39.6	39.8	41.3
	DEC	74 11	22	17	17	24	33	42	48	51	48	40	30	18	08
55	RA	15 34	15.5	16.5	17.4	18.3	18.8	19.1	19.0	18.6	18.1	17.6	17.3	17.5	18.2
	DEC	26 44	37	30	27	29	34	41	47	51	52	49	43	35	26
56	RA	15 59	44.1	45.1	46.0	47.0	47.7	48.1	48.2	48.0	47.6	47.1	46.9	47.1	47.9
	DEC	-22 35	42	45	48	50	52	53	54	53	52	51	50	49	50
57	RA	16 28	47.1	48.0	49.0	50.1	50.9	51.4	51.6	51.5	51.0	50.5	50.2	50.4	51.0
	DEC	-26 24	42	43	46	48	50	51	52	52	52	51	49	48	48
58	RA	16 47	33.8	35.9	38.1	40.5	42.5	43.7	44.0	43.5	42.2	40.7	39.6	39.6	40.8
	DEC	-69 00	37	32	32	34	40	48	55	61	64	62	56	48	41
59	RA	17 09	47.6	48.4	49.3	50.3	51.1	51.8	52.1	52.0	51.6	51.1	50.8	50.8	51.3
	DEC	-15 42	52	55	57	58	57	56	55	54	53	53	53	53	55
60	RA	17 32	55.0	55.9	57.0	58.2	59.2	60.0	60.5	60.5	60.1	59.5	58.9	58.9	59.4
	DEC	-37 05	55	53	53	53	55	57	59	61	63	63	61	57	55
61	RA	17 34	27.5	28.2	29.0	30.0	30.8	31.4	31.7	31.6	31.2	30.7	30.2	30.1	30.5
	DEC	12 33	51	45	41	41	44	50	56	61	64	64	62	57	51
62	RA	17 56	20.6	21.3	22.3	23.5	24.6	25.4	25.6	25.3	24.5	23.5	22.5	22.0	22.1
	DEC	51 28	73	63	58	57	62	71	81	90	96	97	93	86	75
63	RA	18 23	29.8	30.6	31.5	32.6	33.7	34.7	35.2	35.4	35.1	34.6	34.0	33.8	34.1
	DEC	-34 23	31	29	27	26	26	26	28	30	31	32	31	29	26
64	RA	18 36	34.7	35.1	35.9	37.0	38.0	38.8	39.2	39.2	38.7	38.0	37.3	36.8	36.9
	DEC	38 46	19	10	04	03	07	15	24	33	40	42	40	34	26
65	RA	18 54	38.1	38.7	39.5	40.5	41.6	42.5	43.1	43.4	43.2	42.7	42.1	41.9	42.1
	DEC	-26 18	43	41	40	38	37	35	35	35	36	37	37	36	35
66	RA	19 50	17.1	17.4	17.9	18.7	19.7	20.6	21.2	21.5	21.5	21.1	20.6	20.2	20.2
	DEC	08 50	25	20	17	17	20	26	32	38	43	45	44	42	38
67	RA	20 24	51.0	51.3	52.1	53.4	55.0	56.6	57.8	58.5	58.5	57.9	56.9	56.1	55.9
	DEC	-56 45	75	68	61	54	50	49	51	56	61	66	68	66	61
68	RA	20 41	04.0	04.0	04.4	05.3	06.4	07.5	08.4	08.9	08.8	08.2	07.4	06.7	06.3
	DEC	45 14	44	35	28	23	24	30	39	49	59	66	68	66	60
69	RA	21 40	22.4	21.7	22.5	24.6	27.6	31.2	34.3	36.4	37.1	36.0	33.5	30.8	28.8
	DEC	-77 25	81	71	61	51	44	41	43	48	56	64	69	69	62
★70	RA	21 43	41.3	41.3	41.5	42.1	42.9	43.9	44.8	45.4	45.7	45.5	45.1	44.7	44.5
	DEC	09 49	45	41	39	38	40	46	52	59	65	68	68	67	65
★71	RA	22 07	36.5	36.3	36.5	37.2	38.3	39.6	40.8	41.7	42.2	42.1	41.5	40.8	40.3
	DEC	-47 00	47	42	35	27	19	14	12	13	17	23	28	29	27
72	RA	22 57	06.4	06.1	06.2	06.6	07.3	08.3	09.4	10.3	10.8	10.9	10.6	10.2	09.8
	DEC	-29 40	39	37	33	27	20	13	08	06	07	10	15	18	18
73	RA	23 04	15.8	15.5	15.5	15.9	16.6	17.5	18.5	19.3	19.8	19.9	19.7	19.3	19.0
	DEC	15 09	11	08	04	03	04	08	15	22	28	33	35	35	33

Table 10a (4). Apparent Places of Stars, 1991 (Degrees)

Star No.	Right ascension / Declination	(Hr Min) (° ′)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
1	RA	00 07	55.9	55.5	55.3	55.4	55.9	56.8	57.9	58.9	59.6	59.9	59.9	59.6	59.2
	DEC	29 02	42	38	34	29	28	30	35	42	50	56	61	63	62
2	RA	00 08	41.9	40.9	40.4	40.5	41.3	42.7	44.3	45.7	46.7	47.2	47.0	46.4	45.5
	DEC	59 05	84	80	73	65	59	57	60	68	78	88	97	103	104
3	RA	00 25	19.1	16.6	15.1	14.6	15.5	17.8	20.8	24.0	26.3	27.2	26.4	24.3	21.5
	DEC	-77 17	92	87	78	67	55	46	41	41	47	55	64	70	71
4	RA	00 25	51.5	51.0	50.7	50.6	51.1	52.0	53.1	54.2	55.1	55.5	55.4	55.0	54.4
	DEC	-42 20	86	84	79	71	62	53	46	44	46	51	58	63	66
5	RA	00 39	60.3	59.4	58.8	58.7	59.3	60.6	62.0	63.5	64.6	65.2	65.3	64.8	64.1
	DEC	56 29	40	38	32	24	18	16	18	24	33	43	52	58	60
6	RA	00 43	09.3	09.0	08.7	08.7	09.1	09.8	10.8	11.7	12.5	12.9	13.0	12.7	12.4
	DEC	-18 01	70	71	69	65	59	52	45	40	39	40	43	47	50
7	RA	00 56	10.5	09.5	08.7	08.5	09.1	10.4	12.0	13.6	15.0	15.7	15.9	15.4	14.6
	DEC	60 40	30	28	22	14	07	04	05	11	19	29	39	46	49
8	RA	01 25	14.7	13.7	12.9	12.5	12.9	14.1	15.6	17.3	18.7	19.7	20.0	19.8	19.1
	DEC	60 11	44	43	38	30	23	19	19	24	32	41	51	58	62
9	RA	01 37	24.6	23.6	22.8	22.3	22.3	23.1	24.3	25.7	27.0	27.8	28.0	27.5	26.7
	DEC	-57 16	67	66	61	52	42	31	23	19	21	27	36	44	49
10	SEE TABLE 11. APPARENT PLACES OF POLARIS,1991														
11	RA	02 06	41.4	41.0	40.6	40.3	40.5	41.1	42.0	43.0	44.0	44.7	45.1	45.2	45.0
	DEC	23 25	26	25	22	19	18	19	22	27	32	37	40	42	42
12	RA	02 57	57.1	56.5	55.8	55.2	55.1	55.4	56.1	57.2	58.2	59.1	59.6	59.7	59.3
	DEC	-40 19	91	94	93	88	80	70	61	54	52	55	62	71	78
13	RA	03 01	50.3	49.9	49.5	49.2	49.1	49.5	50.3	51.2	52.1	52.8	53.4	53.6	53.5
	DEC	04 03	24	22	21	21	22	26	31	36	40	42	41	39	37
14	RA	03 23	43.2	42.6	41.9	41.2	41.1	41.6	42.6	43.9	45.3	46.5	47.4	47.8	47.8
	DEC	49 49	65	67	66	61	56	51	49	50	53	58	65	71	76
15	RA	04 35	26.5	26.3	25.9	25.4	25.1	25.3	25.8	26.6	27.6	28.5	29.3	29.9	30.1
	DEC	16 29	38	37	36	35	34	35	37	40	42	43	44	43	42
16	RA	05 14	08.5	08.4	08.0	07.4	07.0	07.0	07.4	08.1	08.9	09.8	10.6	11.2	11.5
	DEC	-08 12	39	43	46	46	44	39	34	28	25	24	27	32	38
17	RA	05 16	04.6	04.4	03.9	03.1	02.6	02.6	03.2	04.2	05.4	06.7	07.9	08.8	09.2
	DEC	45 59	32	36	37	36	33	28	24	22	21	22	25	28	33
18	RA	05 24	41.2	41.1	40.7	40.2	39.8	39.8	40.2	40.9	41.8	42.7	43.5	44.2	44.5
	DEC	06 20	35	33	32	31	32	34	37	40	43	43	42	39	36
19	RA	05 25	46.0	45.9	45.5	44.9	44.5	44.6	45.0	45.8	46.8	47.8	48.8	49.5	49.9
	DEC	28 36	08	09	10	09	07	06	05	05	05	06	07	07	08
20	RA	05 35	47.7	47.6	47.2	46.7	46.3	46.3	46.6	47.2	48.1	49.0	49.8	50.5	50.8
	DEC	-01 12	23	26	28	29	27	24	20	16	13	12	14	19	24
21	RA	05 40	20.5	20.5	20.1	19.5	19.2	19.1	19.4	20.0	20.9	21.8	22.6	23.3	23.6
	DEC	-01 56	47	50	52	53	51	48	44	39	36	36	38	42	48
22	RA	05 54	43.4	43.5	43.1	42.6	42.2	42.1	42.4	43.0	43.9	44.8	45.7	46.4	46.8
	DEC	07 24	24	22	21	20	21	23	25	28	30	30	29	26	22
23	RA	06 23	47.8	47.6	46.8	45.7	44.7	44.1	44.1	44.5	45.5	46.7	47.9	48.8	49.2
	DEC	-52 41	24	34	40	42	40	33	24	14	07	05	09	18	29
24	RA	06 37	14.1	14.2	13.9	13.4	13.0	12.8	13.0	13.5	14.3	15.2	16.2	17.0	17.6
	DEC	16 24	29	28	27	27	27	28	28	29	29	29	27	25	22
25	RA	06 44	47.4	47.4	47.1	46.6	46.0	45.8	45.9	46.3	47.0	47.9	48.8	49.6	50.1
	DEC	-16 42	11	18	22	23	22	18	13	07	02	01	04	11	19

Table 10a (4). Apparent Places of Stars, 1991 (Degrees)—Continued

Star No.	Right ascension / Declination	(Hr Min) (° ′)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
26	RA	06 58	18.6	18.7	18.3	17.7	17.1	16.7	16.7	17.1	17.8	18.7	19.7	20.5	21.1
	DEC	-28 57	32	41	46	49	47	43	36	28	22	21	23	30	40
27	RA	07 08	03.8	03.9	03.6	03.0	02.4	02.0	02.0	02.4	03.0	03.9	04.9	05.7	06.3
	DEC	-26 22	41	49	55	57	56	52	45	38	33	31	33	40	50
28	RA	07 34	04.4	04.8	04.6	04.1	03.5	03.2	03.3	03.7	04.4	05.3	06.5	07.5	08.3
	DEC	31 54	29	30	32	34	34	33	31	29	26	23	20	18	18
29	RA	07 38	52.2	52.5	52.4	51.9	51.4	51.2	51.2	51.5	52.1	52.9	53.8	54.7	55.4
	DEC	05 14	54	50	48	48	48	49	51	54	55	54	51	47	42
30	RA	07 44	48.7	49.1	48.9	48.4	47.9	47.6	47.6	47.9	48.6	49.5	50.6	51.6	52.4
	DEC	28 02	51	52	53	55	56	55	54	52	49	46	43	41	39
31	RA	08 09	17.6	17.9	17.6	16.9	16.0	15.3	15.0	15.0	15.5	16.5	17.7	18.8	19.7
	DEC	-47 18	31	42	50	56	57	54	47	39	31	26	27	33	44
32	RA	08 22	22.4	22.7	22.3	21.3	20.1	19.0	18.3	18.2	18.8	19.8	21.3	22.8	23.9
	DEC	-59 28	43	54	64	71	73	71	64	55	46	41	41	46	57
33	RA	09 07	41.9	42.4	42.4	41.9	41.2	40.6	40.2	40.0	40.3	41.1	42.1	43.3	44.3
	DEC	-43 23	40	51	60	67	70	69	64	56	48	43	42	47	57
34	RA	09 13	09.2	09.9	09.6	08.4	06.7	05.0	03.6	03.0	03.2	04.4	06.4	08.5	10.2
	DEC	-69 40	39	50	61	70	75	75	71	62	53	46	43	47	56
35	RA	09 27	10.6	11.2	11.4	11.1	10.7	10.4	10.1	10.1	10.4	11.0	11.8	12.8	13.7
	DEC	-08 37	11	18	23	26	26	25	22	18	15	15	17	22	29
36	RA	10 07	55.5	56.3	56.5	56.4	56.1	55.7	55.5	55.4	55.6	56.0	56.8	57.7	58.8
	DEC	12 00	33	29	28	28	30	31	32	33	32	29	25	19	13
37	RA	11 01	20.7	22.0	22.6	22.6	22.0	21.2	20.4	19.9	19.8	20.2	21.2	22.5	24.1
	DEC	56 25	29	31	36	44	50	53	52	47	39	29	19	12	08
38	RA	11 03	13.5	15.0	15.7	15.6	14.9	13.9	13.0	12.3	12.1	12.5	13.6	15.1	16.9
	DEC	61 47	36	38	44	52	59	62	60	55	46	36	26	19	15
39	RA	11 48	37.4	38.3	38.9	39.1	39.0	38.7	38.4	38.1	38.0	38.1	38.6	39.5	40.5
	DEC	14 36	68	63	62	63	66	68	70	71	70	66	61	54	47
40	RA	11 53	23.4	24.8	25.6	25.8	25.4	24.8	24.1	23.4	23.0	23.1	23.8	24.9	26.3
	DEC	53 43	78	78	82	89	96	101	102	98	91	82	72	63	57
41	RA	12 15	21.5	22.5	23.1	23.4	23.4	23.2	22.9	22.6	22.4	22.5	22.9	23.7	24.8
	DEC	-17 29	33	40	46	51	53	54	53	50	47	45	45	47	53
42	RA	12 26	06.3	08.1	09.2	09.7	09.6	09.0	08.0	07.0	06.2	06.1	06.8	08.2	10.2
	DEC	-63 02	46	53	63	73	83	89	91	89	82	74	67	64	66
43	RA	12 30	40.5	42.0	43.0	43.5	43.4	43.0	42.3	41.4	40.8	40.8	41.3	42.6	44.2
	DEC	-57 03	36	44	53	63	72	78	80	77	71	63	57	54	57
44	RA	12 47	12.0	13.7	14.8	15.4	15.5	15.0	14.3	13.4	12.6	12.5	13.0	14.2	16.0
	DEC	-59 38	12	19	28	38	47	54	56	54	48	41	34	30	32
45	RA	12 53	39.1	40.6	41.7	42.2	42.1	41.5	40.8	39.9	39.2	39.0	39.3	40.1	41.5
	DEC	55 59	66	64	67	74	82	89	92	90	84	75	64	54	47
46	RA	13 23	34.5	36.0	37.1	37.7	37.8	37.3	36.6	35.7	35.0	34.6	34.7	35.4	36.7
	DEC	54 57	55	52	54	61	69	77	80	80	75	67	56	45	37
47	RA	13 24	43.7	44.8	45.5	46.0	46.2	46.2	46.0	45.6	45.3	45.2	45.4	46.0	47.0
	DEC	-11 06	57	63	68	71	73	72	71	69	67	66	67	70	75
48	RA	13 47	11.6	12.9	14.0	14.6	14.8	14.6	14.0	13.2	12.5	12.1	12.1	12.7	13.8
	DEC	49 20	66	61	62	68	76	84	88	89	86	78	68	58	49
49	RA	14 03	10.9	12.7	14.2	15.3	15.8	15.8	15.3	14.4	13.5	12.9	13.0	14.0	15.6
	DEC	-60 19	39	43	49	58	67	74	79	80	76	70	62	57	55

Table 10a.(4). Apparent Places of Stars, 1991 (Degrees)—Continued

Star No.	Right ascension Declination	(Hr Min) (° ′)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA	14 06	09.3	10.6	11.5	12.2	12.6	12.7	12.5	12.1	11.6	11.3	11.4	12.0	13.1
	DEC	-36 19	31	36	42	48	53	58	60	59	56	52	48	46	48
51	RA	14 15	15.4	16.4	17.3	17.9	18.2	18.2	18.0	17.6	17.1	16.8	16.9	17.3	18.1
	DEC	19 13	30	23	21	22	27	31	35	38	37	34	28	20	12
52	RA	14 38	58.8	60.6	62.1	63.4	64.1	64.3	63.9	63.0	62.0	61.2	61.1	61.8	63.3
	DEC	-60 47	47	49	54	62	70	78	84	85	83	77	70	64	61
53	RA	14 50	22.9	24.0	24.9	25.6	26.1	26.3	26.3	25.9	25.5	25.2	25.2	25.6	26.4
	DEC	-16 00	21	26	30	33	35	35	35	33	32	30	30	31	34
54	RA	14 50	41.3	43.8	46.2	48.1	48.8	48.2	46.7	44.4	42.0	40.0	39.0	39.2	40.7
	DEC	74 10	68	63	63	70	79	88	95	97	94	87	76	65	55
55	RA	15 34	18.2	19.2	20.1	20.9	21.5	21.7	21.6	21.2	20.7	20.2	19.9	20.1	20.7
	DEC	26 44	26	19	16	18	23	30	36	40	41	39	33	25	16
56	RA	15 59	47.9	48.9	49.9	50.8	51.5	51.9	52.1	51.8	51.4	50.9	50.7	50.9	51.6
	DEC	-22 35	50	53	56	59	60	61	62	62	61	59	58	57	58
57	RA	16 28	51.0	52.0	53.0	54.0	54.8	55.4	55.6	55.4	54.9	54.4	54.1	54.3	54.9
	DEC	-26 24	48	50	52	54	55	57	58	58	58	56	54	53	53
58	RA	16 47	40.8	42.9	45.1	47.4	49.3	50.6	51.0	50.4	49.0	47.6	46.5	46.4	47.5
	DEC	-69 00	41	37	36	39	44	52	59	65	68	66	60	52	45
59	RA	17 09	51.3	52.1	53.0	54.0	54.8	55.4	55.7	55.6	55.3	54.8	54.4	54.4	54.9
	DEC	-15 42	55	57	59	60	59	58	57	56	55	55	54	55	56
60	RA	17 32	59.4	60.3	61.4	62.5	63.5	64.4	64.8	64.8	64.3	63.8	63.3	63.2	63.6
	DEC	-37 05	55	53	53	54	55	57	59	61	63	62	60	57	54
61	RA	17 34	30.5	31.2	32.0	32.9	33.7	34.3	34.6	34.6	34.2	33.6	33.2	33.1	33.4
	DEC	12 33	51	44	41	41	44	50	56	61	64	65	62	58	51
62	RA	17 56	22.1	22.7	23.7	25.0	26.1	26.9	27.1	26.8	26.0	25.0	24.0	23.4	23.5
	DEC	51 28	75	65	60	59	64	73	83	92	98	99	96	88	78
63	RA	18 23	34.1	34.9	35.8	36.9	37.9	38.9	39.5	39.6	39.3	38.7	38.2	37.9	38.2
	DEC	-34 23	26	24	23	22	21	22	23	25	27	27	26	24	22
64	RA	18 36	36.9	37.4	38.1	39.1	40.1	41.0	41.4	41.4	40.9	40.2	39.4	39.0	39.0
	DEC	38 46	26	16	11	09	13	21	31	40	46	49	47	41	32
65	RA	18 54	42.1	42.7	43.5	44.5	45.5	46.4	47.0	47.3	47.0	46.6	46.0	45.8	45.9
	DEC	-26 18	35	34	33	31	29	28	27	28	29	29	30	29	27
66	RA	19 50	20.2	20.5	21.1	21.9	22.8	23.7	24.3	24.6	24.6	24.2	23.7	23.3	23.2
	DEC	08 50	38	33	30	29	32	38	45	51	55	57	57	55	50
67	RA	20 24	55.9	56.2	57.0	58.3	59.8	61.4	62.7	63.4	63.3	62.7	61.8	60.9	60.6
	DEC	-56 45	61	53	46	40	35	34	36	41	47	52	54	52	46
68	RA	20 41	06.3	06.3	06.7	07.5	08.7	09.8	10.7	11.1	11.0	10.5	09.7	09.0	08.5
	DEC	45 14	60	51	44	39	40	45	54	65	75	81	84	82	76
69	RA	21 40	28.8	28.2	28.9	30.9	33.8	37.4	40.5	42.7	43.2	42.1	39.7	37.0	34.9
	DEC	-77 25	62	53	43	33	25	22	24	30	38	46	50	50	44
★70	RA	21 43	44.5	44.5	44.7	45.2	46.0	47.0	47.9	48.5	48.8	48.6	48.3	47.8	47.6
	DEC	09 49	65	61	58	57	59	65	71	78	83	87	88	86	83
★71	RA	22 07	40.3	40.2	40.4	41.1	42.1	43.4	44.6	45.5	46.0	45.8	45.3	44.6	44.1
	DEC	-46 59	87	82	75	67	60	54	52	53	58	63	68	70	68
72	RA	22 57	09.8	09.6	09.6	10.0	10.7	11.7	12.8	13.7	14.2	14.3	14.0	13.5	13.1
	DEC	-29 39	78	76	72	66	59	52	47	45	46	50	54	57	57
73	RA	23 04	19.0	18.8	18.8	19.1	19.8	20.7	21.7	22.5	23.0	23.1	22.9	22.5	22.2
	DEC	15 09	33	29	26	24	25	29	36	43	49	54	56	56	54

Table 10a.(5). Apparent Places of Stars, 1992 (Degrees)

Star No.	Right Ascension / Declination	(Hr Min) (° ′)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
1	RA	00 07	59.2	58.8	58.6	58.7	59.2	60.2	61.2	62.2	62.9	63.2	63.1	62.9	62.4
	DEC	29 02	62	59	54	50	48	50	55	62	70	76	81	83	82
2	RA	00 08	45.5	44.6	44.1	44.1	44.9	46.3	47.9	49.4	50.4	50.8	50.6	50.0	49.1
	DEC	59 06	44	41	34	25	19	18	21	28	38	48	57	63	64
3	RA	00 25	21.5	18.9	17.4	17.0	17.9	20.1	23.1	26.3	28.6	29.4	28.6	26.5	23.6
	DEC	-77 17	71	66	57	46	35	25	20	21	26	35	44	50	51
4	RA	00 25	54.4	53.9	53.5	53.5	54.0	54.8	56.0	57.1	57.9	58.3	58.2	57.8	57.2
	DEC	-42 20	66	64	59	51	42	33	27	24	26	32	38	44	47
5	RA	00 40	04.1	03.3	02.7	02.6	03.1	04.4	05.9	07.3	08.4	09.0	09.0	08.6	07.8
	DEC	56 29	60	58	52	44	38	35	37	44	53	62	72	78	80
6	RA	00 43	12.4	12.0	11.8	11.8	12.1	12.8	13.8	14.8	15.5	15.9	15.9	15.7	15.3
	DEC	-18 01	50	51	49	45	40	32	25	21	19	21	24	28	31
7	RA	00 56	14.6	13.6	12.9	12.6	13.2	14.5	16.1	17.8	19.0	19.8	19.9	19.5	18.6
	DEC	60 40	49	47	41	33	26	23	24	30	39	48	58	65	68
8	RA	01 25	19.1	18.1	17.3	16.9	17.3	18.5	20.1	21.7	23.1	24.0	24.4	24.1	23.3
	DEC	60 11	62	61	56	48	41	37	37	42	50	59	68	76	79
9	RA	01 37	26.7	25.6	24.8	24.3	24.4	25.1	26.3	27.7	29.0	29.8	29.9	29.5	28.6
	DEC	-57 16	49	48	43	34	24	13	06	02	04	10	19	27	32
10	SEE TABLE 11. APPARENT PLACES OF POLARIS, 1992														
11	RA	02 06	45.0	44.6	44.2	43.9	44.0	44.6	45.6	46.6	47.5	48.2	48.6	48.7	48.4
	DEC	23 25	42	41	38	35	34	34	37	42	48	52	56	58	58
12	RA	02 57	59.3	58.7	58.1	57.5	57.3	57.6	58.4	59.4	60.5	61.3	61.8	61.8	61.5
	DEC	-40 19	78	81	80	75	67	57	48	42	40	43	50	59	66
13	RA	03 01	53.5	53.2	52.8	52.4	52.4	52.8	53.5	54.4	55.3	56.0	56.6	56.8	56.7
	DEC	04 03	37	34	33	33	35	38	43	48	52	53	53	51	48
14	RA	03 23	47.8	47.2	46.5	45.8	45.7	46.2	47.2	48.5	49.9	51.0	51.9	52.3	52.2
	DEC	49 49	76	78	77	72	67	62	59	60	64	69	75	81	86
15	RA	04 35	30.1	29.9	29.5	28.9	28.7	28.8	29.4	30.2	31.2	32.1	32.9	33.4	33.6
	DEC	16 29	42	41	40	40	39	39	41	44	46	48	48	48	46
16	RA	05 14	11.5	11.4	10.9	10.4	10.0	10.0	10.4	11.0	11.9	12.7	13.6	14.1	14.4
	DEC	-08 12	38	42	44	44	42	38	33	27	24	23	26	31	37
17	RA	05 16	09.2	09.1	08.5	07.7	07.2	07.2	07.8	08.8	10.0	11.3	12.5	13.3	13.7
	DEC	45 59	33	36	38	37	33	28	25	22	22	23	25	29	33
18	RA	05 24	44.5	44.4	44.1	43.5	43.1	43.1	43.5	44.2	45.1	46.0	46.8	47.4	47.7
	DEC	06 20	36	33	32	32	32	34	37	41	43	44	42	39	36
19	RA	05 25	49.9	49.9	49.5	48.8	48.4	48.4	48.9	49.7	50.7	51.7	52.7	53.4	53.8
	DEC	28 36	08	09	10	09	07	06	05	05	05	06	06	07	08
20	RA	05 35	50.8	50.8	50.4	49.8	49.4	49.4	49.7	50.4	51.2	52.1	52.9	53.5	53.9
	DEC	-01 12	24	27	29	29	28	25	21	17	14	13	16	20	24
21	RA	05 40	23.6	23.6	23.2	22.7	22.3	22.2	22.5	23.2	24.0	24.9	25.7	26.4	26.7
	DEC	-01 56	48	51	53	54	52	49	45	41	38	37	40	44	49
22	RA	05 54	46.8	46.8	46.5	45.9	45.5	45.4	45.7	46.4	47.2	48.1	49.0	49.7	50.1
	DEC	07 24	22	20	18	18	19	20	23	26	28	28	26	23	20
23	RA	06 23	49.2	49.0	48.2	47.1	46.1	45.5	45.4	45.9	46.9	48.1	49.3	50.2	50.6
	DEC	-52 41	29	40	46	47	45	38	29	19	12	11	15	23	35
24	RA	06 37	17.6	17.8	17.5	17.0	16.5	16.3	16.5	17.1	17.9	18.8	19.7	20.6	21.1
	DEC	16 24	22	21	21	21	21	21	22	23	23	22	21	18	16
25	RA	06 44	50.1	50.2	49.9	49.3	48.8	48.5	48.6	49.1	49.7	50.6	51.5	52.3	52.8
	DEC	-16 42	19	26	30	31	30	26	21	15	10	09	13	19	27

Table 10a.(5). Apparent Places of Stars, 1992 (Degrees)—Continued

Star No.	Right ascension / Declination	(Hr Min) / (° ′)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH											
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
26	RA	06 58	21.1	21.1	20.8	20.1	19.5	19.1	19.2	19.6	20.2	21.1	22.1	22.9	23.5
	DEC	−28 57	40	49	54	57	55	51	44	36	30	29	32	39	48
27	RA	07 08	06.3	06.4	06.1	05.5	04.9	04.5	04.5	04.9	05.6	06.4	07.4	08.2	08.8
	DEC	−26 22	50	58	64	66	65	61	54	47	41	40	43	49	58
28	RA	07 34	08.3	08.7	08.5	08.0	07.4	07.1	07.1	07.5	08.3	09.2	10.3	11.3	12.1
	DEC	31 54	18	19	21	23	23	22	20	18	15	12	09	07	07
29	RA	07 38	55.4	55.8	55.6	55.1	54.6	54.4	54.4	54.7	55.3	56.1	57.0	57.9	58.6
	DEC	05 14	42	38	36	35	36	37	39	41	43	42	39	34	29
30	RA	07 44	52.4	52.8	52.7	52.2	51.6	51.3	51.3	51.7	52.3	53.2	54.3	55.3	56.1
	DEC	28 02	39	40	42	43	44	43	42	40	37	34	31	29	28
31	RA	08 09	19.7	19.9	19.6	18.9	18.0	17.3	17.0	17.0	17.6	18.5	19.7	20.8	21.6
	DEC	−47 18	44	55	64	70	71	67	61	52	44	40	41	47	57
32	RA	08 22	23.9	24.2	23.7	22.7	21.5	20.4	19.8	19.7	20.2	21.3	22.8	24.3	25.3
	DEC	−59 28	57	69	79	85	88	85	79	69	60	55	55	61	71
33	RA	09 07	44.3	44.9	44.8	44.3	43.6	43.0	42.6	42.5	42.7	43.5	44.5	45.7	46.7
	DEC	−43 23	57	68	77	84	87	85	81	73	65	60	59	64	74
34	RA	09 13	10.2	11.0	10.7	09.4	07.7	06.0	04.7	04.0	04.3	05.5	07.5	09.6	11.7
	DEC	−69 40	56	68	79	88	92	92	88	79	70	63	60	64	71
35	RA	09 27	13.7	14.3	14.4	14.2	13.8	13.4	13.2	13.2	13.4	14.0	14.8	15.8	16.7
	DEC	−08 37	29	36	41	44	44	43	40	36	33	32	35	40	47
36	RA	10 07	58.8	59.5	59.8	59.7	59.3	58.9	58.7	58.6	58.8	59.2	60.0	61.0	61.9
	DEC	11 59	73	69	68	69	70	72	73	73	73	70	65	60	54
37	RA	11 01	24.1	25.4	26.1	26.0	25.4	24.5	23.8	23.3	23.2	23.5	24.5	25.9	27.4
	DEC	56 24	68	70	75	83	89	92	91	86	78	68	59	52	48
38	RA	11 03	16.9	18.4	19.2	19.1	18.3	17.3	16.3	15.7	15.5	15.9	16.9	18.5	20.3
	DEC	61 46	75	77	84	92	98	101	100	94	85	75	65	58	55
39	RA	11 48	40.5	41.5	42.0	42.2	42.1	41.8	41.5	41.2	41.0	41.2	41.7	42.5	43.5
	DEC	14 36	47	42	41	42	45	48	50	50	49	46	40	33	27
40	RA	11 53	26.3	27.7	28.6	28.8	28.4	27.7	27.0	26.3	26.0	26.0	26.7	27.8	29.3
	DEC	53 43	57	57	61	68	76	80	81	78	71	61	51	42	37
41	RA	12 15	24.8	25.8	26.4	26.7	26.7	26.4	26.1	25.8	25.6	25.7	26.1	26.9	28.0
	DEC	−17 29	53	61	67	71	74	74	73	70	67	65	64	67	73
42	RA	12 26	10.2	11.9	13.1	13.6	13.4	12.8	11.8	10.8	10.0	09.9	10.7	12.1	14.0
	DEC	−63 03	06	14	23	34	43	49	51	49	42	34	27	24	26
43	RA	12 30	44.2	45.8	46.8	47.2	47.2	46.7	46.0	45.2	44.5	44.5	45.1	46.3	47.9
	DEC	−57 03	57	64	74	84	92	98	100	97	91	83	77	74	77
44	RA	12 47	16.0	17.7	18.8	19.4	19.4	19.0	18.2	17.3	16.6	16.4	16.9	18.2	19.9
	DEC	−59 38	32	39	48	58	67	73	76	74	68	60	53	50	51
45	RA	12 53	41.5	43.1	44.1	44.7	44.5	43.9	43.1	42.3	41.6	41.3	41.6	42.5	43.9
	DEC	55 59	47	44	47	55	63	70	72	71	65	56	45	35	28
46	RA	13 23	36.7	38.2	39.3	40.0	40.0	39.5	38.8	37.9	37.1	36.7	36.8	37.6	38.9
	DEC	54 57	37	34	36	43	51	59	62	62	57	49	38	27	19
47	RA	13 24	47.0	48.1	48.8	49.3	49.5	49.5	49.2	48.9	48.5	48.4	48.7	49.3	50.3
	DEC	−11 07	15	22	27	30	31	30	29	27	25	24	25	28	33
48	RA	13 47	13.8	15.1	16.2	16.9	17.0	16.7	16.2	15.4	14.7	14.3	14.3	14.9	16.0
	DEC	49 20	49	44	45	51	59	67	72	72	69	61	51	41	32
49	RA	14 03	15.6	17.5	18.9	20.0	20.5	20.5	20.0	19.1	18.1	17.6	17.7	18.6	20.2
	DEC	−60 19	55	59	65	74	83	90	95	96	92	85	78	73	71

Table 10a.(5). Apparent Places of Stars, 1992 (Degrees)—Continued

Star No.	Right ascension / Declination	(Hr Min) (° ′)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH											
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA	14 06	13.1	14.3	15.3	16.1	16.4	16.5	16.3	15.8	15.3	15.0	15.1	15.7	16.8
	DEC	-36 19	48	52	58	65	70	74	76	75	72	68	64	62	64
51	RA	14 15	18.1	19.2	20.0	20.7	20.9	20.9	20.7	20.3	19.9	19.5	19.6	20.0	20.9
	DEC	19 12	72	66	63	65	69	74	78	80	80	77	71	63	55
52	RA	14 39	03.3	05.1	06.7	08.0	08.7	08.8	08.4	07.5	06.4	05.7	05.6	06.3	07.7
	DEC	-60 48	01	03	08	16	24	31	37	39	36	30	23	17	14
53	RA	14 50	26.4	27.5	28.4	29.1	29.6	29.8	29.7	29.4	28.9	28.6	28.6	29.0	29.8
	DEC	-16 00	34	39	43	47	48	48	48	46	45	43	42	44	47
54	RA	14 50	40.7	43.2	45.6	47.5	48.2	47.5	45.9	43.7	41.3	39.3	38.3	38.5	40.1
	DEC	74 10	55	49	50	56	66	75	82	84	81	74	63	52	42
55	RA	15 34	20.7	21.7	22.7	23.5	24.0	24.2	24.2	23.8	23.2	22.7	22.4	22.6	23.3
	DEC	26 44	16	09	06	08	13	20	27	31	32	29	23	15	06
56	RA	15 59	51.6	52.6	53.6	54.5	55.2	55.6	55.7	55.5	55.0	54.5	54.3	54.5	55.2
	DEC	-22 35	58	61	64	67	68	69	69	69	68	67	65	65	66
57	RA	16 28	54.9	55.9	56.9	57.9	58.6	59.2	59.4	59.2	58.7	58.2	57.9	58.0	58.6
	DEC	-26 24	53	55	57	59	61	62	63	63	63	61	59	58	58
58	RA	16 47	47.5	49.6	51.9	54.2	56.1	57.3	57.7	57.0	55.6	54.1	53.1	53.1	54.2
	DEC	-69 00	45	40	40	43	48	55	63	69	71	69	63	55	48
59	RA	17 09	54.9	55.7	56.6	57.6	58.3	59.0	59.3	59.2	58.8	58.3	57.9	57.9	58.3
	DEC	-15 42	56	59	61	62	61	60	58	58	57	56	56	56	58
60	RA	17 33	03.6	04.6	05.6	06.8	07.8	08.6	09.0	09.0	08.5	07.9	07.4	07.3	07.7
	DEC	-37 05	54	53	53	53	54	56	58	61	62	62	59	56	54
61	RA	17 34	33.4	34.1	34.9	35.8	36.6	37.2	37.5	37.4	37.0	36.4	36.0	35.9	36.2
	DEC	12 33	51	45	41	41	45	51	57	61	65	65	63	58	52
62	RA	17 56	23.5	24.2	25.2	26.5	27.5	28.3	28.5	28.2	27.4	26.3	25.4	24.8	24.9
	DEC	51 29	18	08	02	02	07	16	26	35	41	42	39	31	20
63	RA	18 23	38.2	39.0	39.9	41.0	42.0	42.9	43.5	43.7	43.3	42.7	42.2	41.9	42.2
	DEC	-34 23	22	19	18	17	16	17	18	20	22	22	21	19	17
64	RA	18 36	39.0	39.5	40.3	41.3	42.3	43.1	43.5	43.5	43.0	42.2	41.5	41.0	41.0
	DEC	38 46	32	23	17	16	20	28	37	46	53	55	53	47	38
65	RA	18 54	45.9	46.5	47.3	48.3	49.3	50.2	50.8	51.1	50.8	50.3	49.8	49.5	49.6
	DEC	-26 18	27	26	25	23	22	20	19	20	21	22	22	21	20
66	RA	19 50	23.2	23.6	24.1	24.9	25.8	26.7	27.4	27.7	27.5	27.1	26.6	26.3	26.2
	DEC	08 50	50	46	43	42	45	51	57	63	68	70	70	67	63
67	RA	20 25	0 .6	0 .9	01.8	03.0	04.5	06.1	07.3	08.0	07.9	07.3	06.3	05.5	05.1
	DEC	-56 45	46	39	31	25	21	20	22	27	33	37	39	37	32
68	RA	20 41	08.5	08.5	09.0	09.8	10.9	12.1	12.9	13.4	13.2	12.7	11.9	11.2	10.7
	DEC	45 14	76	67	59	55	55	61	70	81	90	97	100	97	91
69	RA	21 40	34.9	34.2	34.9	37.0	39.9	43.3	46.5	48.6	49.1	47.9	45.5	42.8	40.6
	DEC	-77 25	44	34	24	14	07	04	05	11	20	28	32	32	26
★70	RA	21 43	47.6	47.6	47.8	48.3	49.1	50.1	51.0	51.6	51.8	51.6	51.3	50.8	50.5
	DEC	09 50	23	20	17	16	18	23	30	37	42	45	46	45	42
★71	RA	22 07	44.1	43.9	44.1	44.8	45.8	47.0	48.3	49.2	49.6	49.4	48.9	48.2	47.6
	DEC	-46 59	68	62	55	47	40	34	32	34	38	44	49	50	49
72	RA	22 57	13.1	12.9	13.0	13.3	14.0	15.0	16.1	17.0	17.4	17.5	17.2	16.8	16.3
	DEC	-29 39	57	55	51	45	38	31	27	25	26	29	34	37	37
73	RA	23 04	22.2	22.0	22.0	22.3	22.9	23.8	24.8	25.6	26.1	26.2	25.9	25.6	25.2
	DEC	15 09	54	50	47	45	46	50	57	64	70	74	76	76	74

Table 10b.(1). Apparent Places of Stars, 1988 (Mils of Declination)

Star No.	Right ascension / Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
1	RA	00 07	45.5	45.1	44.9	45.0	45.6	46.5	47.6	48.6	49.3	49.6	49.6	49.4	48.9
	DEC	515	1.03	1.01	1.00	.98	.97	.98	1.00	1.04	1.08	1.11	1.13	1.15	1.14
2	RA	00 08	30.8	29.9	29.3	29.4	30.2	31.6	33.2	34.6	35.6	36.1	35.9	35.3	34.4
	DEC	1050	.46	.44	.41	.37	.34	.34	.35	.39	.44	.49	.54	.56	.57
3	RA	00 25	10.5	08.0	06.6	06.2	07.3	09.6	12.7	15.9	18.3	19.2	18.4	16.4	13.6
	DEC	-1374	.71	.68	.63	.58	.52	.47	.45	.45	.47	.52	.56	.59	.59
4	RA	00 25	42.1	41.6	41.3	41.3	41.8	42.7	43.9	45.1	45.9	46.3	46.3	45.9	45.3
	DEC	- 753	.33	.32	.29	.25	.21	.17	.13	.12	.13	.15	.19	.21	.22
5	RA	00 39	48.5	47.7	47.1	47.0	47.6	48.9	50.4	51.8	52.9	53.5	53.6	53.1	52.4
	DEC	1003	1.03	1.02	.99	.95	.93	.91	.93	.96	1.00	1.05	1.10	1.13	1.14
6	RA	00 42	59.5	59.2	59.0	59.0	59.4	60.1	61.1	62.1	62.9	63.3	63.4	63.2	62.9
	DEC	- 320	.96	.96	.95	.93	.90	.86	.83	.80	.80	.80	.82	.84	.85
7	RA	00 55	58.0	57.0	56.2	56.0	56.6	57.9	59.5	61.2	62.4	63.2	63.3	62.9	62.1
	DEC	1078	.36	.35	.32	.28	.25	.23	.24	.27	.31	.36	.41	.44	.46
8	RA	01 24	61.2	60.2	59.4	59.0	59.4	60.6	62.2	63.9	65.3	66.2	66.6	66.3	65.6
	DEC	1069	.85	.84	.82	.78	.75	.73	.73	.76	.80	.84	.89	.93	.95
9	RA	01 37	17.7	16.7	16.0	15.5	15.6	16.3	17.6	19.1	20.4	21.2	21.4	21.0	20.1
	DEC	-1018	.69	.69	.66	.61	.56	.51	.47	.45	.45	.48	.53	.57	.59
10	SEE TABLE 11. APPARENT PLACES OF POLARIS,1988														
11	RA	02 06	30.1	29.8	29.4	29.1	29.3	29.9	30.9	31.9	32.9	33.6	34.0	34.1	33.9
	DEC	416	.16	.16	.15	.13	.13	.13	.15	.17	.20	.22	.24	.25	.25
12	RA	02 57	49.8	49.2	48.6	48.0	47.9	48.2	49.0	50.1	51.1	52.0	52.5	52.6	52.3
	DEC	- 717	.41	.42	.41	.39	.34	.29	.25	.21	.20	.22	.25	.29	.33
13	RA	03 01	39.9	39.6	39.2	38.9	38.9	39.3	40.1	41.0	41.9	42.7	43.2	43.5	43.4
	DEC	71	.91	.90	.90	.90	.91	.92	.95	.98	1.00	1.00	1.00	1.00	.99
14	RA	03 23	28.8	28.3	27.6	26.9	26.8	27.3	28.4	29.7	31.1	32.3	33.2	33.7	33.6
	DEC	885	.76	.77	.77	.75	.72	.70	.69	.70	.71	.74	.77	.81	.83
15	RA	04 35	15.1	15.0	14.6	14.1	13.8	14.0	14.6	15.5	16.4	17.4	18.2	18.7	19.0
	DEC	293	.13	.13	.12	.12	.12	.12	.13	.15	.16	.17	.17	.17	.17
16	RA	05 13	59.0	58.9	58.5	58.0	57.6	57.6	58.1	58.8	59.6	60.5	61.4	62.0	62.2
	DEC	- 145	1.01	1.03	1.04	1.04	1.03	1.01	.98	.95	.94	.93	.95	.97	1.00
17	RA	05 15	49.9	49.8	49.3	48.5	48.0	48.1	48.7	49.8	51.0	52.3	53.6	54.4	54.9
	DEC	817	.60	.62	.63	.63	.61	.59	.58	.57	.56	.57	.58	.60	.62
18	RA	05 24	30.6	30.6	30.2	29.7	29.3	29.3	29.8	30.5	31.4	32.3	33.2	33.8	34.2
	DEC	112	.74	.73	.73	.73	.73	.74	.76	.77	.79	.79	.78	.77	.76
19	RA	05 25	33.5	33.5	33.1	32.5	32.1	32.2	32.7	33.5	34.5	35.5	36.6	37.3	37.7
	DEC	508	.46	.47	.47	.47	.46	.45	.45	.45	.45	.46	.46	.47	.47
20	RA	05 35	37.6	37.6	37.3	36.7	36.4	36.3	36.7	37.4	38.2	39.1	40.0	40.7	41.0
	DEC	- 21	.46	.48	.48	.48	.48	.46	.44	.42	.40	.40	.41	.43	.45
21	RA	05 40	10.6	10.5	10.2	09.7	09.3	09.2	09.6	10.3	11.1	12.0	12.9	13.6	13.9
	DEC	- 34	.61	.62	.63	.63	.62	.61	.59	.56	.55	.54	.55	.57	.60
22	RA	05 54	32.8	32.8	32.5	32.0	31.6	31.5	31.9	32.5	33.4	34.3	35.2	35.9	36.4
	DEC	131	.69	.68	.67	.67	.68	.69	.70	.72	.73	.73	.72	.71	.69
23	RA	06 23	43.4	43.2	42.4	41.3	40.3	39.7	39.7	40.2	41.2	42.4	43.6	44.5	44.9
	DEC	- 936	.66	.71	.74	.75	.73	.70	.65	.60	.56	.56	.58	.62	.67
24	RA	06 37	02.7	02.9	02.6	02.1	01.7	01.5	01.8	02.4	03.2	04.1	05.1	06.0	06.5
	DEC	291	.77	.77	.77	.77	.77	.77	.77	.78	.78	.78	.77	.76	.75
25	RA	06 44	38.7	38.8	38.5	37.9	37.4	37.2	37.3	37.8	38.5	39.3	40.3	41.1	41.6
	DEC	- 296	.84	.87	.89	.90	.89	.87	.84	.81	.79	.79	.80	.83	.87

Table 10b.(1). Apparent Places of Stars, 1988 (Mils of Declination)—Continued

Star No.	Right Ascension / Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH											
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
26	RA	06 58	10.8	10.9	10.6	09.9	09.3	09.0	09.0	09.4	10.1	11.0	12.0	12.9	13.4
	DEC	- 514	.72	.77	.79	.80	.80	.77	.74	.70	.67	.66	.67	.71	.75
27	RA	07 07	55.7	55.8	55.5	54.9	54.3	54.0	54.0	54.4	55.1	56.0	57.0	57.8	58.4
	DEC	- 468	.82	.87	.89	.90	.90	.87	.84	.80	.78	.77	.79	.81	.86
28	RA	07 33	51.9	52.3	52.2	51.7	51.1	50.8	50.9	51.4	52.1	53.1	54.3	55.3	56.2
	DEC	567	.40	.41	.42	.43	.44	.43	.42	.41	.39	.38	.37	.36	.36
29	RA	07 38	41.9	42.2	42.1	41.7	41.2	40.9	41.0	41.4	42.0	42.8	43.8	44.7	45.4
	DEC	93	.48	.46	.45	.45	.45	.46	.47	.48	.49	.48	.47	.45	.42
30	RA	07 44	36.7	37.1	37.0	36.5	36.0	35.7	35.8	36.2	36.9	37.8	38.9	39.9	40.7
	DEC	498	.79	.79	.80	.81	.81	.81	.80	.80	.78	.77	.75	.74	.74
31	RA	08 09	11.4	11.7	11.4	10.6	09.8	09.1	08.7	08.8	09.3	10.3	11.5	12.6	13.5
	DEC	- 840	.84	.90	.94	.97	.98	.96	.93	.88	.84	.82	.82	.86	.91
32	RA	08 22	18.1	18.4	17.9	16.9	15.7	14.6	14.0	13.8	14.4	15.5	17.0	18.4	19.5
	DEC	-1057	.19	.24	.29	.33	.34	.32	.29	.24	.20	.18	.18	.20	.25
33	RA	09 07	34.4	35.0	35.0	34.5	33.8	33.1	32.7	32.6	32.9	33.7	34.7	35.9	36.9
	DEC	- 771	.20	.26	.30	.34	.35	.34	.32	.28	.24	.21	.21	.24	.28
34	RA	09 13	06.4	07.2	06.8	05.5	03.8	02.1	0 .8	0 .1	0 .3	01.5	03.5	05.6	07.2
	DEC	-1238	.45	.51	.57	.61	.63	.63	.61	.57	.52	.49	.47	.49	.54
35	RA	09 27	0 .9	01.5	01.7	01.4	01.0	0 .7	0 .5	0 .6	0 .8	01.4	02.3	03.3	04.2
	DEC	- 152	.97	1.01	1.03	1.04	1.04	1.04	1.02	1.01	.99	.99	1.00	1.03	1.06
36	RA	10 07	45.1	45.8	46.2	46.1	45.7	45.4	45.2	45.1	45.3	45.8	46.6	47.6	48.6
	DEC	213	.79	.77	.77	.77	.78	.79	.79	.79	.79	.77	.75	.72	.69
37	RA	11 01	09.3	10.7	11.4	11.4	10.8	10.0	09.3	08.9	08.8	09.2	10.2	11.6	13.3
	DEC	1003	.43	.43	.46	.50	.53	.54	.54	.51	.47	.42	.37	.34	.32
38	RA	11 03	01.9	03.5	04.3	04.3	03.6	02.6	01.7	01.1	01.0	01.4	02.6	04.2	06.0
	DEC	1098	.87	.88	.91	.95	.98	1.00	.99	.96	.91	.86	.81	.78	.77
39	RA	11 48	27.4	28.4	29.0	29.2	29.1	28.8	28.5	28.3	28.2	28.4	28.9	29.8	30.8
	DEC	260	.22	.20	.19	.19	.21	.22	.23	.23	.22	.20	.17	.14	.11
40	RA	11 53	13.5	14.9	15.8	16.0	15.7	15.0	14.4	13.8	13.4	13.6	14.3	15.4	16.9
	DEC	955	.67	.67	.69	.73	.76	.78	.79	.77	.73	.69	.63	.59	.57
41	RA	12 15	11.3	12.3	13.0	13.2	13.2	13.0	12.8	12.5	12.3	12.3	12.8	13.7	14.7
	DEC	- 310	.65	.69	.72	.75	.76	.76	.76	.75	.73	.72	.72	.74	.77
42	RA	12 25	54.6	56.4	57.5	58.0	57.9	57.2	56.3	55.3	54.5	54.4	55.2	56.6	58.5
	DEC	-1120	.50	.54	.58	.64	.68	.72	.73	.72	.68	.65	.61	.60	.61
43	RA	12 30	29.0	30.5	31.5	32.0	31.9	31.5	30.8	30.0	29.4	29.3	29.9	31.2	32.8
	DEC	-1014	.08	.12	.16	.21	.26	.29	.30	.29	.25	.22	.19	.18	.19
44	RA	12 46	59.9	61.6	62.7	63.3	63.3	62.9	62.2	61.2	60.5	60.3	60.9	62.2	63.9
	DEC	-1059	.90	.93	.98	1.02	1.07	1.10	1.12	1.11	1.08	1.04	1.01	1.00	1.00
45	RA	12 53	30.9	32.5	33.6	34.2	34.1	33.5	32.8	32.0	31.3	31.1	31.4	32.4	33.8
	DEC	995	.90	.89	.90	.94	.98	1.00	1.02	1.01	.98	.94	.88	.83	.79
46	RA	13 23	27.0	28.5	29.7	30.3	30.4	30.0	29.3	28.5	27.7	27.3	27.5	28.3	29.6
	DEC	977	.46	.44	.45	.48	.53	.56	.58	.57	.55	.51	.45	.40	.36
47	RA	13 24	33.2	34.3	35.1	35.6	35.8	35.8	35.6	35.3	35.0	34.9	35.1	35.8	36.8
	DEC	- 197	.32	.35	.38	.39	.40	.40	.40	.39	.38	.37	.38	.39	.42
48	RA	13 47	04.1	05.5	06.6	07.3	07.5	07.2	06.7	06.0	05.3	04.9	05.0	05.6	06.7
	DEC	877	.64	.62	.62	.65	.69	.73	.75	.75	.73	.69	.64	.59	.55
49	RA	14 02	56.4	58.3	59.8	60.8	61.4	61.4	60.9	60.0	59.0	58.5	58.7	59.6	61.2
	DEC	-1072	.22	.24	.27	.32	.36	.40	.42	.43	.41	.38	.35	.32	.32

Table 10b.(1). Apparent Places of Stars, 1988 (Mils of Declination)—Continued

Star No.	Right ascension / Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA	14 05	57.5	58.7	59.7	60.5	60.8	60.9	60.8	60.3	59.8	59.5	59.7	60.4	61.4
	DEC	- 645	.51	.54	.57	.60	.62	.64	.65	.65	.64	.62	.60	.60	.60
51	RA	14 15	06.4	07.5	08.4	09.0	09.3	09.4	09.2	08.8	08.4	08.1	08.2	08.6	09.5
	DEC	341	1.06	1.03	1.02	1.02	1.04	1.07	1.08	1.09	1.09	1.07	1.04	1.00	.96
52	RA	14 38	44.7	46.6	48.2	49.4	50.1	50.3	49.9	49.1	48.0	47.3	47.2	47.9	49.4
	DEC	-1080	.60	.61	.64	.68	.72	.76	.79	.80	.79	.76	.72	.70	.68
53	RA	14 50	11.9	13.0	14.0	14.7	15.2	15.4	15.4	15.1	14.7	14.3	14.4	14.8	15.7
	DEC	- 284	.32	.35	.37	.39	.40	.40	.40	.39	.39	.38	.38	.39	.40
54	RA	14 50	42.5	45.1	47.5	49.5	50.2	49.6	48.0	45.8	43.4	41.5	40.5	40.7	42.4
	DEC	1318	1.08	1.05	1.05	1.08	1.13	1.18	1.20	1.21	1.20	1.16	1.11	1.05	1.00
55	RA	15 34	09.9	10.9	11.9	12.7	13.3	13.5	13.5	13.1	12.6	12.1	11.9	12.1	12.7
	DEC	475	.57	.53	.51	.52	.55	.58	.61	.62	.63	.61	.59	.55	.50
56	RA	15 59	36.1	37.2	38.2	39.1	39.8	40.3	40.4	40.2	39.8	39.3	39.2	39.4	40.1
	DEC	- 401	.59	.60	.62	.63	.64	.64	.65	.65	.64	.64	.63	.63	.64
57	RA	16 28	38.9	39.9	40.9	41.9	42.7	43.3	43.5	43.4	42.9	42.4	42.2	42.3	43.0
	DEC	- 469	.46	.47	.49	.50	.51	.51	.52	.52	.52	.52	.51	.50	.51
58	RA	16 47	19.6	21.7	24.0	26.4	28.2	29.5	29.9	29.3	28.0	26.5	25.6	25.6	26.7
	DEC	-1226	.79	.77	.77	.78	.81	.85	.88	.92	.93	.92	.89	.85	.82
59	RA	17 09	40.0	40.8	41.8	42.7	43.5	44.2	44.5	44.5	44.1	43.6	43.3	43.3	43.8
	DEC	- 279	.33	.34	.36	.36	.36	.35	.35	.35	.34	.34	.34	.34	.35
60	RA	17 32	46.0	46.9	48.0	49.2	50.2	51.1	51.5	51.5	51.1	50.5	50.1	50.0	50.5
	DEC	- 659	.51	.51	.51	.51	.52	.53	.54	.56	.56	.56	.55	.54	.53
61	RA	17 34	21.3	22.1	22.9	23.8	24.6	25.3	25.6	25.5	25.1	24.6	24.2	24.1	24.4
	DEC	223	.38	.35	.33	.32	.34	.37	.40	.42	.44	.44	.43	.40	.37
62	RA	17 56	17.5	18.2	19.2	20.5	21.6	22.3	22.6	22.3	21.4	20.4	19.5	19.0	19.0
	DEC	915	.32	.27	.24	.23	.26	.30	.35	.40	.42	.43	.41	.37	.32
63	RA	18 23	21.0	21.8	22.8	23.9	25.0	25.9	26.6	26.7	26.4	25.9	25.4	25.2	25.5
	DEC	- 611	.44	.43	.43	.42	.42	.42	.43	.44	.45	.46	.45	.44	.43
64	RA	18 36	30.1	30.7	31.5	32.5	33.5	34.3	34.8	34.7	34.3	33.6	32.8	32.4	32.4
	DEC	689	.23	.19	.16	.15	.17	.21	.25	.30	.33	.34	.33	.30	.25
65	RA	18 54	29.9	30.6	31.4	32.4	33.4	34.4	35.0	35.3	35.1	34.6	34.1	33.9	34.1
	DEC	- 467	.83	.82	.82	.81	.80	.79	.79	.80	.80	.81	.81	.80	.80
66	RA	19 50	10.6	10.9	11.5	12.3	13.2	14.1	14.8	15.2	15.1	14.7	14.2	13.9	13.8
	DEC	157	.05	.02	.01	0.00	.02	.05	.08	.11	.13	.14	.14	.13	.10
67	RA	20 24	40.6	41.0	41.9	43.2	44.8	46.4	47.7	48.4	48.4	47.8	46.9	46.2	45.8
	DEC	-1009	.40	.36	.32	.29	.27	.27	.28	.30	.33	.36	.37	.36	.33
68	RA	20 40	59.4	59.4	59.8	60.7	61.8	62.9	63.8	64.2	64.1	63.6	62.8	62.1	61.6
	DEC	804	.22	.17	.14	.11	.11	.14	.19	.24	.29	.32	.33	.32	.29
69	RA	21 40	08.5	07.9	08.8	11.0	14.0	17.5	20.8	23.1	23.6	22.5	20.2	17.6	15.6
	DEC	-1376	.88	.83	.78	.73	.70	.68	.69	.72	.76	.80	.82	.82	.79
★70	RA	21 43	34.8	34.8	35.1	35.6	36.4	37.4	38.3	39.0	39.2	39.1	38.7	38.3	38.0
	DEC	174	.55	.54	.52	.52	.53	.56	.59	.62	.65	.67	.67	.66	.65
★71	RA	22 07	28.3	28.2	28.5	29.1	30.2	31.5	32.8	33.8	34.2	34.1	33.5	32.9	32.4
	DEC	- 835	.99	.96	.93	.88	.85	.82	.81	.82	.84	.87	.89	.90	.89
72	RA	22 56	59.1	59.0	59.0	59.4	60.1	61.2	62.3	63.2	63.7	63.8	63.6	63.2	62.8
	DEC	- 527	.81	.80	.78	.75	.72	.68	.66	.65	.65	.67	.69	.70	.71
73	RA	23 04	09.1	08.9	08.9	09.3	09.9	10.9	11.9	12.7	13.2	13.3	13.1	12.8	12.4
	DEC	269	.18	.16	.14	.13	.14	.16	.20	.23	.26	.28	.29	.29	.28

Table 10b.(2). Apparent Places of Stars, 1989 (Mils of Declination)

Star No.	Right ascension Oecli-nation	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
1	RA	00 07	48.9	48.6	48.4	48.5	49.1	50.0	51.1	52.1	52.8	53.1	53.1	52.8	52.4
	DEC	516	.14	.12	.10	.08	.07	.08	.11	.15	.19	.22	.24	.25	.25
2	RA	00 08	34.4	33.5	33.0	33.1	33.9	35.2	36.9	38.4	39.3	39.7	39.6	39.0	38.1
	DEC	1050	.57	.55	.52	.48	.45	.44	.46	.50	.55	.60	.64	.67	.68
3	RA	00 25	13.6	11.1	09.6	09.3	10.4	12.7	15.6	18.9	21.3	22.2	21.3	19.3	16.6
	DEC	-1374	.59	.57	.52	.46	.41	.37	.34	.34	.37	.41	.45	.48	.48
4	RA	00 25	45.3	44.8	44.5	44.5	45.0	45.9	47.1	48.2	49.1	49.5	49.4	49.0	48.5
	DEC	- 753	.22	.21	.19	.15	.10	.06	.03	.01	.02	.05	.08	.11	.12
5	RA	00 39	52.4	51.5	51.0	50.9	51.5	52.7	54.2	55.7	56.8	57.4	57.4	57.1	56.3
	DEC	1004	.14	.12	.10	.06	.03	.02	.03	.06	.11	.16	.20	.23	.25
6	RA	00 43	02.9	02.5	02.3	02.3	02.7	03.4	04.4	05.4	06.2	06.6	06.6	06.5	06.2
	DEC	- 320	.85	.85	.84	.82	.80	.76	.73	.70	.69	.70	.72	.73	.75
7	RA	00 56	02.1	01.1	0 .3	0 .2	0 .7	02.0	03.7	05.4	06.6	07.3	07.5	07.1	06.3
	DEC	1078	.46	.45	.42	.39	.35	.34	.34	.37	.41	.46	.51	.55	.56
8	RA	01 25	05.6	04.6	03.8	03.5	03.9	05.1	06.7	08.4	09.8	10.7	11.0	10.8	10.1
	DEC	1069	.95	.95	.92	.89	.85	.83	.83	.86	.90	.94	.99	1.02	1.05
9	RA	01 37	20.1	19.1	18.3	17.9	18.0	18.7	19.9	21.4	22.7	23.5	23.7	23.3	22.4
	DEC	-1018	.59	.59	.56	.52	.46	.41	.37	.35	.36	.39	.43	.47	.49
10	SEE TABLE 11. APPARENT PLACES OF POLARIS, 1989														
11	RA	02 06	33.9	33.5	33.1	32.9	33.1	33.7	34.6	35.7	36.7	37.3	37.7	37.8	37.7
	DEC	416	.25	.25	.24	.22	.22	.22	.24	.26	.29	.31	.33	.34	.34
12	RA	02 57	52.3	51.7	51.1	50.5	50.4	50.7	51.4	52.5	53.6	54.4	55.0	55.1	54.8
	DEC	- 717	.33	.34	.34	.31	.27	.22	.18	.14	.13	.15	.18	.22	.25
13	RA	03 01	43.4	43.1	42.7	42.4	42.4	42.7	43.5	44.5	45.4	46.1	46.7	46.9	46.9
	DEC	71	.99	.97	.97	.97	.98	1.00	1.02	1.04	1.07	1.07	1.07	1.06	1.05
14	RA	03 23	33.6	33.0	32.4	31.8	31.6	32.1	33.1	34.5	35.9	37.1	38.0	38.4	38.4
	DEC	885	.83	.84	.84	.82	.79	.77	.75	.76	.78	.81	.84	.87	.89
15	RA	04 35	19.0	18.8	18.4	17.9	17.7	17.8	18.4	19.3	20.2	21.1	22.0	22.5	22.8
	DEC	293	.17	.16	.16	.16	.16	.16	.17	.18	.20	.20	.20	.20	.20
16	RA	05 14	02.2	02.1	01.7	01.2	0 .8	0 .8	01.2	02.0	02.8	03.7	04.5	05.1	05.4
	DEC	- 145	1.00	1.01	1.02	1.02	1.01	.99	.97	.94	.92	.92	.93	.96	.98
17	RA	05 15	54.9	54.7	54.2	53.5	53.0	53.0	53.6	54.7	55.9	57.2	58.4	59.3	59.8
	DEC	817	.62	.64	.65	.64	.63	.60	.59	.58	.58	.58	.59	.61	.63
18	RA	05 24	34.2	34.1	33.7	33.2	32.9	32.9	33.3	34.1	34.9	35.8	36.7	37.4	37.7
	DEC	112	.76	.74	.74	.74	.74	.75	.77	.78	.80	.80	.79	.78	.77
19	RA	05 25	37.7	37.6	37.3	36.7	36.3	36.3	36.8	37.7	38.7	39.7	40.7	41.5	41.9
	DEC	508	.47	.48	.48	.48	.47	.46	.46	.46	.46	.47	.47	.47	.48
20	RA	05 35	41.0	41.0	40.6	40.1	39.8	39.7	40.1	40.8	41.6	42.5	43.3	44.0	44.4
	DEC	- 21	.45	.47	.48	.48	.47	.45	.43	.41	.39	.39	.40	.42	.45
21	RA	05 40	13.9	13.9	13.5	13.0	12.7	12.6	12.9	13.6	14.5	15.3	16.2	16.9	17.3
	DEC	- 34	.60	.62	.63	.63	.62	.60	.58	.56	.54	.54	.55	.57	.60
22	RA	05 54	36.4	36.4	36.1	35.6	35.2	35.1	35.4	36.1	37.0	37.8	38.7	39.5	40.0
	DEC	131	.69	.68	.67	.67	.67	.68	.70	.71	.72	.72	.72	.70	.68
23	RA	06 23	44.9	44.6	43.9	42.8	41.8	41.2	41.1	41.7	42.6	43.8	45.1	46.0	46.4
	DEC	- 936	.67	.72	.75	.76	.75	.71	.67	.62	.58	.57	.59	.64	.69
24	RA	06 37	06.5	06.7	06.4	06.0	05.5	05.3	05.6	06.2	07.0	07.9	08.9	09.7	10.4
	DEC	291	.75	.74	.74	.74	.75	.75	.75	.76	.76	.76	.75	.73	.72
25	RA	06 44	41.6	41.7	41.4	40.8	40.3	40.1	40.2	40.7	41.4	42.2	43.2	44.0	44.5
	DEC	- 296	.87	.90	.92	.93	.92	.90	.87	.84	.82	.82	.83	.86	.90

Table 10b.(2). Apparent Places of Stars, 1989 (Mils of Declination)—Continued

Star No.	Right ascension / Declination	(Hr Min) / MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
26	RA	06 58	13.4	13.5	13.2	12.5	12.0	11.6	11.6	12.0	12.7	13.6	14.6	15.5	16.0
	DEC	− 514	.75	.80	.82	.83	.82	.80	.77	.73	.70	.69	.71	.74	.79
27	RA	07 07	58.4	58.5	58.2	57.7	57.1	56.7	56.7	57.1	57.8	58.7	59.6	60.5	61.1
	DEC	− 468	.86	.90	.93	.94	.93	.91	.88	.84	.81	.80	.82	.85	.90
28	RA	07 33	56.2	56.5	56.4	55.9	55.4	55.0	55.1	55.6	56.4	57.3	58.4	59.5	60.3
	DEC	567	.36	.36	.38	.38	.39	.38	.37	.36	.34	.33	.32	.31	.31
29	RA	07 38	45.4	45.7	45.6	45.2	44.7	44.4	44.5	44.8	45.4	46.2	47.2	48.1	48.8
	DEC	93	.42	.40	.39	.39	.39	.40	.41	.42	.43	.43	.41	.39	.36
30	RA	07 44	40.7	41.1	41.0	40.6	40.1	39.7	39.8	40.2	40.9	41.8	42.8	43.9	44.8
	DEC	498	.74	.74	.75	.76	.76	.76	.75	.74	.73	.72	.70	.69	.68
31	RA	08 09	13.5	13.7	13.4	12.7	11.9	11.1	10.8	10.9	11.4	12.3	13.5	14.7	15.6
	DEC	− 840	.91	.96	1.01	1.03	1.04	1.02	.99	.95	.91	.88	.89	.92	.97
32	RA	08 22	19.5	19.8	19.3	18.3	17.1	16.0	15.4	15.3	15.8	16.9	18.4	19.9	20.9
	DEC	−1057	.25	.31	.36	.40	.41	.39	.36	.31	.27	.24	.24	.27	.32
33	RA	09 07	36.9	37.5	37.4	37.0	36.3	35.6	35.2	35.1	35.4	36.1	37.2	38.4	39.4
	DEC	− 771	.28	.34	.38	.42	.43	.43	.40	.36	.33	.30	.30	.32	.37
34	RA	09 13	07.2	08.0	07.6	06.4	04.7	03.0	01.6	01.0	01.2	02.4	04.4	06.5	08.2
	DEC	−1238	.54	.60	.65	.70	.72	.72	.70	.65	.61	.57	.56	.58	.62
35	RA	09 27	04.2	04.8	04.9	04.7	04.3	04.0	03.8	03.8	04.1	04.7	05.5	06.5	07.4
	DEC	− 153	.06	.10	.12	.13	.14	.13	.11	.10	.08	.08	.09	.12	.15
36	RA	10 07	48.6	49.4	49.7	49.6	49.3	48.9	48.7	48.7	48.8	49.3	50.1	51.1	52.1
	DEC	213	.69	.67	.67	.67	.68	.69	.69	.69	.69	.67	.65	.62	.60
37	RA	11 01	13.3	14.6	15.2	15.3	14.7	13.9	13.1	12.7	12.6	13.0	14.0	15.4	17.1
	DEC	1003	.32	.33	.35	.39	.42	.44	.43	.40	.36	.31	.27	.23	.21
38	RA	11 03	06.0	07.5	08.2	08.2	07.6	06.5	05.6	05.0	04.9	05.3	06.4	08.0	09.8
	DEC	1098	.77	.78	.80	.84	.87	.89	.88	.85	.81	.76	.71	.67	.66
39	RA	11 48	30.8	31.8	32.3	32.6	32.5	32.2	31.9	31.7	31.6	31.7	32.2	33.1	34.2
	DEC	259	1.11	1.08	1.08	1.08	1.09	1.11	1.12	1.12	1.11	1.09	1.07	1.03	1.00
40	RA	11 53	16.9	18.3	19.1	19.4	19.1	18.4	17.7	17.1	16.8	16.9	17.5	18.7	20.2
	DEC	955	.57	.56	.58	.61	.65	.67	.68	.66	.62	.58	.53	.48	.45
41	RA	12 15	14.7	15.7	16.4	16.7	16.7	16.5	16.2	15.9	15.7	15.8	16.2	17.1	18.2
	DEC	− 310	.77	.80	.83	.85	.87	.87	.86	.85	.84	.82	.82	.84	.87
42	RA	12 25	58.5	60.3	61.3	61.9	61.7	61.1	60.2	59.2	58.4	58.3	59.0	60.5	62.4
	DEC	−1120	.61	.65	.69	.75	.80	.82	.83	.82	.79	.75	.72	.70	.72
43	RA	12 30	32.8	34.3	35.3	35.8	35.8	35.3	34.6	33.8	33.2	33.1	33.7	35.0	36.6
	DEC	−1014	.19	.23	.27	.33	.37	.40	.40	.40	.37	.33	.30	.28	.30
44	RA	12 47	03.9	05.6	06.7	07.3	07.4	06.9	06.2	05.3	04.6	04.3	04.9	06.2	08.0
	DEC	−1060	0.00	.03	.08	.13	.18	.21	.22	.21	.19	.15	.11	.10	.11
45	RA	12 53	33.8	35.3	36.4	37.0	36.9	36.3	35.5	34.7	34.1	33.8	34.1	35.1	36.5
	DEC	995	.79	.78	.79	.83	.87	.90	.91	.90	.87	.83	.77	.72	.68
46	RA	13 23	29.6	31.1	32.2	32.9	33.0	32.5	31.8	31.0	30.3	29.9	30.0	30.8	32.1
	DEC	977	.36	.34	.35	.38	.42	.46	.48	.47	.45	.41	.35	.30	.26
47	RA	13 24	36.8	37.8	38.6	39.2	39.4	39.3	39.1	38.8	38.5	38.4	38.6	39.3	40.3
	DEC	− 197	.42	.45	.48	.50	.50	.50	.50	.49	.48	.47	.48	.49	.52
48	RA	13 47	06.7	08.1	09.1	09.9	10.1	09.8	09.2	08.5	07.8	07.4	07.4	08.0	09.2
	DEC	877	.55	.52	.53	.56	.60	.63	.65	.65	.63	.60	.55	.50	.45
49	RA	14 03	01.2	03.1	04.5	05.7	06.2	06.2	05.7	04.8	03.9	03.3	03.5	04.4	06.1
	DEC	−1072	.32	.33	.37	.41	.45	.49	.51	.52	.50	.47	.43	.41	.40

Table 10b.(4). Apparent Places of Stars, 1991 (Mils of Declination)

Star No.	Right Ascension / Declination	(Hr Min) / MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
1	RA	00 07	55.9	55.5	55.3	55.4	55.9	56.8	57.9	58.9	59.6	59.9	59.9	59.6	59.2
	DEC	516	.36	.34	.32	.29	.29	.30	.32	.36	.40	.42	.45	.46	.45
2	RA	00 08	41.9	40.9	40.4	40.5	41.3	42.7	44.3	45.7	46.7	47.2	47.0	46.4	45.5
	DEC	1050	.79	.77	.73	.69	.66	.65	.67	.71	.76	.80	.85	.88	.88
3	RA	00 25	19.1	16.6	15.1	14.6	15.5	17.8	20.8	24.0	26.3	27.2	26.4	24.3	21.5
	DEC	-1374	.38	.36	.31	.26	.20	.15	.13	.13	.16	.20	.24	.27	.28
4	RA	00 25	51.5	51.0	50.7	50.6	51.1	52.0	53.1	54.2	55.1	55.5	55.4	55.0	54.4
	DEC	- 752	1.02	1.01	.98	.94	.90	.85	.82	.81	.82	.84	.88	.90	.92
5	RA	00 39	60.3	59.4	58.8	58.7	59.3	60.6	62.0	63.5	64.6	65.2	65.3	64.8	64.1
	DEC	1004	.35	.34	.31	.27	.24	.23	.24	.27	.31	.36	.40	.43	.44
6	RA	00 43	09.3	09.0	08.7	08.7	09.1	09.8	10.8	11.7	12.5	12.9	13.0	12.7	12.4
	DEC	- 320	.64	.65	.64	.62	.59	.55	.52	.49	.49	.49	.51	.53	.54
7	RA	00 56	10.5	09.5	08.7	08.5	09.1	10.4	12.0	13.6	15.0	15.7	15.9	15.4	14.6
	DEC	1078	.67	.66	.63	.59	.55	.54	.54	.57	.61	.66	.71	.75	.76
8	RA	01 25	14.7	13.7	12.9	12.5	12.9	14.1	15.6	17.3	18.7	19.7	20.0	19.8	19.1
	DEC	1070	.14	.14	.11	.07	.04	.02	.02	.04	.08	.13	.18	.21	.23
9	RA	01 37	24.6	23.6	22.8	22.3	22.3	23.1	24.3	25.7	27.0	27.8	28.0	27.5	26.7
	DEC	-1018	.40	.40	.38	.33	.28	.23	.19	.17	.18	.21	.25	.29	.32
10	SEE TABLE 11. APPARENT PLACES OF POLARIS,1991														
11	RA	02 06	41.4	41.0	40.6	40.3	40.5	41.1	42.0	43.0	44.0	44.7	45.1	45.2	45.0
	DEC	416	.42	.42	.40	.39	.39	.39	.40	.43	.45	.48	.49	.50	.50
12	RA	02 57	57.1	56.5	55.8	55.2	55.1	55.4	56.1	57.2	58.2	59.1	59.6	59.7	59.3
	DEC	- 716	1.19	1.20	1.20	1.18	1.14	1.09	1.04	1.01	1.00	1.01	1.05	1.09	1.13
13	RA	03 01	50.3	49.9	49.5	49.2	49.1	49.5	50.3	51.2	52.1	52.8	53.4	53.6	53.5
	DEC	72	.12	.11	.10	.10	.11	.13	.15	.18	.20	.21	.20	.19	.18
14	RA	03 23	43.2	42.6	41.9	41.2	41.1	41.6	42.6	43.9	45.3	46.5	47.4	47.8	47.8
	DEC	885	.95	.96	.96	.93	.91	.88	.87	.88	.89	.92	.95	.98	1.00
15	RA	04 35	26.5	26.3	25.9	25.4	25.1	25.3	25.8	26.6	27.6	28.5	29.3	29.9	30.1
	DEC	293	.22	.22	.21	.21	.20	.21	.22	.23	.24	.25	.25	.25	.24
16	RA	05 14	08.5	08.4	08.0	07.4	07.0	07.0	07.4	08.1	08.9	09.8	10.6	11.2	11.5
	DEC	- 145	.97	.99	1.00	1.00	1.00	.97	.95	.92	.90	.90	.91	.94	.97
17	RA	05 16	04.6	04.4	03.9	03.1	02.6	02.6	03.2	04.2	05.4	06.7	07.9	08.8	09.2
	DEC	817	.64	.66	.66	.66	.64	.62	.60	.59	.59	.59	.60	.62	.64
18	RA	05 24	41.2	41.1	40.7	40.2	39.8	39.8	40.2	40.9	41.8	42.7	43.5	44.2	44.5
	DEC	112	.77	.76	.75	.75	.75	.76	.78	.79	.80	.80	.80	.79	.77
19	RA	05 25	46.0	45.9	45.5	44.9	44.5	44.6	45.0	45.8	46.8	47.8	48.8	49.5	49.9
	DEC	508	.48	.49	.49	.49	.48	.47	.47	.47	.47	.47	.48	.48	.48
20	RA	05 35	47.7	47.6	47.2	46.7	46.3	46.3	46.6	47.2	48.1	49.0	49.8	50.5	50.8
	DEC	- 21	.45	.46	.47	.48	.47	.45	.43	.41	.40	.39	.40	.43	.45
21	RA	05 40	20.5	20.5	20.1	19.5	19.2	19.1	19.4	20.0	20.9	21.8	22.6	23.3	23.6
	DEC	- 34	.60	.62	.63	.63	.62	.61	.59	.56	.55	.55	.56	.58	.61
22	RA	05 54	43.4	43.5	43.1	42.6	42.2	42.1	42.4	43.0	43.9	44.8	45.7	46.4	46.8
	DEC	131	.67	.66	.66	.65	.66	.67	.68	.69	.70	.70	.70	.68	.66
23	RA	06 23	47.8	47.6	46.8	45.7	44.7	44.1	44.1	44.5	45.5	46.7	47.9	48.8	49.2
	DEC	- 936	.71	.76	.79	.80	.79	.76	.71	.66	.63	.62	.64	.68	.74
24	RA	06 37	14.1	14.2	13.9	13.4	13.0	12.8	13.0	13.5	14.3	15.2	16.2	17.0	17.6
	DEC	291	.70	.69	.69	.69	.69	.69	.69	.70	.70	.70	.69	.68	.66
25	RA	06 44	47.4	47.4	47.1	46.6	46.0	45.8	45.9	46.3	47.0	47.9	48.8	49.6	50.1
	DEC	- 296	.94	.98	1.00	1.00	1.00	.98	.95	.92	.90	.89	.91	.94	.98

Table 10b.(4). Apparent Places of Stars, 1991 (Mils of Declination)—Continued

Star No.	Right ascension / Declination	(Hr Min) / MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
26	RA	06 58	18.6	18.7	18.3	17.7	17.1	16.7	16.7	17.1	17.8	18.7	19.7	20.5	21.1
	DEC	- 514	.82	.87	.89	.91	.90	.88	.84	.80	.78	.77	.78	.81	.86
27	RA	07 08	03.8	03.9	03.6	03.0	02.4	02.0	02.0	02.4	03.0	03.9	04.9	05.7	06.3
	DEC	- 468	.94	.98	1.01	1.02	1.02	1.00	.96	.93	.90	.89	.90	.94	.99
28	RA	07 34	04.4	04.8	04.6	04.1	03.5	03.2	03.3	03.7	04.4	05.3	06.5	07.5	08.3
	DEC	567	.25	.26	.27	.28	.28	.27	.26	.25	.24	.22	.21	.20	.20
29	RA	07 38	52.2	52.5	52.4	51.9	51.4	51.2	51.2	51.5	52.1	52.9	53.8	54.7	55.4
	DEC	93	.30	.28	.27	.27	.27	.28	.29	.30	.31	.30	.29	.27	.24
30	RA	07 44	48.7	49.1	48.9	48.4	47.9	47.6	47.6	47.9	48.6	49.5	50.6	51.6	52.4
	DEC	498	.62	.63	.63	.64	.65	.64	.64	.63	.61	.60	.58	.57	.56
31	RA	08 09	17.6	17.9	17.6	16.9	16.0	15.3	15.0	15.0	15.5	16.5	17.7	18.8	19.7
	DEC	- 841	.04	.10	.14	.17	.17	.16	.12	.08	.04	.02	.02	.05	.11
32	RA	08 22	22.4	22.7	22.3	21.3	20.1	19.0	18.3	18.2	18.8	19.8	21.3	22.8	23.9
	DEC	-1057	.40	.45	.50	.54	.55	.54	.50	.46	.41	.39	.39	.41	.47
33	RA	09 07	41.9	42.4	42.4	41.9	41.2	40.6	40.2	40.0	40.3	41.1	42.1	43.3	44.3
	DEC	- 771	.46	.51	.56	.59	.60	.60	.58	.54	.50	.47	.47	.49	.54
34	RA	09 13	09.2	09.9	09.6	08.4	06.7	05.0	03.6	03.0	03.2	04.4	06.4	08.5	10.2
	DEC	-1238	.71	.77	.82	.86	.89	.89	.87	.82	.78	.75	.73	.75	.80
35	RA	09 27	10.6	11.2	11.4	11.1	10.7	10.4	10.1	10.1	10.4	11.0	11.8	12.8	13.7
	DEC	- 153	.24	.27	.30	.31	.31	.31	.29	.27	.26	.26	.27	.29	.33
36	RA	10 07	55.5	56.3	56.5	56.4	56.1	55.7	55.5	55.4	55.6	56.0	56.8	57.7	58.8
	DEC	213	.50	.48	.47	.47	.48	.49	.49	.50	.49	.48	.46	.43	.40
37	RA	11 01	20.7	22.0	22.6	22.6	22.0	21.2	20.4	19.9	19.8	20.2	21.2	22.5	24.1
	DEC	1003	.11	.12	.14	.18	.21	.22	.22	.20	.16	.11	.06	.02	0.00
38	RA	11 03	13.5	15.0	15.7	15.6	14.9	13.9	13.0	12.3	12.1	12.5	13.6	15.1	16.9
	DEC	1098	.55	.56	.59	.63	.66	.68	.67	.64	.60	.55	.50	.46	.44
39	RA	11 48	37.4	38.3	38.9	39.1	39.0	38.7	38.4	38.1	38.0	38.1	38.6	39.5	40.5
	DEC	259	.89	.87	.86	.87	.88	.89	.90	.91	.90	.88	.86	.82	.79
40	RA	11 53	23.4	24.8	25.6	25.8	25.4	24.8	24.1	23.4	23.0	23.1	23.8	24.9	26.3
	DEC	955	.35	.35	.37	.40	.44	.46	.47	.45	.41	.37	.32	.27	.24
41	RA	12 15	21.5	22.5	23.1	23.4	23.4	23.2	22.9	22.6	22.4	22.5	22.9	23.7	24.8
	DEC	- 310	.98	1.01	1.04	1.07	1.08	1.08	1.08	1.06	1.05	1.04	1.04	1.05	1.08
42	RA	12 26	06.3	08.1	09.2	09.7	09.6	09.0	08.0	07.0	06.2	06.1	06.8	08.2	10.2
	DEC	-1120	.82	.85	.90	.95	1.00	1.03	1.04	1.03	1.00	.96	.92	.91	.92
43	RA	12 30	40.5	42.0	43.0	43.5	43.4	43.0	42.3	41.4	40.8	40.8	41.3	42.6	44.2
	DEC	-1014	.40	.44	.48	.53	.58	.61	.62	.60	.57	.53	.50	.49	.50
44	RA	12 47	12.0	13.7	14.8	15.4	15.5	15.0	14.3	13.4	12.6	12.5	13.0	14.2	16.0
	DEC	-1060	.21	.24	.29	.34	.38	.41	.42	.41	.39	.35	.32	.30	.31
45	RA	12 53	39.1	40.6	41.7	42.2	42.1	41.5	40.8	39.9	39.2	39.0	39.3	40.1	41.5
	DEC	995	.59	.58	.59	.62	.66	.70	.71	.70	.67	.63	.58	.53	.49
46	RA	13 23	34.5	36.0	37.1	37.7	37.8	37.3	36.6	35.7	35.0	34.6	34.7	35.4	36.7
	DEC	977	.16	.15	.16	.19	.23	.27	.28	.28	.26	.22	.17	.11	.07
47	RA	13 24	43.7	44.8	45.5	46.0	46.2	46.2	46.0	45.6	45.3	45.2	45.4	46.0	47.0
	DEC	- 197	.61	.64	.67	.68	.69	.69	.68	.67	.66	.66	.66	.68	.70
48	RA	13 47	11.6	12.9	14.0	14.6	14.8	14.6	14.0	13.2	12.5	12.1	12.1	12.7	13.8
	DEC	877	.36	.34	.34	.37	.41	.45	.47	.48	.46	.42	.37	.32	.28
49	RA	14 03	10.9	12.7	14.2	15.3	15.8	15.8	15.3	14.4	13.5	12.9	13.0	14.0	15.6
	DEC	-1072	.49	.51	.54	.58	.63	.66	.69	.69	.67	.64	.60	.58	.57

Table 10b.(4). Apparent Places of Stars, 1991 (Mils of Declination)—Continued

Star No.	Right ascension Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA	14 06	09.3	10.6	11.5	12.2	12.6	12.7	12.5	12.1	11.6	11.3	11.4	12.0	13.1
	DEC	- 645	.78	.81	.84	.87	.89	.92	.93	.92	.91	.89	.87	.86	.87
51	RA	14 15	15.4	16.4	17.3	17.9	18.2	18.2	18.0	17.6	17.1	16.8	16.9	17.3	18.1
	DEC	341	.78	.74	.73	.74	.76	.78	.80	.82	.81	.80	.77	.73	.69
52	RA	14 38	58.8	60.6	62.1	63.4	64.1	64.3	63.9	63.0	62.0	61.2	61.1	61.8	63.3
	DEC	-1080	.82	.83	.86	.90	.94	.98	1.01	1.01	1.00	.97	.94	.91	.89
53	RA	14 50	22.9	24.0	24.9	25.6	26.1	26.3	26.3	25.9	25.5	25.2	25.2	25.6	26.4
	DEC	- 284	.55	.57	.59	.61	.62	.62	.62	.61	.60	.59	.59	.60	.61
54	RA	14 50	41.3	43.8	46.2	48.1	48.8	48.2	46.7	44.4	42.0	40.0	39.0	39.2	40.7
	DEC	1318	.85	.83	.83	.86	.91	.95	.99	1.00	.98	.95	.89	.84	.79
55	RA	15 34	18.2	19.2	20.1	20.9	21.5	21.7	21.6	21.2	20.7	20.2	19.9	20.1	20.7
	DEC	475	.39	.35	.34	.35	.37	.41	.44	.46	.46	.45	.42	.38	.34
56	RA	15 59	47.9	48.9	49.9	50.8	51.5	51.9	52.1	51.8	51.4	50.9	50.7	50.9	51.6
	DEC	- 401	.73	.74	.76	.77	.78	.78	.79	.79	.78	.77	.77	.76	.77
57	RA	16 28	51.0	52.0	53.0	54.0	54.8	55.4	55.6	55.4	54.9	54.4	54.1	54.3	54.9
	DEC	- 469	.57	.58	.59	.60	.60	.61	.62	.62	.62	.61	.60	.60	.60
58	RA	16 47	40.8	42.9	45.1	47.4	49.3	50.6	51.0	50.4	49.0	47.6	46.5	46.4	47.5
	DEC	-1226	.87	.85	.84	.86	.88	.92	.96	.99	1.00	.99	.96	.92	.89
59	RA	17 09	51.3	52.1	53.0	54.0	54.8	55.4	55.7	55.6	55.3	54.8	54.4	54.4	54.9
	DEC	- 279	.38	.39	.40	.41	.40	.40	.39	.39	.38	.38	.38	.38	.39
60	RA	17 32	59.4	60.3	61.4	62.5	63.5	64.4	64.8	64.8	64.3	63.8	63.3	63.2	63.6
	DEC	- 659	.53	.52	.52	.53	.53	.54	.55	.56	.57	.57	.56	.54	.53
61	RA	17 34	30.5	31.2	32.0	32.9	33.7	34.3	34.6	34.6	34.2	33.6	33.2	33.1	33.4
	DEC	223	.36	.33	.31	.31	.33	.36	.39	.41	.43	.43	.42	.40	.36
62	RA	17 56	22.1	22.7	23.7	25.0	26.1	26.9	27.1	26.8	26.0	25.0	24.0	23.4	23.5
	DEC	915	.33	.28	.26	.25	.28	.32	.37	.42	.45	.45	.44	.40	.35
63	RA	18 23	34.1	34.9	35.8	36.9	37.9	38.9	39.5	39.6	39.3	38.7	38.2	37.9	38.2
	DEC	- 611	.39	.38	.37	.37	.36	.37	.37	.38	.39	.39	.39	.38	.37
64	RA	18 36	36.9	37.4	38.1	39.1	40.1	41.0	41.4	41.4	40.9	40.2	39.4	39.0	39.0
	DEC	689	.31	.26	.24	.23	.25	.29	.34	.38	.41	.43	.42	.39	.34
65	RA	18 54	42.1	42.7	43.5	44.5	45.5	46.4	47.0	47.3	47.0	46.6	46.0	45.8	45.9
	DEC	- 467	.73	.72	.72	.71	.70	.69	.69	.69	.70	.70	.70	.70	.69
66	RA	19 50	20.2	20.5	21.1	21.9	22.8	23.7	24.3	24.6	24.6	24.2	23.7	23.3	23.2
	DEC	157	.22	.20	.19	.18	.20	.22	.26	.29	.31	.32	.32	.31	.28
67	RA	20 24	55.9	56.2	57.0	58.3	59.8	61.4	62.7	63.4	63.3	62.7	61.8	60.9	60.6
	DEC	-1009	.19	.15	.12	.09	.06	.06	.07	.09	.12	.15	.16	.15	.12
68	RA	20 41	06.3	06.3	06.7	07.5	08.7	09.8	10.7	11.1	11.0	10.5	09.7	09.0	08.5
	DEC	804	.44	.40	.37	.34	.35	.37	.41	.47	.52	.55	.56	.55	.52
69	RA	21 40	28.8	28.2	28.9	30.9	33.8	37.4	40.5	42.7	43.2	42.1	39.7	37.0	34.9
	DEC	-1376	.60	.56	.51	.46	.42	.40	.41	.44	.48	.52	.54	.54	.51
★70	RA	21 43	44.5	44.5	44.7	45.2	46.0	47.0	47.9	48.5	48.8	48.6	48.3	47.8	47.6
	DEC	174	.84	.82	.80	.80	.81	.84	.87	.90	.93	.95	.95	.94	.93
★71	RA	22 07	40.3	40.2	40.4	41.1	42.1	43.4	44.6	45.5	46.0	45.8	45.3	44.6	44.1
	DEC	- 835	.69	.66	.63	.59	.56	.53	.52	.52	.55	.57	.60	.60	.60
72	RA	22 57	09.8	09.6	09.6	10.0	10.7	11.7	12.8	13.7	14.2	14.3	14.0	13.5	13.1
	DEC	- 527	.50	.49	.47	.44	.40	.37	.34	.33	.34	.36	.38	.39	.39
73	RA	23 04	19.0	18.8	18.8	19.1	19.8	20.7	21.7	22.5	23.0	23.1	22.9	22.5	22.2
	DEC	269	.50	.48	.46	.45	.46	.48	.51	.55	.58	.60	.61	.61	.60

Table 10b.(5). Apparent Places of Stars, 1992 (Mils of Declination)

Star No.	Right ascension / Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
1	RA	00 07	59.2	58.8	58.6	58.7	59.2	60.2	61.2	62.2	62.9	63.2	63.1	62.9	62.4
	DEC	516	.45	.44	.41	.40	.39	.40	.42	.45	.49	.52	.55	.56	.55
2	RA	00 08	45.5	44.6	44.1	44.1	44.9	46.3	47.9	49.4	50.4	50.8	50.6	50.0	49.1
	DEC	1050	.88	.87	.83	.79	.76	.76	.77	.80	.85	.90	.95	.98	.98
3	RA	00 25	21.5	18.9	17.4	17.0	17.9	20.1	23.1	26.3	28.6	29.4	28.6	26.5	23.6
	DEC	-1374	.28	.25	.21	.15	.10	.05	.02	.03	.05	.10	.14	.17	.18
4	RA	00 25	54.4	53.9	53.5	53.5	54.0	54.8	56.0	57.1	57.9	58.3	58.2	57.8	57.2
	DEC	- 752	.92	.91	.88	.84	.80	.76	.73	.71	.72	.75	.78	.81	.82
5	RA	00 40	04.1	03.3	02.7	02.6	03.1	04.4	05.9	07.3	08.4	09.0	09.0	08.6	07.8
	DEC	1004	.44	.43	.40	.37	.34	.32	.33	.37	.41	.45	.50	.53	.54
6	RA	00 43	12.4	12.0	11.8	11.8	12.1	12.8	13.8	14.8	15.5	15.9	15.9	15.7	15.3
	DEC	- 320	.54	.55	.54	.52	.49	.45	.42	.40	.39	.40	.41	.43	.45
7	RA	00 56	14.6	13.6	12.9	12.6	13.2	14.5	16.1	17.8	19.0	19.8	19.9	19.5	18.6
	DEC	1078	.76	.75	.72	.68	.65	.63	.64	.67	.71	.76	.80	.84	.85
8	RA	01 25	19.1	18.1	17.3	16.9	17.3	18.5	20.1	21.7	23.1	24.0	24.4	24.1	23.3
	DEC	1070	.23	.23	.20	.16	.13	.11	.11	.13	.17	.22	.26	.30	.32
9	RA	01 37	26.7	25.6	24.8	24.3	24.4	25.1	26.3	27.7	29.0	29.8	29.9	29.5	28.6
	DEC	-1018	.32	.31	.29	.24	.19	.14	.10	.08	.09	.12	.17	.21	.23
10	SEE TABLE 11. APPARENT PLACES OF POLARIS,1992														
11	RA	02 06	45.0	44.6	44.2	43.9	44.0	44.6	45.6	46.6	47.5	48.2	48.6	48.7	48.4
	DEC	416	.50	.50	.48	.47	.46	.46	.48	.50	.53	.55	.57	.58	.58
12	RA	02 57	59.3	58.7	58.1	57.5	57.3	57.6	58.4	59.4	60.5	61.3	61.8	61.8	61.5
	DEC	- 716	1.13	1.14	1.14	1.11	1.07	1.02	.98	.95	.94	.95	.99	1.03	1.07
13	RA	03 01	53.5	53.2	52.8	52.4	52.4	52.8	53.5	54.4	55.3	56.0	56.6	56.8	56.7
	DEC	72	.18	.17	.16	.16	.17	.19	.21	.24	.26	.26	.26	.25	.24
14	RA	03 23	47.8	47.2	46.5	45.8	45.7	46.2	47.2	48.5	49.9	51.0	51.9	52.3	52.2
	DEC	885	1.00	1.01	1.01	.99	.96	.94	.92	.93	.95	.97	1.00	1.03	1.05
15	RA	04 35	30.1	29.9	29.5	28.9	28.7	28.8	29.4	30.2	31.2	32.1	32.9	33.4	33.6
	DEC	293	.24	.24	.23	.23	.23	.23	.24	.25	.26	.27	.27	.27	.26
16	RA	05 14	11.5	11.4	10.9	10.4	10.0	10.0	10.4	11.0	11.9	12.7	13.6	14.1	14.4
	DEC	- 145	.97	.99	1.00	1.00	.99	.97	.94	.91	.90	.89	.91	.93	.96
17	RA	05 16	09.2	09.1	08.5	07.7	07.2	07.2	07.8	08.8	10.0	11.3	12.5	13.3	13.7
	DEC	817	.64	.66	.67	.66	.64	.62	.60	.59	.59	.60	.60	.62	.64
18	RA	05 24	44.5	44.4	44.1	43.5	43.1	43.1	43.5	44.2	45.1	46.0	46.8	47.4	47.7
	DEC	112	.77	.76	.75	.75	.75	.76	.78	.80	.80	.81	.80	.79	.77
19	RA	05 25	49.9	49.9	49.5	48.8	48.4	48.4	48.9	49.7	50.7	51.7	52.7	53.4	53.8
	DEC	508	.48	.49	.49	.49	.48	.47	.47	.47	.47	.47	.47	.48	.48
20	RA	05 35	50.8	50.8	50.4	49.8	49.4	49.4	49.7	50.4	51.2	52.1	52.9	53.5	53.9
	DEC	- 21	.45	.47	.48	.48	.47	.46	.44	.42	.40	.40	.41	.43	.45
21	RA	05 40	23.6	23.6	23.2	22.7	22.3	22.2	22.5	23.2	24.0	24.9	25.7	26.4	26.7
	DEC	- 34	.61	.62	.63	.64	.63	.61	.59	.57	.56	.55	.57	.59	.61
22	RA	05 54	46.8	46.8	46.5	45.9	45.5	45.4	45.7	46.4	47.2	48.1	49.0	49.7	50.1
	DEC	131	.66	.65	.64	.64	.65	.65	.67	.68	.69	.69	.68	.67	.65
23	RA	06 23	49.2	49.0	48.2	47.1	46.1	45.5	45.4	45.9	46.9	48.1	49.3	50.2	50.6
	DEC	- 936	.74	.79	.82	.82	.81	.78	.74	.69	.65	.65	.67	.71	.77
24	RA	06 37	17.6	17.8	17.5	17.0	16.5	16.3	16.5	17.1	17.9	18.8	19.7	20.6	21.1
	DEC	291	.66	.66	.66	.66	.66	.66	.66	.67	.67	.66	.66	.64	.63
25	RA	06 44	50.1	50.2	49.9	49.3	48.8	48.5	48.6	49.1	49.7	50.6	51.5	52.3	52.8
	DEC	- 296	.98	1.02	1.04	1.04	1.04	1.02	.99	.96	.94	.93	.95	.98	1.02

Table 10b.(5). Apparent Places of Stars, 1992 (Mils of Declination)—Continued

Star No.	Right Ascension Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
26	RA	06 58	21.1	21.1	20.8	20.1	19.5	19.1	19.2	19.6	20.2	21.1	22.1	22.9	23.5
	DEC	- 514	.86	.91	.93	.95	.94	.92	.88	.84	.81	.81	.82	.86	.90
27	RA	07 08	06.3	06.4	06.1	05.5	04.9	04.5	04.5	04.9	05.6	06.4	07.4	08.2	08.8
	DEC	- 468	.99	1.03	1.06	1.07	1.06	1.04	1.01	.97	.94	.94	.95	.98	1.03
28	RA	07 34	08.3	08.7	08.5	08.0	07.4	07.1	07.1	07.5	08.3	09.2	10.3	11.3	12.1
	DEC	567	.20	.20	.21	.22	.22	.22	.21	.20	.19	.17	.16	.15	.15
29	RA	07 38	55.4	55.8	55.6	55.1	54.6	54.4	54.4	54.7	55.3	56.1	57.0	57.9	58.6
	DEC	93	.24	.22	.21	.21	.21	.22	.23	.24	.25	.24	.23	.20	.18
30	RA	07 44	52.4	52.8	52.7	52.2	51.6	51.3	51.3	51.7	52.3	53.2	54.3	55.3	56.1
	DEC	498	.56	.57	.58	.58	.59	.58	.58	.57	.55	.54	.52	.51	.51
31	RA	08 09	19.7	19.9	19.6	18.9	18.0	17.3	17.0	17.0	17.6	18.5	19.7	20.8	21.6
	DEC	- 841	.11	.16	.20	.23	.24	.22	.19	.15	.11	.09	.09	.12	.17
32	RA	08 22	23.9	24.2	23.7	22.7	21.5	20.4	19.8	19.7	20.2	21.3	22.8	24.3	25.3
	DEC	-1057	.47	.53	.58	.60	.62	.60	.58	.53	.48	.46	.46	.49	.54
33	RA	09 07	44.3	44.9	44.8	44.3	43.6	43.0	42.6	42.5	42.7	43.5	44.5	45.7	46.7
	DEC	- 771	.54	.60	.64	.67	.69	.68	.66	.62	.58	.56	.55	.58	.62
34	RA	09 13	10.2	11.0	10.7	09.4	07.7	06.0	04.7	04.0	04.3	05.5	07.5	09.6	11.7
	DEC	-1238	.80	.85	.91	.95	.97	.97	.95	.91	.86	.83	.81	.83	.87
35	RA	09 27	13.7	14.3	14.4	14.2	13.8	13.4	13.2	13.2	13.4	14.0	14.8	15.8	16.7
	DEC	- 153	.33	.36	.39	.40	.40	.40	.38	.36	.35	.34	.36	.38	.42
36	RA	10 07	58.8	59.5	59.8	59.7	59.3	58.9	58.7	58.6	58.8	59.2	60.0	61.0	61.9
	DEC	213	.40	.38	.37	.38	.38	.39	.40	.40	.40	.38	.36	.33	.30
37	RA	11 01	24.1	25.4	26.1	26.0	25.4	24.5	23.8	23.3	23.2	23.5	24.5	25.9	27.4
	DEC	1002	1.00	1.01	1.04	1.08	1.11	1.12	1.12	1.09	1.05	1.00	.96	.92	.90
38	RA	11 03	16.9	18.4	19.2	19.1	18.3	17.3	16.3	15.7	15.5	15.9	16.9	18.5	20.3
	DEC	1098	.44	.45	.49	.53	.56	.57	.57	.54	.49	.44	.40	.36	.35
39	RA	11 48	40.5	41.5	42.0	42.2	42.1	41.8	41.5	41.2	41.0	41.2	41.7	42.5	43.5
	DEC	259	.79	.76	.76	.76	.78	.79	.80	.80	.80	.78	.75	.72	.69
40	RA	11 53	26.3	27.7	28.6	28.8	28.4	27.7	27.0	26.3	26.0	26.0	26.7	27.8	29.3
	DEC	955	.24	.24	.26	.30	.34	.36	.36	.35	.31	.26	.21	.17	.15
41	RA	12 15	24.8	25.8	26.4	26.7	26.7	26.4	26.1	25.8	25.6	25.7	26.1	26.9	28.0
	DEC	- 311	.08	.12	.15	.17	.18	.18	.18	.16	.15	.14	.13	.15	.18
42	RA	12 26	10.2	11.9	13.1	13.6	13.4	12.8	11.8	10.8	10.0	09.9	10.7	12.1	14.0
	DEC	-1120	.92	.96	1.00	1.06	1.10	1.13	1.14	1.13	1.10	1.06	1.02	1.01	1.02
43	RA	12 30	44.2	45.8	46.8	47.2	47.2	46.7	46.0	45.2	44.5	44.5	45.1	46.3	47.9
	DEC	-1014	.50	.54	.59	.64	.68	.71	.72	.70	.67	.63	.60	.59	.60
44	RA	12 47	16.0	17.7	18.8	19.4	19.4	19.0	18.2	17.3	16.6	16.4	16.9	18.2	19.9
	DEC	-1060	.31	.34	.39	.43	.48	.51	.52	.51	.48	.44	.41	.40	.40
45	RA	12 53	41.5	43.1	44.1	44.7	44.5	43.9	43.1	42.3	41.6	41.3	41.6	42.5	43.9
	DEC	995	.49	.48	.49	.53	.57	.60	.61	.61	.58	.54	.48	.43	.40
46	RA	13 23	36.7	38.2	39.3	40.0	40.0	39.5	38.8	37.9	37.1	36.7	36.8	37.6	38.9
	DEC	976	1.07	1.06	1.07	1.10	1.14	1.18	1.20	1.20	1.17	1.13	1.08	1.02	.98
47	RA	13 24	47.0	48.1	48.8	49.3	49.5	49.5	49.2	48.9	48.5	48.4	48.7	49.3	50.3
	DEC	- 197	.70	.74	.76	.78	.78	.78	.77	.76	.75	.75	.75	.77	.79
48	RA	13 47	13.8	15.1	16.2	16.9	17.0	16.7	16.2	15.4	14.7	14.3	14.3	14.9	16.0
	DEC	877	.28	.25	.26	.29	.33	.37	.39	.39	.38	.34	.29	.24	.20
49	RA	14 03	15.6	17.5	18.9	20.0	20.5	20.5	20.0	19.1	18.1	17.6	17.7	18.6	20.2
	DEC	-1072	.57	.59	.62	.66	.71	.74	.77	.77	.75	.72	.68	.66	.65

Table 10b.(5). Apparent Places of Stars, 1992 (Mils of Declination)—Continued

Ster No.	Right ascension / Declination	(Hr Min) / MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA	14 06	13.1	14.3	15.3	16.1	16.4	16.5	16.3	15.8	15.3	15.0	15.1	15.7	16.8
	DEC	- 645	.87	.89	.92	.95	.98	1.00	1.00	1.00	.99	.97	.95	.94	.95
51	RA	14 15	18.1	19.2	20.0	20.7	20.9	20.9	20.7	20.3	19.9	19.5	19.6	20.0	20.9
	DEC	341	.69	.66	.64	.65	.67	.70	.72	.73	.73	.71	.68	.64	.60
52	RA	14 39	03.3	05.1	06.7	08.0	08.7	08.8	08.4	07.5	06.4	05.7	05.6	06.3	07.7
	DEC	-1080	.89	.90	.93	.97	1.01	1.04	1.07	1.08	1.07	1.04	1.00	.97	.96
53	RA	14 50	26.4	27.5	28.4	29.1	29.6	29.8	29.7	29.4	28.9	28.6	28.6	29.0	29.8
	DEC	- 284	.61	.64	.66	.68	.68	.68	.68	.67	.67	.66	.65	.66	.68
54	RA	14 50	40.7	43.2	45.6	47.5	48.2	47.5	45.9	43.7	41.3	39.3	38.3	38.5	40.1
	DEC	1318	.79	.76	.77	.80	.84	.89	.92	.93	.92	.88	.83	.78	.73
55	RA	15 34	20.7	21.7	22.7	23.5	24.0	24.2	24.2	23.8	23.2	22.7	22.4	22.6	23.3
	DEC	475	.34	.30	.29	.30	.32	.36	.39	.41	.42	.40	.37	.33	.29
56	RA	15 59	51.6	52.6	53.6	54.5	55.2	55.6	55.7	55.5	55.0	54.5	54.3	54.5	55.2
	DEC	- 401	.77	.78	.80	.81	.82	.82	.82	.82	.82	.81	.80	.80	.81
57	RA	16 28	54.9	55.9	56.9	57.9	58.6	59.2	59.4	59.2	58.7	58.2	57.9	58.0	58.6
	DEC	- 469	.60	.60	.61	.62	.63	.64	.64	.64	.64	.63	.62	.62	.62
58	RA	16 47	47.5	49.6	51.9	54.2	56.1	57.3	57.7	57.0	55.6	54.1	53.1	53.1	54.2
	DEC	-1226	.89	.86	.86	.88	.90	.94	.98	1.01	1.02	1.01	.98	.94	.90
59	RA	17 09	54.9	55.7	56.6	57.6	58.3	59.0	59.3	59.2	58.8	58.3	57.9	57.9	58.3
	DEC	- 279	.39	.40	.41	.42	.41	.41	.40	.40	.39	.39	.39	.39	.40
60	RA	17 33	03.6	04.6	05.6	06.8	07.8	08.6	09.0	09.0	08.5	07.9	07.4	07.3	07.7
	DEC	- 659	.53	.52	.52	.52	.53	.54	.55	.56	.57	.57	.55	.54	.53
61	RA	17 34	33.4	34.1	34.9	35.8	36.6	37.2	37.5	37.4	37.0	36.4	36.0	35.9	36.2
	DEC	223	.36	.33	.31	.31	.33	.36	.39	.41	.43	.43	.42	.40	.37
62	RA	17 56	23.5	24.2	25.2	26.5	27.5	28.3	28.5	28.2	27.4	26.3	25.4	24.8	24.9
	DEC	915	.35	.30	.27	.27	.29	.34	.39	.43	.46	.47	.45	.41	.36
63	RA	18 23	38.2	39.0	39.9	41.0	42.0	42.9	43.5	43.7	43.3	42.7	42.2	41.9	42.2
	DEC	- 611	.37	.35	.35	.34	.34	.34	.35	.36	.37	.37	.36	.35	.34
64	RA	18 36	39.0	39.5	40.3	41.3	42.3	43.1	43.5	43.5	43.0	42.2	41.5	41.0	41.0
	DEC	689	.34	.30	.27	.26	.28	.32	.37	.41	.45	.46	.45	.42	.37
65	RA	18 54	45.9	46.5	47.3	48.3	49.3	50.2	50.8	51.1	50.8	50.3	49.8	49.5	49.6
	DEC	- 467	.69	.68	.68	.67	.66	.65	.65	.65	.66	.66	.66	.66	.65
66	RA	19 50	23.2	23.6	24.1	24.9	25.8	26.7	27.4	27.7	27.5	27.1	26.6	26.3	26.2
	DEC	157	.28	.26	.25	.24	.26	.29	.32	.35	.37	.38	.38	.37	.35
67	RA	20 25	0 .6	0 .9	01.8	03.0	04.5	06.1	07.3	08.0	07.9	07.3	06.3	05.5	05.1
	DEC	-1008	1.12	1.08	1.04	1.01	.99	.99	1.00	1.02	1.05	1.07	1.08	1.07	1.05
68	RA	20 41	08.5	08.5	09.0	09.8	10.9	12.1	12.9	13.4	13.2	12.7	11.9	11.2	10.7
	DEC	804	.52	.48	.44	.42	.42	.45	.49	.55	.59	.63	.64	.63	.60
69	RA	21 40	34.9	34.2	34.9	37.0	39.9	43.3	46.5	48.6	49.1	47.9	45.5	42.8	40.6
	DEC	-1376	.51	.46	.41	.37	.33	.32	.32	.35	.40	.43	.45	.45	.42
★70	RA	21 43	47.6	47.6	47.8	48.3	49.1	50.1	51.0	51.6	51.8	51.6	51.3	50.8	50.5
	DEC	174	.93	.91	.90	.89	.90	.93	.96	1.00	1.02	1.04	1.04	1.04	1.02
★71	RA	22 07	44.1	43.9	44.1	44.8	45.8	47.0	48.3	49.2	49.6	49.4	48.9	48.2	47.6
	DEC	- 835	.60	.57	.53	.49	.46	.43	.42	.43	.45	.48	.50	.51	.50
72	RA	22 57	13.1	12.9	13.0	13.3	14.0	15.0	16.1	17.0	17.4	17.5	17.2	16.8	16.3
	DEC	- 527	.39	.38	.36	.33	.30	.26	.24	.23	.24	.25	.28	.29	.29
73	RA	23 04	22.2	22.0	22.0	22.3	22.9	23.8	24.8	25.6	26.1	26.2	25.9	25.6	25.2
	DEC	269	.60	.58	.57	.56	.56	.58	.61	.65	.68	.70	.71	.71	.70

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Table 11a. Apparent Places of Polaris (Star No 10), 1988

	DECLINATION				RIGHT ASCENSION		
	DEG	MIN	SEC	MILS	HR	MIN	SEC
JAN 00	89	13	01	1586.07	02	19	28
10	89	13	03	1586.08	02	19	14
20	89	13	04	1586.09	02	19	00
30	89	13	04	1586.09	02	18	45
FEB 00	89	13	04	1586.09	02	18	45
10	89	13	04	1586.09	02	18	27
20	89	13	04	1586.09	02	18	12
30	89	13	2	1586.08	02	18	00
MAR 00	89	13	02	1586.08	02	18	00
10	89	13	00	1586.07	02	17	48
20	89	12	58	1586.06	02	17	37
30	89	12	55	1586.04	02	17	31
APR 00	89	12	55	1586.04	02	17	30
10	89	12	52	1586.03	02	17	27
20	89	12	49	1586.01	02	17	25
30	89	12	46	1586.00	02	17	26
MAY 00	89	12	46	1586.00	02	17	26
10	89	12	43	1585.99	02	17	32
20	89	12	40	1585.97	02	17	40
30	89	12	38	1585.96	02	17	49
JUN 00	89	12	38	1585.96	02	17	50
10	89	12	36	1585.95	02	18	02
20	89	12	34	1585.94	02	18	16
30	89	12	33	1585.94	02	18	32
JUL 00	89	12	33	1585.94	02	18	32
10	89	12	33	1585.94	02	18	48
20	89	12	33	1585.94	02	19	04
30	89	12	34	1585.94	02	19	21
AUG 00	89	12	34	1585.94	02	19	23
10	89	12	35	1585.95	02	19	40
20	89	12	37	1585.96	02	19	55
30	89	12	39	1585.97	02	20	10
SEP 00	89	12	39	1585.97	02	20	12
10	89	12	42	1585.98	02	20	26
20	89	12	45	1586.00	02	20	39
30	89	12	48	1586.01	02	20	50
OCT 00	89	12	48	1586.01	02	20	50
10	89	12	51	1586.02	02	20	58
20	89	12	55	1586.04	02	21	05
30	89	12	59	1586.06	02	21	10
NOV 00	89	12	59	1586.06	02	21	10
10	89	13	03	1586.08	02	21	10
20	89	13	07	1586.10	02	21	08
30	89	13	10	1586.12	02	21	05
DEC 00	89	13	10	1586.12	02	21	05
10	89	13	13	1586.13	02	20	58
20	89	13	16	1586.15	02	20	48
30	89	13	19	1586.16	02	20	36

Table 11b. Apparent Places of Polaris (Star No 10), 1989

	DECLINATION				RIGHT ASCENSION		
	DEG	MIN	SEC	MILS	HR	MIN	SEC
JAN 00	89	13	19	1586.16	02	20	35
10	89	13	21	1586.17	02	20	22
20	89	13	22	1586.18	02	20	08
30	89	13	22	1586.18	02	19	51
FEB 00	89	13	22	1586.18	02	19	51
10	89	13	22	1586.18	02	19	34
20	89	13	21	1586.17	02	19	20
30	89	13	20	1586.17	02	19	09
MAR 00	89	13	20	1586.17	02	19	09
10	89	13	18	1586.16	02	18	56
20	89	13	16	1586.15	02	18	47
30	89	13	13	1586.13	02	18	40
APR 00	89	13	13	1586.13	02	18	39
10	89	13	10	1586.12	02	18	35
20	89	13	07	1586.10	02	18	33
30	89	13	04	1586.09	02	18	35
MAY 00	89	13	04	1586.09	02	18	35
10	89	13	01	1586.07	02	18	41
20	89	12	58	1586.06	02	18	47
30	89	12	56	1586.05	02	18	57
JUN 00	89	12	55	1586.04	02	18	58
10	89	12	54	1586.04	02	19	11
20	89	12	52	1586.03	02	19	25
30	89	12	51	1586.02	02	19	40
JUL 00	89	12	51	1586.02	02	19	40
10	89	12	51	1586.02	02	19	56
20	89	12	51	1586.02	02	20	14
30	89	12	51	1586.02	02	20	31
AUG 00	89	12	51	1586.02	02	20	33
10	89	12	52	1586.03	02	20	49
20	89	12	54	1586.04	02	21	05
30	89	12	56	1586.05	02	21	21
SEP 00	89	12	56	1586.05	02	21	23
10	89	12	59	1586.06	02	21	37
20	89	13	02	1586.08	02	21	50
30	89	13	05	1586.09	02	22	00
OCT 00	89	13	05	1586.09	02	22	00
10	89	13	09	1586.11	02	22	10
20	89	13	12	1586.13	02	22	17
30	89	13	16	1586.15	02	22	20
NOV 00	89	13	16	1586.15	02	22	21
10	89	13	20	1586.17	02	22	22
20	89	13	24	1586.19	02	22	21
30	89	13	27	1586.20	02	22	17
DEC 00	89	13	27	1586.20	02	22	17
10	89	13	30	1586.22	02	22	10
20	89	13	33	1586.23	02	22	01
30	89	13	36	1586.25	02	21	50

Table 11c. Apparent Places of Polaris (Star No 10), 1990

	DECLINATION				RIGHT ASCENSION		
	DEG	MIN	SEC	MILS	HR	MIN	SEC
JAN 00	89	13	36	1586.25	02	21	49
10	89	13	38	1586.26	02	21	35
20	89	13	39	1586.26	02	21	20
30	89	13	39	1586.26	02	21	04
FEB 00	89	13	39	1586.26	02	21	04
10	89	13	39	1586.26	02	20	48
20	89	13	38	1586.26	02	20	33
30	89	13	37	1586.25	02	20	21
MAR 00	89	13	37	1586.25	02	20	21
10	89	13	35	1586.24	02	20	09
20	89	13	33	1586.23	02	20	00
30	89	13	30	1586.22	02	19	52
APR 00	89	13	30	1586.22	02	19	51
10	89	13	27	1586.20	02	19	46
20	89	13	24	1586.19	02	19	46
30	89	13	21	1586.17	02	19	48
MAY 00	89	13	21	1586.17	02	19	48
10	89	13	18	1586.16	02	19	52
20	89	13	15	1586.14	02	19	59
30	89	13	13	1586.13	02	20	10
JUN 00	89	13	12	1586.13	02	20	11
10	89	13	10	1586.12	02	20	23
20	89	13	09	1586.11	02	20	37
30	89	13	08	1586.11	02	20	52
JUL 00	89	13	08	1586.11	02	20	52
10	89	13	07	1586.10	02	21	09
20	89	13	07	1586.10	02	21	26
30	89	13	08	1586.11	02	21	43
AUG 00	89	13	08	1586.11	02	21	45
10	89	13	09	1586.11	02	22	01
20	89	13	11	1586.12	02	22	19
30	89	13	12	1586.13	02	22	34
SEP 00	89	13	13	1586.13	02	22	36
10	89	13	15	1586.14	02	22	50
20	89	13	18	1586.16	02	23	03
30	89	13	21	1586.17	02	23	14
OCT 00	89	13	21	1586.17	02	23	14
10	89	13	25	1586.19	02	23	24
20	89	13	28	1586.21	02	23	30
30	89	13	32	1586.23	02	23	34
NOV 00	89	13	32	1586.23	02	23	35
10	89	13	36	1586.25	02	23	37
20	89	13	40	1586.27	02	23	36
30	89	13	43	1586.28	02	23	31
DEC 00	89	13	43	1586.28	02	23	31
10	89	13	47	1586.30	02	23	25
20	89	13	49	1586.31	02	23	17
30	89	13	52	1586.33	02	23	05

Table 11d. Apparent Places of Polaris (Star No 10), 1991

	DECLINATION				RIGHT ASCENSION		
	DEG	MIN	SEC	MILS	HR	MIN	SEC
JAN 00	89	13	52	1586.33	02	23	04
10	89	13	54	1586.34	02	22	50
20	89	13	55	1586.34	02	22	35
30	89	13	55	1586.34	02	22	20
FEB 00	89	13	55	1586.34	02	22	20
10	89	13	55	1586.34	02	22	03
20	89	13	54	1586.34	02	21	47
30	89	13	53	1586.33	02	21	37
MAR 00	89	13	53	1586.33	02	21	37
10	89	13	51	1586.32	02	21	25
20	89	13	49	1586.31	02	21	14
30	89	13	46	1586.30	02	21	06
APR 00	89	13	46	1586.30	02	21	05
10	89	13	43	1586.28	02	21	01
20	89	13	40	1586.27	02	21	00
30	89	13	36	1586.25	02	21	01
MAY 00	89	13	36	1586.25	02	21	01
10	89	13	34	1586.24	02	21	05
20	89	13	31	1586.22	02	21	14
30	89	13	28	1586.21	02	21	24
JUN 00	89	13	28	1586.21	02	21	25
10	89	13	26	1586.20	02	21	36
20	89	13	25	1586.19	02	21	50
30	89	13	23	1586.18	02	22	06
JUL 00	89	13	23	1586.18	02	22	06
10	89	13	23	1586.18	02	22	23
20	89	13	23	1586.18	02	22	40
30	89	13	23	1586.18	02	22	57
AUG 00	89	13	23	1586.18	02	22	58
10	89	13	24	1586.19	02	23	16
20	89	13	26	1586.20	02	23	33
30	89	13	28	1586.21	02	23	48
SEP 00	89	13	28	1586.21	02	23	50
10	89	13	31	1586.22	02	24	04
20	89	13	34	1586.24	02	24	18
30	89	13	36	1586.25	02	24	30
OCT 00	89	13	36	1586.25	02	24	30
10	89	13	40	1586.27	02	24	39
20	89	13	44	1586.29	02	24	45
30	89	13	47	1586.30	02	24	51
NOV 00	89	13	48	1586.31	02	24	51
10	89	13	51	1586.32	02	24	53
20	89	13	55	1586.34	02	24	51
30	89	13	58	1586.36	02	24	48
DEC 00	89	13	58	1586.36	02	24	48
10	89	14	02	1586.38	02	24	42
20	89	14	04	1586.39	02	24	33
30	89	14	07	1586.40	02	24	21

Table 11e. Apparent Places of Polaris (Star No 10), 1992

	DECLINATION				RIGHT ASCENSION		
	DEG	MIN	SEC	MILS	HR	MIN	SEC
JAN 00	89	14	07	1586.40	02	24	20
10	89	14	09	1586.41	02	24	06
20	89	14	10	1586.41	02	23	52
30	89	14	10	1586.41	02	23	37
FEB 00	89	14	10	1586.41	02	23	37
10	89	14	10	1586.41	02	23	18
20	89	14	10	1586.41	02	23	03
30	89	14	8	1586.40	02	22	53
MAR 00	89	14	08	1586.40	02	22	53
10	89	14	06	1586.40	02	22	38
20	89	14	04	1586.39	02	22	28
30	89	14	01	1586.37	02	22	21
APR 00	89	14	01	1586.37	02	22	20
10	89	13	58	1586.36	02	22	16
20	89	13	54	1586.34	02	22	15
30	89	13	51	1586.32	02	22	16
MAY 00	89	13	51	1586.32	02	22	16
10	89	13	48	1586.31	02	22	21
20	89	13	46	1586.30	02	22	29
30	89	13	43	1586.28	02	22	38
JUN 00	89	13	43	1586.28	02	22	39
10	89	13	41	1586.27	02	22	52
20	89	13	39	1586.26	02	23	06
30	89	13	38	1586.26	02	23	22
JUL 00	89	13	38	1586.26	02	23	22
10	89	13	38	1586.26	02	23	38
20	89	13	38	1586.26	02	23	55
30	89	13	38	1586.26	02	24	13
AUG 00	89	13	38	1586.26	02	24	15
10	89	13	39	1586.26	02	24	32
20	89	13	41	1586.27	02	24	48
30	89	13	43	1586.28	02	25	04
SEP 00	89	13	43	1586.28	02	25	06
10	89	13	45	1586.29	02	25	21
20	89	13	48	1586.31	02	25	34
30	89	13	51	1586.32	02	25	45
OCT 00	89	13	51	1586.32	02	25	45
10	89	13	55	1586.34	02	25	54
20	89	13	58	1586.36	02	26	02
30	89	14	02	1586.38	02	26	07
NOV 00	89	14	02	1586.38	02	26	07
10	89	14	06	1586.40	02	26	08
20	89	14	10	1586.41	02	26	07
30	89	14	13	1586.43	02	26	03
DEC 00	89	14	13	1586.43	02	26	03
10	89	14	16	1586.44	02	25	57
20	89	14	19	1586.46	02	25	47
30	89	14	21	1586.47	02	25	35

Table 12a. To Determine Azimuth From Polaris, 1988

L.S.T.	0^h	1^h	2^h	3^h	4^h	5^h	6^h	7^h	8^h	9^h	10^h	11^h
	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0
M	°	°	°	°	°	°	°	°	°	°	°	°
0	+27.3	+16.2	+ 4.0	- 8.5	-20.3	-30.8	-39.0	-44.6	-47.0	-46.2	-42.3	-35.6
3	26.7	15.6	3.4	9.1	20.9	31.2	39.4	44.8	47.0	46.1	42.1	35.2
6	26.2	15.0	2.8	9.7	21.5	31.7	39.7	44.9	47.1	46.0	41.8	34.8
9	25.7	14.4	2.2	10.3	22.0	32.2	40.0	45.1	47.1	45.8	41.5	34.4
12	25.2	13.8	1.5	10.9	22.6	32.6	40.4	45.3	47.1	45.7	41.2	34.0
15	+24.7	+13.2	+ 0.9	-11.5	-23.1	-33.1	-40.7	-45.5	-47.1	-45.5	-40.9	-33.5
18	24.1	12.6	+ 0.3	12.1	23.6	33.5	41.0	45.6	47.1	45.4	40.6	33.1
21	23.6	12.0	- 0.4	12.7	24.2	33.9	41.3	45.8	47.1	45.2	40.3	32.7
24	23.0	11.4	1.0	13.3	24.7	34.4	41.6	45.9	47.1	45.0	40.0	32.2
27	22.5	10.8	1.6	13.9	25.3	34.8	41.9	46.0	47.0	44.8	39.6	31.8
30	+21.9	+10.2	- 2.2	-14.5	-25.8	-35.2	-42.2	-46.2	-47.0	-44.7	-39.3	-31.3
33	21.4	9.6	2.9	15.1	26.3	35.6	42.4	46.3	47.0	44.5	39.0	30.9
36	20.8	9.0	3.5	15.7	26.8	36.0	42.7	46.4	46.9	44.2	38.6	30.4
39	20.3	8.4	4.1	16.3	27.3	36.4	43.0	46.5	46.9	44.0	38.3	29.9
42	19.7	7.8	4.7	16.9	27.8	36.8	43.2	46.6	46.8	43.8	37.9	29.5
45	+19.1	+ 7.1	- 5.4	-17.5	-28.3	-37.2	-43.5	-46.7	-46.7	-43.6	-37.5	-29.0
48	18.5	6.5	6.0	18.0	28.8	37.6	43.7	46.8	46.6	43.3	37.2	28.5
51	18.0	5.9	6.6	18.6	29.3	37.9	43.9	46.8	46.5	43.1	36.8	28.0
54	17.4	5.3	7.2	19.2	29.8	38.3	44.1	46.9	46.4	42.9	36.4	27.5
57	16.8	4.7	7.8	19.8	30.3	38.7	44.3	47.0	46.3	42.6	36.0	27.0
60	+16.2	+ 4.0	- 8.5	-20.3	-30.8	-39.0	-44.6	-47.0	-46.2	-42.3	-35.6	-26.5
LAT	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1
	°	°	°	°	°	°	°	°	°	°	°	°
0	-.3	-.2	.0	+.2	+.3	+.4	+.3	+.2	.0	-.2	-.3	-.4
10	-.3	-.1	.0	+.2	+.3	+.3	+.3	+.1	.0	-.2	-.3	-.3
20	-.2	-.1	.0	+.2	+.2	+.3	+.2	+.1	.0	-.2	-.2	-.3
30	-.2	-.1	.0	+.1	+.2	+.2	+.2	+.1	.0	-.1	-.2	-.2
40	-.1	.0	.0	+.1	+.1	+.1	+.1	.0	.0	-.1	-.1	-.1
45	-.1	.0	.0	.0	+.1	+.1	+.1	.0	.0	.0	-.1	-.1
50	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
55	+.1	.0	.0	.0	-.1	-.1	-.1	.0	.0	.0	+.1	+.1
60	+.1	+.1	.0	-.1	-.2	-.2	-.1	-.1	.0	+.1	+.2	+.2
62	+.2	+.1	.0	-.1	-.2	-.2	-.2	-.1	.0	+.1	+.2	+.2
64	+.2	+.1	.0	-.2	-.3	-.3	-.2	-.1	.0	+.2	+.3	+.3
66	+.3	+.1	.0	-.2	-.3	-.3	-.3	-.1	.0	+.2	+.3	+.3
MONTH	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2
	°	°	°	°	°	°	°	°	°	°	°	°
Jan.	-.1	-.1	.0	.0	.0	+.1	+.1	+.1	+.1	+.2	+.1	+.1
Feb.	-.2	-.2	-.2	-.1	-.1	.0	.0	+.1	+.2	+.2	+.2	+.2
Mar.	-.3	-.3	-.3	-.3	-.2	-.2	-.1	.0	+.1	+.2	+.2	+.3
Apr.	-.3	-.4	-.4	-.4	-.4	-.3	-.2	-.1	.0	+.1	+.1	+.2
May	-.2	-.3	-.3	-.4	-.4	-.4	-.3	-.3	-.2	-.1	.0	+.1
June	-.1	-.2	-.2	-.3	-.4	-.4	-.4	-.4	-.3	-.2	-.1	.0
July	+.1	.0	-.1	-.2	-.2	-.3	-.3	-.3	-.3	-.3	-.2	-.2
Aug.	+.2	+.2	+.1	.0	-.1	-.1	-.2	-.3	-.3	-.3	-.3	-.3
Sept.	+.3	+.3	+.2	+.2	+.1	.0	.0	-.1	-.2	-.2	-.3	-.3
Oct.	+.3	+.3	+.4	+.3	+.3	+.2	+.2	+.1	.0	-.1	-.2	-.3
Nov.	+.2	+.3	+.4	+.4	+.4	+.4	+.3	+.3	+.2	+.1	.0	-.2
Dec.	+.1	+.2	+.3	+.4	+.5	+.5	+.5	+.4	+.3	+.2	+.1	.0

$$\text{AZIMUTH OF POLARIS} = \frac{(B0 + B1 + B2)}{\text{COS LATITUDE}}$$

Table 12a. To Determine Azimuth From Polaris, 1988—Continued

L.S.T.	12^h	13^h	14^h	15^h	16^h	17^h	18^h	19^h	20^h	21^h	22^h	23^h
	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0
M	°	°	°	°	°	°	°	°	°	°	°	°
0	-26.5	-15.7	- 3.9	+ 8.2	+19.7	+30.0	+38.3	+44.1	+46.9	+46.5	+42.9	+36.4
3	26.0	15.2	3.3	8.8	20.3	30.5	38.7	44.3	46.9	46.4	42.7	36.0
6	25.5	14.6	2.7	9.4	20.8	30.9	39.0	44.5	47.0	46.3	42.4	35.6
9	25.0	14.0	2.1	10.0	21.4	31.4	39.3	44.7	47.0	46.2	42.1	35.2
12	24.5	13.4	1.5	10.6	21.9	31.8	39.7	44.9	47.1	46.0	41.8	34.7
15	-24.0	-12.8	- 0.9	+11.2	+22.5	+32.3	+40.0	+45.1	+47.1	+45.9	+41.6	+34.3
18	23.4	12.3	- 0.3	11.7	23.0	32.7	40.3	45.2	47.1	45.8	41.3	33.9
21	22.9	11.7	+ 0.3	12.3	23.5	33.2	40.6	45.4	47.1	45.6	41.0	33.4
24	22.4	11.1	0.9	12.9	24.0	33.6	40.9	45.6	47.1	45.4	40.6	33.0
27	21.8	10.5	1.6	13.5	24.6	34.0	41.2	45.7	47.1	45.3	40.3	32.6
30	-21.3	- 9.9	+ 2.2	+14.1	+25.1	+34.4	+41.5	+45.9	+47.1	+45.1	+40.0	+32.1
33	20.8	9.3	2.8	14.7	25.6	34.9	41.8	46.0	47.1	44.9	39.7	31.6
36	20.2	8.7	3.4	15.2	26.1	35.3	42.1	46.1	47.0	44.7	39.3	31.2
39	19.7	8.1	4.0	15.8	26.6	35.7	42.4	46.2	47.0	44.5	39.0	30.7
42	19.1	7.5	4.6	16.4	27.1	36.1	42.6	46.4	46.9	44.3	38.6	30.2
45	-18.6	- 6.9	+ 5.2	+16.9	+27.6	+36.4	+42.9	+46.5	+46.9	+44.1	+38.3	+29.7
48	18.0	6.3	5.8	17.5	28.1	36.8	43.1	46.6	46.8	43.9	37.9	29.3
51	17.4	5.7	6.4	18.1	28.6	37.2	43.4	46.6	46.8	43.7	37.5	28.8
54	16.9	5.1	7.0	18.6	29.1	37.6	43.6	46.7	46.7	43.4	37.1	28.3
57	16.3	4.5	7.6	19.2	29.5	37.9	43.8	46.8	46.6	43.2	36.8	27.8
60	-15.7	- 3.9	+ 8.2	+19.7	+30.0	+38.3	+44.1	+46.9	+46.5	+42.9	+36.4	+27.3
LAT	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1
	°	°	°	°	°	°	°	°	°	°	°	°
0	-.3	-.2	.0	+.2	+.3	+.4	+.3	+.2	.0	-.2	-.3	-.4
10	-.3	-.1	.0	+.2	+.3	+.3	+.3	+.1	.0	-.2	-.3	-.3
20	-.2	-.1	.0	+.2	+.2	+.3	+.2	+.1	.0	-.2	-.2	-.3
30	-.2	-.1	.0	+.1	+.2	+.2	+.2	+.1	.0	-.1	-.2	-.2
40	-.1	.0	.0	+.1	+.1	+.1	+.1	.0	.0	-.1	-.1	-.1
45	-.1	.0	.0	.0	+.1	+.1	+.1	.0	.0	.0	-.1	-.1
50	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
55	+.1	.0	.0	.0	-.1	-.1	-.1	.0	.0	.0	+.1	+.1
60	+.1	+.1	.0	-.1	-.2	-.2	-.1	-.1	.0	+.1	+.2	+.2
62	+.2	+.1	.0	-.1	-.2	-.2	-.2	-.1	.0	+.1	+.2	+.2
64	+.2	+.1	.0	-.2	-.3	-.3	-.2	-.1	.0	+.2	+.3	+.3
66	+.3	+.1	.0	-.2	-.3	-.3	-.3	-.1	.0	+.2	+.3	+.3
MONTH	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2
	°	°	°	°	°	°	°	°	°	°	°	°
Jan.	+.1	+.1	.0	.0	.0	-.1	-.1	-.1	-.1	-.2	-.1	-.1
Feb.	+.2	+.2	+.2	+.1	+.1	.0	.0	-.1	-.2	-.2	-.2	-.2
Mar.	+.3	+.3	+.3	+.3	+.2	+.2	+.1	.0	-.1	-.2	-.2	-.3
Apr.	+.3	+.4	+.4	+.4	+.4	+.3	+.2	+.1	.0	-.1	-.1	-.2
May	+.2	+.3	+.3	+.4	+.4	+.4	+.3	+.3	+.2	+.1	.0	-.1
June	+.1	+.2	+.2	+.3	+.4	+.4	+.4	+.4	+.3	+.2	+.1	.0
July	-.1	.0	+.1	+.2	+.2	+.3	+.3	+.3	+.3	+.3	+.2	+.2
Aug.	-.2	-.2	-.1	.0	+.1	+.1	+.2	+.3	+.3	+.3	+.3	+.3
Sept.	-.3	-.3	-.2	-.2	-.1	.0	.0	+.1	+.2	+.2	+.3	+.3
Oct.	-.3	-.3	-.4	-.3	-.3	-.2	-.2	-.1	.0	+.1	+.2	+.3
Nov.	-.2	-.3	-.4	-.4	-.4	-.4	-.3	-.3	-.2	-.1	.0	+.2
Dec.	-.1	-.2	-.3	-.4	-.5	-.5	-.5	-.4	-.3	-.2	-.1	.0

$$\text{AZIMUTH OF POLARIS} = \frac{(B0 + B1 + B2)}{\text{COS LATITUDE}}$$

Table 12b. To Determine Azimuth From Polaris, 1989

L.S.T.	0^h	1^h	2^h	3^h	4^h	5^h	6^h	7^h	8^h	9^h	10^h	11^h
	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0
M	'	'	'	'	'	'	'	'	'	'	'	'
0	+27.3	+16.3	+ 4.2	- 8.2	-20.0	-30.4	-38.6	-44.2	-46.7	-46.0	-42.2	-35.5
3	26.8	15.8	3.6	8.8	20.5	30.9	39.0	44.4	46.7	45.9	41.9	35.1
6	26.3	15.2	3.0	9.4	21.1	31.3	39.3	44.6	46.8	45.7	41.6	34.7
9	25.7	14.6	2.4	10.0	21.7	31.8	39.7	44.8	46.8	45.6	41.3	34.3
12	25.2	14.0	1.8	10.6	22.2	32.2	40.0	44.9	46.8	45.5	41.1	33.9
15	+24.7	+13.4	+ 1.1	-11.2	-22.7	-32.7	-40.3	-45.1	-46.8	-45.3	-40.8	-33.5
18	24.2	12.8	+ 0.5	11.8	23.3	33.1	40.6	45.3	46.8	45.2	40.5	33.1
21	23.6	12.2	- 0.1	12.4	23.8	33.5	40.9	45.4	46.8	45.0	40.1	32.6
24	23.1	11.6	0.7	13.0	24.4	34.0	41.2	45.6	46.8	44.8	39.8	32.2
27	22.6	11.0	1.4	13.6	24.9	34.4	41.5	45.7	46.8	44.6	39.5	31.8
30	+22.0	+10.4	- 2.0	-14.2	-25.4	-34.8	-41.8	-45.8	-46.7	-44.4	-39.2	-31.3
33	21.5	9.8	2.6	14.8	25.9	35.2	42.1	46.0	46.7	44.3	38.8	30.9
36	20.9	9.2	3.2	15.4	26.4	35.6	42.3	46.1	46.6	44.0	38.5	30.4
39	20.3	8.6	3.8	16.0	27.0	36.0	42.6	46.2	46.6	43.8	38.2	29.9
42	19.8	7.9	4.5	16.5	27.5	36.4	42.8	46.3	46.5	43.6	37.8	29.5
45	+19.2	+ 7.3	- 5.1	-17.1	-28.0	-36.8	-43.1	-46.4	-46.5	-43.4	-37.4	-29.0
48	18.6	6.7	5.7	17.7	28.5	37.2	43.3	46.4	46.4	43.2	37.1	28.5
51	18.1	6.1	6.3	18.3	28.9	37.6	43.5	46.5	46.3	42.9	36.7	28.0
54	17.5	5.5	6.9	18.8	29.4	37.9	43.8	46.6	46.2	42.7	36.3	27.6
57	16.9	4.9	7.5	19.4	29.9	38.3	44.0	46.6	46.1	42.4	35.9	27.1
60	+16.3	+ 4.2	- 8.2	-20.0	-30.4	-38.6	-44.2	-46.7	-46.0	-42.2	-35.5	-26.6

LAT	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1
	'	'	'	'	'	'	'	'	'	'	'	'
0	-.3	-.2	.0	+.2	+.3	+.4	+.3	+.2	.0	-.2	-.3	-.4
10	-.3	-.1	.0	+.2	+.3	+.3	+.3	+.1	.0	-.2	-.3	-.3
20	-.2	-.1	.0	+.2	+.2	+.3	+.2	+.1	.0	-.2	-.2	-.3
30	-.2	-.1	.0	+.1	+.2	+.2	+.2	+.1	.0	-.1	-.2	-.2
40	-.1	.0	.0	+.1	+.1	+.1	+.1	.0	.0	-.1	-.1	-.1
45	-.1	.0	.0	.0	+.1	+.1	+.1	.0	.0	.0	-.1	-.1
50	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
55	+.1	.0	.0	.0	-.1	-.1	-.1	.0	.0	.0	+.1	+.1
60	+.1	+.1	.0	-.1	-.2	-.2	-.1	-.1	.0	+.1	+.2	+.2
62	+.2	+.1	.0	-.1	-.2	-.2	-.2	-.1	.0	+.1	+.2	+.2
64	+.2	+.1	.0	-.2	-.2	-.3	-.2	-.1	.0	+.2	+.2	+.3
66	+.3	+.1	.0	-.2	-.3	-.3	-.3	-.1	.0	+.2	+.3	+.3

MONTH	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2
	'	'	'	'	'	'	'	'	'	'	'	'
Jan.	-.1	-.1	-.1	.0	.0	+.1	+.1	+.1	+.1	+.2	+.2	+.1
Feb.	-.2	-.2	-.2	-.1	-.1	.0	.0	+.1	+.2	+.2	+.2	+.3
Mar.	-.3	-.3	-.3	-.3	-.2	-.2	-.1	.0	+.1	+.2	+.2	+.3
Apr.	-.3	-.4	-.4	-.4	-.4	-.3	-.2	-.1	-.1	.0	+.1	+.2
May	-.2	-.3	-.4	-.4	-.4	-.4	-.3	-.3	-.2	-.1	.0	+.1
June	-.1	-.2	-.2	-.3	-.4	-.4	-.4	-.4	-.3	-.2	-.1	.0
July	+.1	.0	-.1	-.2	-.2	-.3	-.3	-.4	-.3	-.3	-.3	-.2
Aug.	+.2	+.2	+.1	.0	-.1	-.1	-.2	-.3	-.3	-.3	-.3	-.3
Sept.	+.3	+.3	+.2	+.2	+.1	.0	.0	-.1	-.2	-.3	-.3	-.3
Oct.	+.3	+.3	+.4	+.3	+.3	+.2	+.1	+.1	.0	-.1	-.2	-.3
Nov.	+.3	+.3	+.4	+.4	+.4	+.4	+.3	+.2	+.2	.0	-.1	-.2
Dec.	+.1	+.2	+.3	+.4	+.4	+.5	+.4	+.4	+.3	+.2	+.1	.0

$$\text{AZIMUTH OF POLARIS} = \frac{(B0 + B1 + B2)}{\text{COS LATITUDE}}$$

Table 12b. To Determine Azimuth From Polaris, 1989—Continued

L.S.T.	12^h	13^h	14^h	15^h	16^h	17^h	18^h	19^h	20^h	21^h	22^h	23^h
	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0
M	'	'	'	'	'	'	'	'	'	'	'	'
0	-26.6	-15.9	- 4.1	+ 7.9	+19.4	+29.6	+37.9	+43.7	+46.5	+46.2	+42.7	+36.3
3	26.1	15.3	3.5	8.5	19.9	30.1	38.3	43.9	46.6	46.1	42.5	35.9
6	25.6	14.7	2.9	9.1	20.5	30.6	38.6	44.1	46.7	46.0	42.2	35.5
9	25.1	14.1	2.3	9.7	21.0	31.0	39.0	44.3	46.7	45.9	42.0	35.1
12	24.5	13.6	1.7	10.3	21.6	31.5	39.3	44.5	46.7	45.8	41.7	34.7
15	-24.0	-13.0	- 1.1	+10.9	+22.1	+31.9	+39.6	+44.7	+46.8	+45.7	+41.4	+34.3
18	23.5	12.4	- 0.5	11.4	22.6	32.4	39.9	44.9	46.8	45.5	41.1	33.8
21	23.0	11.8	+ 0.1	12.0	23.2	32.8	40.3	45.0	46.8	45.4	40.8	33.4
24	22.5	11.2	0.7	12.6	23.7	33.2	40.6	45.2	46.8	45.2	40.5	33.0
27	21.9	10.6	1.3	13.2	24.2	33.6	40.9	45.4	46.8	45.1	40.2	32.5
30	-21.4	-10.1	+ 1.9	+13.8	+24.7	+34.1	+41.2	+45.5	+46.8	+44.9	+39.9	+32.1
33	20.8	9.5	2.5	14.3	25.2	34.5	41.4	45.6	46.8	44.7	39.5	31.6
36	20.3	8.9	3.1	14.9	25.7	34.9	41.7	45.8	46.7	44.5	39.2	31.2
39	19.8	8.3	3.7	15.5	26.2	35.3	42.0	45.9	46.7	44.3	38.9	30.7
42	19.2	7.7	4.3	16.1	26.7	35.7	42.3	46.0	46.7	44.1	38.5	30.2
45	-18.7	- 7.1	+ 4.9	+16.6	+27.2	+36.1	+42.5	+46.1	+46.6	+43.9	+38.2	+29.7
48	18.1	6.5	5.5	17.2	27.7	36.5	42.8	46.2	46.6	43.7	37.8	29.3
51	17.5	5.9	6.1	17.7	28.2	36.8	43.0	46.3	46.5	43.5	37.4	28.8
54	17.0	5.3	6.7	18.3	28.7	37.2	43.2	46.4	46.4	43.2	37.1	28.3
57	16.4	4.7	7.3	18.9	29.2	37.6	43.5	46.5	46.3	43.0	36.7	27.8
60	-15.9	- 4.1	+ 7.9	+19.4	+29.6	+37.9	+43.7	+46.5	+46.2	+42.7	+36.3	+27.3
LAT	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1
	'	'	'	'	'	'	'	'	'	'	'	'
0	-.3	-.2	.0	+.2	+.3	+.4	+.3	+.2	.0	-.2	-.3	-.4
10	-.3	-.1	.0	+.2	+.3	+.3	+.3	+.1	.0	-.2	-.3	-.3
20	-.2	-.1	.0	+.2	+.2	+.3	+.2	+.1	.0	-.2	-.2	-.3
30	-.2	-.1	.0	+.1	+.2	+.2	+.2	+.1	.0	-.1	-.2	-.2
40	-.1	.0	.0	+.1	+.1	+.1	+.1	.0	.0	-.1	-.1	-.1
45	-.1	.0	.0	.0	+.1	+.1	+.1	.0	.0	.0	-.1	-.1
50	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
55	+.1	.0	.0	.0	-.1	-.1	-.1	.0	.0	.0	+.1	+.1
60	+.1	+.1	.0	-.1	-.2	-.2	-.1	-.1	.0	+.1	+.2	+.2
62	+.2	+.1	.0	-.1	-.2	-.2	-.2	-.1	.0	+.1	+.2	+.2
64	+.2	+.1	.0	-.2	-.2	-.3	-.2	-.1	.0	+.2	+.2	+.3
66	+.3	+.1	.0	-.2	-.3	-.3	-.3	-.1	.0	+.2	+.3	+.3
MONTH	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2
	'	'	'	'	'	'	'	'	'	'	'	'
Jan.	+.1	+.1	+.1	.0	.0	-.1	-.1	-.1	-.1	-.2	-.2	-.1
Feb.	+.2	+.2	+.2	+.1	+.1	.0	.0	-.1	-.2	-.2	-.2	-.3
Mar.	+.3	+.3	+.3	+.3	+.2	+.2	+.1	.0	-.1	-.2	-.2	-.3
Apr.	+.3	+.4	+.4	+.4	+.4	+.3	+.2	+.1	+.1	.0	-.1	-.2
May	+.2	+.3	+.4	+.4	+.4	+.4	+.3	+.3	+.2	+.1	.0	-.1
June	+.1	+.2	+.2	+.3	+.4	+.4	+.4	+.4	+.3	+.2	+.1	.0
July	-.1	.0	+.1	+.2	+.2	+.3	+.3	+.4	+.3	+.3	+.3	+.2
Aug.	-.2	-.2	-.1	.0	+.1	+.1	+.2	+.3	+.3	+.3	+.3	+.3
Sept.	-.3	-.3	-.2	-.2	-.1	.0	.0	+.1	+.2	+.3	+.3	+.3
Oct.	-.3	-.3	-.4	-.3	-.3	-.2	-.1	-.1	.0	+.1	+.2	+.3
Nov.	-.3	-.3	-.4	-.4	-.4	-.4	-.3	-.2	-.2	.0	+.1	+.2
Dec.	-.1	-.2	-.3	-.4	-.4	-.5	-.4	-.4	-.3	-.2	-.1	.0

$$\text{AZIMUTH OF POLARIS} = \frac{(B0 + B1 + B2)}{\text{COS LATITUDE}}$$

Table 12c. To Determine Azimuth From Polaris, 1990

L.S.T.	0^h	1^h	2^h	3^h	4^h	5^h	6^h	7^h	8^h	9^h	10^h	11^h
	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0
M	'	'	'	'	'	'	'	'	'	'	'	'
0	+27.3	+16.5	+ 4.5	- 7.9	-19.6	-30.0	-38.2	-43.8	-46.4	-45.7	-42.0	-35.5
3	26.8	15.9	3.8	8.5	20.2	30.5	38.6	44.0	46.4	45.6	41.7	35.1
6	26.3	15.3	3.2	9.1	20.7	30.9	38.9	44.2	46.4	45.5	41.5	34.7
9	25.8	14.7	2.6	9.7	21.3	31.4	39.3	44.4	46.5	45.4	41.2	34.3
12	25.3	14.1	2.0	10.3	21.8	31.8	39.6	44.6	46.5	45.2	40.9	33.9
15	+24.8	+13.5	+ 1.4	-10.9	-22.4	-32.3	-39.9	-44.8	-46.5	-45.1	-40.6	-33.5
18	24.2	13.0	0.8	11.5	22.9	32.7	40.2	44.9	46.5	44.9	40.3	33.0
21	23.7	12.4	+ 0.1	12.1	23.5	33.2	40.5	45.1	46.5	44.8	40.0	32.6
24	23.2	11.8	- 0.5	12.7	24.0	33.6	40.8	45.2	46.5	44.6	39.7	32.2
27	22.6	11.2	1.1	13.3	24.5	34.0	41.1	45.4	46.5	44.4	39.4	31.7
30	+22.1	+10.6	- 1.7	-13.9	-25.0	-34.4	-41.4	-45.5	-46.4	-44.2	-39.1	-31.3
33	21.5	10.0	2.3	14.5	25.5	34.8	41.7	45.6	46.4	44.0	38.7	30.8
36	21.0	9.4	2.9	15.0	26.1	35.2	41.9	45.7	46.4	43.9	38.4	30.4
39	20.4	8.7	3.6	15.6	26.6	35.6	42.2	45.8	46.3	43.6	38.1	29.9
42	19.9	8.1	4.2	16.2	27.1	36.0	42.5	45.9	46.3	43.4	37.7	29.5
45	+19.3	+ 7.5	- 4.8	-16.8	-27.6	-36.4	-42.7	-46.0	-46.2	-43.2	-37.3	-29.0
48	18.8	6.9	5.4	17.4	28.1	36.8	42.9	46.1	46.1	43.0	37.0	28.5
51	18.2	6.3	6.0	17.9	28.6	37.2	43.2	46.2	46.0	42.8	36.6	28.1
54	17.6	5.7	6.6	18.5	29.0	37.5	43.4	46.3	45.9	42.5	36.2	27.6
57	17.0	5.1	7.2	19.1	29.5	37.9	43.6	46.3	45.8	42.3	35.9	27.1
60	+16.5	+ 4.5	- 7.9	-19.6	-30.0	-38.2	-43.8	-46.4	-45.7	-42.0	-35.5	-26.6
LAT	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1
	'	'	'	'	'	'	'	'	'	'	'	'
0	-.3	-.2	.0	+.2	+.3	+.4	+.3	+.2	.0	-.2	-.3	-.4
10	-.3	-.1	.0	+.2	+.3	+.3	+.3	+.1	.0	-.2	-.3	-.3
20	-.2	-.1	.0	+.1	+.2	+.3	+.2	+.1	.0	-.1	-.2	-.3
30	-.2	-.1	.0	+.1	+.2	+.2	+.2	+.1	.0	-.1	-.2	-.2
40	-.1	.0	.0	+.1	+.1	+.1	+.1	.0	.0	-.1	-.1	-.1
45	.0	.0	.0	.0	+.1	+.1	.0	.0	.0	.0	-.1	-.1
50	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
55	+.1	.0	.0	.0	-.1	-.1	-.1	.0	.0	.0	+.1	+.1
60	+.1	+.1	.0	-.1	-.2	-.2	-.1	-.1	.0	+.1	+.2	+.2
62	+.2	+.1	.0	-.1	-.2	-.2	-.2	-.1	.0	+.1	+.2	+.2
64	+.2	+.1	.0	-.2	-.2	-.3	-.2	-.1	.0	+.2	+.2	+.3
66	+.3	+.1	.0	-.2	-.3	-.3	-.3	-.1	.0	+.2	+.3	+.3
MONTH	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2
	'	'	'	'	'	'	'	'	'	'	'	'
Jan.	-.1	-.1	-.1	.0	.0	+.1	+.1	+.1	+.1	+.1	+.1	+.1
Feb.	-.2	-.2	-.2	-.2	-.1	.0	.0	+.1	+.1	+.2	+.2	+.2
Mar.	-.3	-.3	-.3	-.3	-.2	-.2	-.1	.0	+.1	+.1	+.2	+.3
Apr.	-.3	-.3	-.4	-.4	-.4	-.3	-.3	-.2	-.1	.0	+.1	+.2
May	-.2	-.3	-.4	-.4	-.4	-.4	-.4	-.3	-.2	-.1	.0	+.1
June	.0	-.2	-.2	-.3	-.4	-.4	-.4	-.4	-.3	-.3	-.2	-.1
July	+.1	.0	-.1	-.2	-.3	-.3	-.4	-.4	-.4	-.3	-.3	-.2
Aug.	+.2	+.2	+.1	.0	-.1	-.2	-.2	-.3	-.3	-.3	-.3	-.3
Sept.	+.3	+.3	+.2	+.2	+.1	.0	-.1	-.1	-.2	-.3	-.3	-.3
Oct.	+.3	+.4	+.3	+.3	+.3	+.2	+.1	.0	-.1	-.1	-.2	-.3
Nov.	+.3	+.3	+.4	+.4	+.4	+.4	+.3	+.2	+.1	.0	-.1	-.2
Dec.	+.1	+.2	+.3	+.4	+.4	+.4	+.4	+.4	+.3	+.2	+.1	.0

$$\text{AZIMUTH OF POLARIS} = \frac{(B0 + B1 + B2)}{\text{COS LATITUDE}}$$

Table 12c. To Determine Azimuth From Polaris, 1990—Continued

L.S.T.	12^h	13^h	14^h	15^h	16^h	17^h	18^h	19^h	20^h	21^h	22^h	23^h
	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0
M	'	'	'	'	'	'	'	'	'	'	'	'
0	-26.6	-16.0	- 4.3	+ 7.6	+19.1	+29.3	+37.5	+43.3	+46.2	+46.0	+42.6	+36.2
3	26.1	15.4	3.7	8.2	19.6	29.7	37.9	43.5	46.3	45.9	42.3	35.8
6	25.6	14.9	3.1	8.8	20.1	30.2	38.2	43.8	46.3	45.8	42.1	35.4
9	25.1	14.3	2.5	9.4	20.7	30.6	38.6	44.0	46.4	45.7	41.8	35.0
12	24.6	13.7	1.9	10.0	21.2	31.1	38.9	44.2	46.4	45.5	41.5	34.6
15	-24.1	-13.1	- 1.3	+10.6	+21.8	+31.5	+39.2	+44.3	+46.5	+45.4	+41.2	+34.2
18	23.6	12.6	0.7	11.1	22.3	32.0	39.6	44.5	46.5	45.3	41.0	33.8
21	23.0	12.0	- 0.1	11.7	22.8	32.4	39.9	44.7	46.5	45.1	40.7	33.4
24	22.5	11.4	+ 0.5	12.3	23.3	32.8	40.2	44.9	46.5	45.0	40.4	32.9
27	22.0	10.8	1.1	12.9	23.8	33.3	40.5	45.0	46.5	44.8	40.1	32.5
30	-21.5	-10.2	+ 1.7	+13.4	+24.4	+33.7	+40.8	+45.2	+46.5	+44.7	+39.7	+32.0
33	20.9	9.7	2.3	14.0	24.9	34.1	41.1	45.3	46.5	44.5	39.4	31.6
36	20.4	9.1	2.9	14.6	25.4	34.5	41.3	45.4	46.5	44.3	39.1	31.1
39	19.9	8.5	3.5	15.2	25.9	34.9	41.6	45.6	46.4	44.1	38.8	30.7
42	19.3	7.9	4.0	15.7	26.4	35.3	41.9	45.7	46.4	43.9	38.4	30.2
45	-18.8	- 7.3	+ 4.6	+16.3	+26.9	+35.7	+42.1	+45.8	+46.3	+43.7	+38.1	+29.7
48	18.2	6.7	5.2	16.8	27.4	36.1	42.4	45.9	46.3	43.5	37.7	29.3
51	17.7	6.1	5.8	17.4	27.8	36.4	42.6	46.0	46.2	43.3	37.3	28.8
54	17.1	5.5	6.4	18.0	28.3	36.8	42.9	46.1	46.1	43.0	37.0	28.3
57	16.5	4.9	7.0	18.5	28.8	37.2	43.1	46.2	46.1	42.8	36.6	27.8
60	-16.0	- 4.3	+ 7.6	+19.1	+29.3	+37.5	+43.3	+46.2	+46.0	+42.6	+36.2	+27.3

LAT	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1
	'	'	'	'	'	'	'	'	'	'	'	'
0	-.3	-.2	.0	+.2	+.3	+.4	+.3	+.2	.0	-.2	-.3	-.4
10	-.3	-.1	.0	+.2	+.3	+.3	+.3	+.1	.0	-.2	-.3	-.3
20	-.2	-.1	.0	+.1	+.2	+.3	+.2	+.1	.0	-.1	-.2	-.3
30	-.2	-.1	.0	+.1	+.2	+.2	+.2	+.1	.0	-.1	-.2	-.2
40	-.1	.0	.0	+.1	+.1	+.1	+.1	.0	.0	-.1	-.1	-.1
45	.0	.0	.0	.0	+.1	+.1	.0	.0	.0	.0	-.1	-.1
50	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
55	+.1	.0	.0	.0	-.1	-.1	-.1	.0	.0	.0	+.1	+.1
60	+.1	+.1	.0	-.1	-.2	-.2	-.1	-.1	.0	+.1	+.2	+.2
62	+.2	+.1	.0	-.1	-.2	-.2	-.2	-.1	.0	+.1	+.2	+.2
64	+.2	+.1	.0	-.2	-.2	-.3	-.2	-.1	.0	+.2	+.2	+.3
66	+.3	+.1	.0	-.2	-.3	-.3	-.3	-.1	.0	+.2	+.3	+.3

MONTH	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2
	'	'	'	'	'	'	'	'	'	'	'	'
Jan.	+.1	+.1	+.1	.0	.0	-.1	-.1	-.1	-.1	-.1	-.1	-.1
Feb.	+.2	+.2	+.2	+.2	+.1	.0	.0	-.1	-.1	-.2	-.2	-.2
Mar.	+.3	+.3	+.3	+.3	+.2	+.2	+.1	.0	-.1	-.1	-.2	-.3
Apr.	+.3	+.3	+.4	+.4	+.4	+.3	+.3	+.2	+.1	.0	-.1	-.2
May	+.2	+.3	+.4	+.4	+.4	+.4	+.4	+.3	+.2	+.1	.0	-.1
June	.0	+.2	+.2	+.3	+.4	+.4	+.4	+.4	+.3	+.3	+.2	+.1
July	-.1	.0	+.1	+.2	+.3	+.3	+.4	+.4	+.4	+.3	+.3	+.2
Aug.	-.2	-.2	-.1	.0	+.1	+.2	+.2	+.3	+.3	+.3	+.3	+.3
Sept.	-.3	-.3	-.2	-.2	-.1	.0	+.1	+.1	+.2	+.3	+.3	+.3
Oct.	-.3	-.4	-.3	-.3	-.3	-.2	-.1	.0	+.1	+.1	+.2	+.3
Nov.	-.3	-.3	-.4	-.4	-.4	-.4	-.3	-.2	-.1	.0	+.1	+.2
Dec.	-.1	-.2	-.3	-.4	-.4	-.4	-.4	-.4	-.3	-.2	-.1	.0

$$\text{AZIMUTH OF POLARIS} = \frac{(B0 + B1 + B2)}{\text{COS LATITUDE}}$$

Table 12d. To Determine Azimuth From Polaris, 1991

L.S.T.	0^h	1^h	2^h	3^h	4^h	5^h	6^h	7^h	8^h	9^h	10^h	11^h
	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0
M	°	°	°	°	°	°	°	°	°	°	°	°
0	+27.4	+16.6	+ 4.7	- 7.6	-19.3	-29.7	-37.9	-43.5	-46.1	-45.6	-41.9	-35.5
3	26.9	16.1	4.1	8.2	19.9	30.1	38.3	43.8	46.2	45.5	41.7	35.1
6	26.4	15.5	3.5	8.8	20.4	30.6	38.6	43.9	46.2	45.3	41.4	34.7
9	25.9	14.9	2.9	9.4	21.0	31.1	39.0	44.1	46.3	45.2	41.1	34.3
12	25.4	14.3	2.2	10.0	21.5	31.5	39.3	44.3	46.3	45.1	40.9	33.9
15	+24.9	+13.7	+ 1.6	-10.6	-22.1	-32.0	-39.6	-44.5	-46.3	-44.9	-40.6	-33.5
18	24.3	13.1	1.0	11.2	22.6	32.4	39.9	44.7	46.3	44.8	40.3	33.1
21	23.8	12.6	+ 0.4	11.8	23.1	32.8	40.2	44.8	46.3	44.6	40.0	32.6
24	23.3	12.0	- 0.2	12.4	23.7	33.3	40.5	45.0	46.3	44.5	39.7	32.2
27	22.8	11.4	0.8	13.0	24.2	33.7	40.8	45.1	46.3	44.3	39.4	31.8
30	+22.2	+10.8	- 1.4	-13.6	-24.7	-34.1	-41.1	-45.2	-46.3	-44.1	-39.0	-31.3
33	21.7	10.2	2.1	14.1	25.2	34.5	41.4	45.4	46.2	43.9	38.7	30.9
36	21.1	9.6	2.7	14.7	25.7	34.9	41.6	45.5	46.2	43.7	38.4	30.5
39	20.6	9.0	3.3	15.3	26.2	35.3	41.9	45.6	46.1	43.5	38.0	30.0
42	20.0	8.4	3.9	15.9	26.7	35.7	42.2	45.7	46.1	43.3	37.7	29.5
45	+19.5	+ 7.8	- 4.5	-16.5	-27.2	-36.1	-42.4	-45.8	-46.0	-43.1	-37.3	-29.1
48	18.9	7.1	5.1	17.0	27.7	36.5	42.7	45.9	45.9	42.9	37.0	28.6
51	18.3	6.5	5.7	17.6	28.2	36.9	42.9	46.0	45.9	42.7	36.6	28.1
54	17.8	5.9	6.4	18.2	28.7	37.2	43.1	46.0	45.8	42.4	36.2	27.7
57	17.2	5.3	7.0	18.7	29.2	37.6	43.3	46.1	45.7	42.2	35.9	27.2
60	+16.6	+ 4.7	- 7.6	-19.3	-29.7	-37.9	-43.5	-46.1	-45.6	-41.9	-35.5	-26.7
LAT	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1
0	-.3	-.2	.0	+.2	+.3	+.4	+.3	+.2	.0	-.2	-.3	-.4
10	-.3	-.1	.0	+.2	+.3	+.3	+.3	+.1	.0	-.2	-.3	-.3
20	-.2	-.1	.0	+.1	+.2	+.3	+.2	+.1	.0	-.1	-.2	-.3
30	-.2	-.1	.0	+.1	+.2	+.2	+.2	+.1	.0	-.1	-.2	-.2
40	-.1	.0	.0	+.1	+.1	+.1	+.1	.0	.0	-.1	-.1	-.1
45	.0	.0	.0	.0	+.1	+.1	.0	.0	.0	.0	-.1	-.1
50	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
55	+.1	.0	.0	.0	-.1	-.1	-.1	.0	.0	.0	+.1	+.1
60	+.1	+.1	.0	-.1	-.2	-.2	-.1	-.1	.0	+.1	+.2	+.2
62	+.2	+.1	.0	-.1	-.2	-.2	-.2	-.1	.0	+.1	+.2	+.2
64	+.2	+.1	.0	-.1	-.2	-.3	-.2	-.1	.0	+.1	+.2	+.3
66	+.3	+.1	.0	-.2	-.3	-.3	-.3	-.1	.0	+.2	+.3	+.3
MONTH	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2
Jan.	-.1	-.1	.0	.0	+.1	+.1	+.1	+.2	+.2	+.2	+.2	+.2
Feb.	-.3	-.2	-.2	-.1	-.1	.0	+.1	+.2	+.2	+.3	+.3	+.3
Mar.	-.3	-.3	-.3	-.3	-.2	-.1	.0	.0	+.1	+.2	+.3	+.3
Apr.	-.3	-.4	-.4	-.4	-.3	-.3	-.2	-.1	.0	+.1	+.2	+.3
May	-.2	-.3	-.3	-.4	-.4	-.4	-.3	-.2	-.2	-.1	.0	+.1
June	-.1	-.2	-.2	-.3	-.3	-.4	-.4	-.3	-.3	-.2	-.1	.0
July	+.1	.0	-.1	-.2	-.2	-.3	-.3	-.3	-.3	-.3	-.2	-.2
Aug.	+.2	+.2	+.1	.0	-.1	-.1	-.2	-.2	-.3	-.3	-.3	-.3
Sept.	+.3	+.3	+.2	+.2	+.1	+.1	.0	-.1	-.2	-.2	-.3	-.3
Oct.	+.3	+.3	+.4	+.3	+.3	+.2	+.2	+.1	.0	-.1	-.2	-.3
Nov.	+.2	+.3	+.4	+.4	+.4	+.4	+.3	+.3	+.2	+.1	.0	-.1
Dec.	+.1	+.2	+.3	+.4	+.5	+.5	+.5	+.4	+.3	+.2	+.1	.0

$$\text{AZIMUTH OF POLARIS} = \frac{(B0 + B1 + B2)}{\text{COS LATITUDE}}$$

Table 12d. To Determine Azimuth From Polaris, 1991—Continued

L.S.T.	12^h	13^h	14^h	15^h	16^h	17^h	18^h	19^h	20^h	21^h	22^h	23^h
	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0
M	°	°	°	°	°	°	°	°	°	°	°	°
0	-26.7	-16.1	- 4.6	+ 7.3	+18.7	+28.9	+37.2	+43.1	+46.0	+45.8	+42.5	+36.2
3	26.2	15.6	4.0	7.9	19.3	29.4	37.6	43.3	46.1	45.7	42.2	35.8
6	25.7	15.0	3.4	8.5	19.8	29.9	37.9	43.5	46.1	45.6	42.0	35.4
9	25.2	14.5	2.8	9.1	20.4	30.3	38.3	43.7	46.2	45.5	41.7	35.0
12	24.7	13.9	2.2	9.7	20.9	30.8	38.6	43.9	46.2	45.4	41.5	34.6
15	-24.2	-13.3	- 1.6	+10.3	+21.4	+31.2	+38.9	+44.1	+46.2	+45.3	+41.2	+34.2
18	23.7	12.7	1.0	10.8	22.0	31.7	39.3	44.3	46.3	45.1	40.9	33.8
21	23.2	12.2	- 0.4	11.4	22.5	32.1	39.6	44.4	46.3	45.0	40.6	33.4
24	22.6	11.6	+ 0.2	12.0	23.0	32.5	39.9	44.6	46.3	44.9	40.3	33.0
27	22.1	11.0	0.8	12.6	23.5	32.9	40.2	44.8	46.3	44.7	40.0	32.5
30	-21.6	-10.4	+ 1.4	+13.1	+24.0	+33.4	+40.5	+44.9	+46.3	+44.5	+39.7	+32.1
33	21.1	9.9	2.0	13.7	24.5	33.8	40.8	45.0	46.3	44.4	39.4	31.6
36	20.5	9.3	2.6	14.3	25.1	34.2	41.1	45.2	46.3	44.2	39.1	31.2
39	20.0	8.7	3.2	14.9	25.6	34.6	41.3	45.3	46.2	44.0	38.7	30.7
42	19.5	8.1	3.8	15.4	26.1	35.0	41.6	45.4	46.2	43.8	38.4	30.3
45	-18.9	- 7.5	+ 4.4	+16.0	+26.5	+35.4	+41.9	+45.5	+46.2	+43.6	+38.0	+29.8
48	18.4	6.9	5.0	16.5	27.0	35.8	42.1	45.7	46.1	43.4	37.7	29.3
51	17.8	6.3	5.6	17.1	27.5	36.1	42.4	45.7	46.0	43.2	37.3	28.9
54	17.3	5.7	6.2	17.6	28.0	36.5	42.6	45.8	46.0	43.0	37.0	28.4
57	16.7	5.1	6.7	18.2	28.5	36.9	42.8	45.9	45.9	42.7	36.6	27.9
60	-16.1	- 4.6	+ 7.3	+18.7	+28.9	+37.2	+43.1	+46.0	+45.8	+42.5	+36.2	+27.4
LAT	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1
	°	°	°	°	°	°	°	°	°	°	°	°
0	-.3	-.2	.0	+.2	+.3	+.4	+.3	+.2	.0	-.2	-.3	-.4
10	-.3	-.1	.0	+.2	+.3	+.3	+.3	+.1	.0	-.2	-.3	-.3
20	-.2	-.1	.0	+.1	+.2	+.3	+.2	+.1	.0	-.1	-.2	-.3
30	-.2	-.1	.0	+.1	+.2	+.2	+.2	+.1	.0	-.1	-.2	-.2
40	-.1	.0	.0	+.1	+.1	+.1	+.1	.0	.0	-.1	-.1	-.1
45	.0	.0	.0	.0	+.1	+.1	.0	.0	.0	.0	-.1	-.1
50	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
55	+.1	.0	.0	.0	-.1	-.1	-.1	.0	.0	.0	+.1	+.1
60	+.1	+.1	.0	-.1	-.2	-.2	-.1	-.1	.0	+.1	+.2	+.2
62	+.2	+.1	.0	-.1	-.2	-.2	-.2	-.1	.0	+.1	+.2	+.2
64	+.2	+.1	.0	-.1	-.2	-.3	-.2	-.1	.0	+.1	+.2	+.3
66	+.3	+.1	.0	-.2	-.3	-.3	-.3	-.1	.0	+.2	+.3	+.3
MONTH	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2
	°	°	°	°	°	°	°	°	°	°	°	°
Jan.	+.1	+.1	.0	.0	-.1	-.1	-.1	-.2	-.2	-.2	-.2	-.2
Feb.	+.3	+.2	+.2	+.1	+.1	.0	-.1	-.2	-.2	-.3	-.3	-.3
Mar.	+.3	+.3	+.3	+.3	+.2	+.1	.0	.0	-.1	-.2	-.3	-.3
Apr.	+.3	+.4	+.4	+.4	+.3	+.3	+.2	+.1	.0	-.1	-.2	-.3
May	+.2	+.3	+.3	+.4	+.4	+.4	+.3	+.2	+.2	+.1	.0	-.1
June	+.1	+.2	+.2	+.3	+.3	+.4	+.4	+.3	+.3	+.2	+.1	.0
July	-.1	.0	+.1	+.2	+.2	+.3	+.3	+.3	+.3	+.3	+.2	+.2
Aug.	-.2	-.2	-.1	.0	+.1	+.1	+.2	+.2	+.3	+.3	+.3	+.3
Sept.	-.3	-.3	-.2	-.2	-.1	-.1	.0	+.1	+.2	+.2	+.3	+.3
Oct.	-.3	-.3	-.4	-.3	-.3	-.2	-.2	-.1	.0	+.1	+.2	+.3
Nov.	-.2	-.3	-.4	-.4	-.4	-.4	-.3	-.3	-.2	-.1	.0	+.1
Dec.	-.1	-.2	-.3	-.4	-.5	-.5	-.5	-.4	-.3	-.2	-.1	.0

$$\text{AZIMUTH OF POLARIS} = \frac{(B0 + B1 + B2)}{\text{COS LATITUDE}}$$

Table 12e. To Determine Azimuth From Polaris, 1992

L.S.T.	0^h	1^h	2^h	3^h	4^h	5^h	6^h	7^h	8^h	9^h	10^h	11^h
	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0
M	°	°	°	°	°	°	°	°	°	°	°	°
0	+27.4	+16.8	+ 4.9	- 7.3	-18.9	-29.3	-37.5	-43.2	-45.8	-45.3	-41.8	-35.4
3	26.9	16.2	4.3	7.9	19.5	29.7	37.9	43.4	45.9	45.2	41.5	35.0
6	26.4	15.6	3.7	8.5	20.1	30.2	38.2	43.6	45.9	45.1	41.3	34.6
9	25.9	15.0	3.1	9.1	20.6	30.7	38.6	43.8	45.9	45.0	41.0	34.2
12	25.4	14.5	2.5	9.7	21.1	31.1	38.9	44.0	46.0	44.9	40.7	33.8
15	+24.9	+13.9	+ 1.9	-10.3	-21.7	-31.6	-39.2	-44.1	-46.0	-44.7	-40.4	-33.4
18	24.4	13.3	1.3	10.9	22.2	32.0	39.5	44.3	46.0	44.6	40.1	33.0
21	23.9	12.7	+ 0.7	11.5	22.8	32.4	39.8	44.5	46.0	44.4	39.8	32.6
24	23.4	12.1	0.0	12.1	23.3	32.9	40.1	44.6	46.0	44.3	39.5	32.2
27	22.8	11.5	- 0.6	12.6	23.8	33.3	40.4	44.8	46.0	44.1	39.2	31.8
30	+22.3	+10.9	- 1.2	-13.2	-24.3	-33.7	-40.7	-44.9	-46.0	-43.9	-38.9	-31.3
33	21.8	10.3	1.8	13.8	24.8	34.1	41.0	45.0	45.9	43.7	38.6	30.9
36	21.2	9.8	2.4	14.4	25.4	34.5	41.3	45.1	45.9	43.5	38.3	30.4
39	20.7	9.2	3.0	15.0	25.9	34.9	41.5	45.2	45.9	43.3	37.9	30.0
42	20.1	8.6	3.6	15.5	26.4	35.3	41.8	45.4	45.8	43.1	37.6	29.5
45	+19.6	+ 8.0	- 4.2	-16.1	-26.9	-35.7	-42.0	-45.5	-45.7	-42.9	-37.2	-29.1
48	19.0	7.3	4.8	16.7	27.4	36.1	42.3	45.5	45.7	42.7	36.9	28.6
51	18.5	6.7	5.5	17.3	27.8	36.5	42.5	45.6	45.6	42.5	36.5	28.2
54	17.9	6.1	6.1	17.8	28.3	36.8	42.7	45.7	45.5	42.3	36.2	27.7
57	17.3	5.5	6.7	18.4	28.8	37.2	43.0	45.8	45.4	42.0	35.8	27.2
60	+16.8	+ 4.9	- 7.3	-18.9	-29.3	-37.5	-43.2	-45.8	-45.3	-41.8	-35.4	-26.7

LAT	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1
	°	°	°	°	°	°	°	°	°	°	°	°
0	-.3	-.2	.0	+.2	+.3	+.4	+.3	+.2	.0	-.2	-.3	-.4
10	-.3	-.1	.0	+.2	+.3	+.3	+.3	+.1	.0	-.2	-.3	-.3
20	-.2	-.1	.0	+.1	+.2	+.3	+.2	+.1	.0	-.1	-.2	-.3
30	-.2	-.1	.0	+.1	+.2	+.2	+.2	+.1	.0	-.1	-.2	-.2
40	-.1	.0	.0	+.1	+.1	+.1	+.1	.0	.0	-.1	-.1	-.1
45	.0	.0	.0	.0	+.1	+.1	.0	.0	.0	.0	-.1	-.1
50	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
55	+.1	.0	.0	.0	-.1	-.1	-.1	.0	.0	.0	+.1	+.1
60	+.1	+.1	.0	-.1	-.1	-.2	-.1	-.1	.0	+.1	+.1	+.2
62	+.2	+.1	.0	-.1	-.2	-.2	-.2	-.1	.0	+.1	+.2	+.2
64	+.2	+.1	.0	-.1	-.2	-.3	-.2	-.1	.0	+.1	+.2	+.3
66	+.3	+.1	.0	-.2	-.3	-.3	-.3	-.1	.0	+.2	+.3	+.3

MONTH	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2
	°	°	°	°	°	°	°	°	°	°	°	°
Jan.	-.1	-.1	.0	.0	.0	+.1	+.1	+.1	+.1	+.2	+.2	+.1
Feb.	-.2	-.2	-.2	-.1	-.1	.0	.0	+.1	+.2	+.2	+.2	+.3
Mar.	-.3	-.3	-.3	-.3	-.2	-.2	-.1	.0	+.1	+.2	+.2	+.3
Apr.	-.3	-.4	-.4	-.4	-.4	-.3	-.2	-.2	-.1	.0	+.1	+.2
May	-.2	-.3	-.3	-.4	-.4	-.4	-.4	-.3	-.2	-.1	.0	+.1
June	.0	-.1	-.2	-.3	-.4	-.4	-.4	-.4	-.3	-.2	-.2	-.1
July	+.1	.0	-.1	-.2	-.2	-.3	-.4	-.4	-.4	-.3	-.3	-.2
Aug.	+.2	+.2	+.1	.0	-.1	-.2	-.2	-.3	-.3	-.3	-.3	-.3
Sept.	+.3	+.3	+.2	+.2	+.1	.0	-.1	-.1	-.2	-.3	-.3	-.3
Oct.	+.3	+.4	+.4	+.3	+.3	+.2	+.1	.0	-.1	-.1	-.2	-.3
Nov.	+.3	+.3	+.4	+.4	+.4	+.4	+.3	+.2	+.1	.0	-.1	-.2
Dec.	+.1	+.2	+.3	+.4	+.4	+.4	+.4	+.4	+.3	+.2	+.1	.0

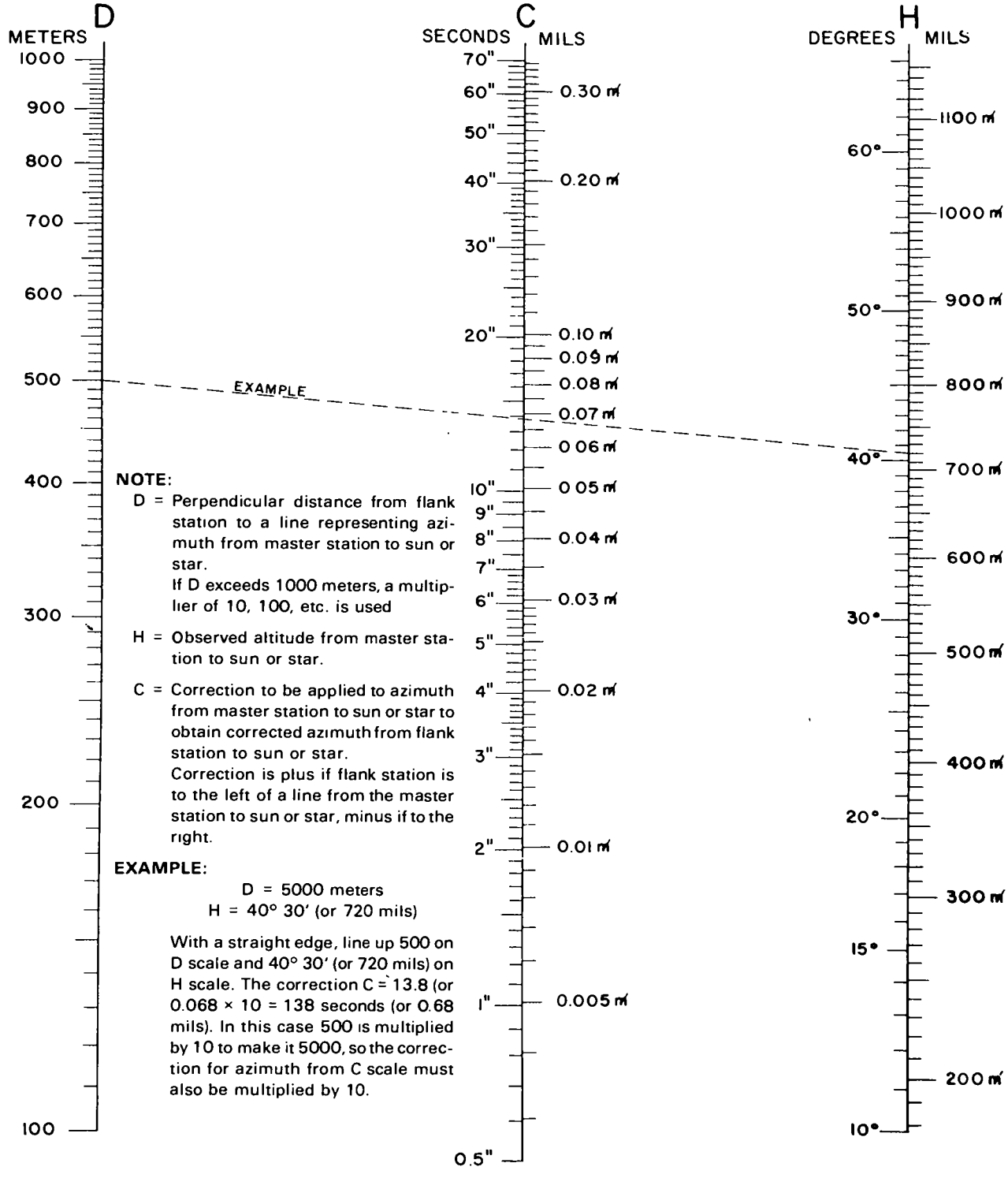
$$\text{AZIMUTH OF POLARIS} = \frac{(B0 + B1 + B2)}{\text{COS LATITUDE}}$$

Table 12e. To Determine Azimuth From Polaris, 1992—Continued

L.S.T.	12^h	13^h	14^h	15^h	16^h	17^h	18^h	19^h	20^h	21^h	22^h	23^h
	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0	b_0
M	'	'	'	'	'	'	'	'	'	'	'	'
0	-26.7	-16.3	- 4.8	+ 7.0	+18.4	+28.6	+36.8	+42.7	+45.7	+45.6	+42.3	+36.1
3	26.2	15.7	4.2	7.6	18.9	29.0	37.2	42.9	45.7	45.5	42.1	35.8
6	25.7	15.2	3.6	8.2	19.5	29.5	37.5	43.1	45.8	45.4	41.8	35.4
9	25.2	14.6	3.0	8.8	20.0	29.9	37.9	43.3	45.9	45.3	41.6	35.0
12	24.8	14.0	2.4	9.4	20.6	30.4	38.2	43.5	45.9	45.2	41.3	34.6
15	-24.2	-13.5	- 1.8	+10.0	+21.1	+30.8	+38.6	+43.7	+45.9	+45.0	+41.0	+34.2
18	23.7	12.9	1.2	10.5	21.6	31.3	38.9	43.9	46.0	44.9	40.8	33.8
21	23.2	12.3	- 0.6	11.1	22.1	31.7	39.2	44.1	46.0	44.8	40.5	33.3
24	22.7	11.8	0.0	11.7	22.6	32.1	39.5	44.2	46.0	44.6	40.2	32.9
27	22.2	11.2	+ 0.6	12.3	23.2	32.6	39.8	44.4	46.0	44.5	39.9	32.5
30	-21.7	-10.6	+ 1.1	+12.8	+23.7	+33.0	+40.1	+44.6	+46.0	+44.3	+39.6	+32.1
33	21.2	10.0	1.7	13.4	24.2	33.4	40.4	44.7	46.0	44.1	39.3	31.6
36	20.6	9.5	2.3	14.0	24.7	33.8	40.7	44.8	46.0	44.0	38.9	31.2
39	20.1	8.9	2.9	14.5	25.2	34.2	40.9	45.0	46.0	43.8	38.6	30.7
42	19.6	8.3	3.5	15.1	25.7	34.6	41.2	45.1	45.9	43.6	38.3	30.3
45	-19.0	- 7.7	+ 4.1	+15.6	+26.2	+35.0	+41.5	+45.2	+45.9	+43.4	+37.9	+29.8
48	18.5	7.1	4.7	16.2	26.7	35.4	41.7	45.3	45.8	43.2	37.6	29.3
51	17.9	6.5	5.3	16.8	27.1	35.7	42.0	45.4	45.8	43.0	37.2	28.9
54	17.4	5.9	5.9	17.3	27.6	36.1	42.2	45.5	45.7	42.8	36.9	28.4
57	16.8	5.4	6.5	17.9	28.1	36.5	42.5	45.6	45.6	42.5	36.5	27.9
60	-16.3	- 4.8	+ 7.0	+18.4	+28.6	+36.8	+42.7	+45.7	+45.6	+42.3	+36.1	+27.4
LAT	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1	b_1
	'	'	'	'	'	'	'	'	'	'	'	'
0	-.3	-.2	.0	+.2	+.3	+.4	+.3	+.2	.0	-.2	-.3	-.4
10	-.3	-.1	.0	+.2	+.3	+.3	+.3	+.1	.0	-.2	-.3	-.3
20	-.2	-.1	.0	+.1	+.2	+.3	+.2	+.1	.0	-.1	-.2	-.3
30	-.2	-.1	.0	+.1	+.2	+.2	+.2	+.1	.0	-.1	-.2	-.2
40	-.1	.0	.0	+.1	+.1	+.1	+.1	.0	.0	-.1	-.1	-.1
45	.0	.0	.0	.0	+.1	+.1	.0	.0	.0	.0	-.1	-.1
50	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0
55	+.1	.0	.0	.0	-.1	-.1	-.1	.0	.0	.0	+.1	+.1
60	+.1	+.1	.0	-.1	-.1	-.2	-.1	-.1	.0	+.1	+.1	+.2
62	+.2	+.1	.0	-.1	-.2	-.2	-.2	-.1	.0	+.1	+.2	+.2
64	+.2	+.1	.0	-.1	-.2	-.3	-.2	-.1	.0	+.1	+.2	+.3
66	+.3	+.1	.0	-.2	-.3	-.3	-.3	-.1	.0	+.2	+.3	+.3
MONTH	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2	b_2
	'	'	'	'	'	'	'	'	'	'	'	'
Jan.	+.1	+.1	.0	.0	.0	-.1	-.1	-.1	-.1	-.2	-.2	-.1
Feb.	+.2	+.2	+.2	+.1	+.1	.0	.0	-.1	-.2	-.2	-.2	-.3
Mar.	+.3	+.3	+.3	+.3	+.2	+.2	+.1	.0	-.1	-.2	-.2	-.3
Apr.	+.3	+.4	+.4	+.4	+.4	+.3	+.2	+.2	+.1	.0	-.1	-.2
May	+.2	+.3	+.3	+.4	+.4	+.4	+.4	+.3	+.2	+.1	.0	-.1
June	.0	+.1	+.2	+.3	+.4	+.4	+.4	+.4	+.3	+.2	+.2	+.1
July	-.1	.0	+.1	+.2	+.2	+.3	+.4	+.4	+.4	+.3	+.3	+.2
Aug.	-.2	-.2	-.1	.0	+.1	+.2	+.2	+.3	+.3	+.3	+.3	+.3
Sept.	-.3	-.3	-.2	-.2	-.1	.0	+.1	+.1	+.2	+.3	+.3	+.3
Oct.	-.3	-.4	-.4	-.3	-.3	-.2	-.1	.0	+.1	+.1	+.2	+.3
Nov.	-.3	-.3	-.4	-.4	-.4	-.4	-.3	-.2	-.1	.0	+.1	+.2
Dec.	-.1	-.2	-.3	-.4	-.4	-.4	-.4	-.4	-.3	-.2	-.1	.0

$$\text{AZIMUTH OF POLARIS} = \frac{(B0 + B1 + B2)}{\text{COS LATITUDE}}$$

Table 13. Grid Azimuth Correction, Simultaneous Observation



NOTE:

D = Perpendicular distance from flank station to a line representing azimuth from master station to sun or star.
If D exceeds 1000 meters, a multiplier of 10, 100, etc. is used

H = Observed altitude from master station to sun or star.

C = Correction to be applied to azimuth from master station to sun or star to obtain corrected azimuth from flank station to sun or star.
Correction is plus if flank station is to the left of a line from the master station to sun or star, minus if to the right.

EXAMPLE:

D = 5000 meters
H = 40° 30′ (or 720 mils)

With a straight edge, line up 500 on D scale and 40° 30′ (or 720 mils) on H scale. The correction C = 13.8 (or 0.068 × 10 = 138 seconds (or 0.68 mils). In this case 500 is multiplied by 10 to make it 5000, so the correction for azimuth from C scale must also be multiplied by 10.

Table 14. Zone-to-Zone Azimuth Transformation

PURPOSE: The purpose of this table is to provide a method for the conversion of UTM grid azimuths in one zone into the corresponding azimuths at an adjacent zone. The table is designed for use in the area between the respective central meridians of the adjacent zones; however, it will yield accurate results a moderate distance outside this area. Results are in mils.

GUIDE FOR USE:

1. Coordinates must be transformed to the adjacent zone by use of TM 5-241-2 or other means.

2. The northing coordinates in each zone are added together. This "total northing" (N) is rounded to the nearest 100 (4th order) or 1000 (5th order). In the Southern Hemisphere the total N must be subtracted from 20,000,000 before entering the table.

3. Find the tabulated Ns between which the total N lies, subtract the lower tabulated N from the total N and move the decimal five places to the left.

4. Multiply this by the "DIFF IN C" located opposite the lower tabulated N.

5. Add this product to the "C" opposite the lower tabulated value. In 5th order computations, this is the change in azimuth; 4th order accuracy requires the following steps.

6. Subtract the smaller of the 2 Ns of the point from the larger, round to the nearest 100, and move the decimal three places to the left. If the resulting number is smaller than the "ALLOWABLE DIFF IN N" opposite the lower tabulated N, no further computations are required and the result from 5 above is the correct change in azimuth. If it is larger, complete the following steps.

7. Square the computed number.

8. Extract from the table the F closest the total N, multiply it by the squared number, round to nearest whole number and move the decimal three places to the left.

9. Add the resulting number to the result of 5 above. The sum is the change in azimuth.

10. The sign of the change in azimuth is determined by use of the following chart:

When the point is transformed from:

(Northern Hemisphere)	(Southern Hemisphere)
East to West, sign is -	East to West, sign is +
West to East, sign is +	West to East, sign is -

Table 14. Zone-to-Zone Azimuth Transformation —Continued

Example of a 5th Order Accuracy:

Required: Change in azimuth (C) to nearest 0.1 mil.
Known: N (Zone 15) = 3833384
N (Zone 14) = 3830861

3833384 + 3830861 = 7664245; round to 7664000, which lies between 7600000 and 7700000 in the table.

7664000 - 7600000 = 64000; moving the decimal five places to the left yields 0.64.

N	C	DIFF IN C
7 600 000	60.157	.691

C = 60.157 + (0.64 × .691) = 60.157 + .442 = 60.599
Rounded to the nearest 0.1 mil, C = 60.6 mil

Example of a 4th Order Accuracy:

Required: Change in azimuth (C) to nearest 0.001 m.
Known: N (Zone 15) = 3834767
N (Zone 14) = 3830679

3834767 + 3830679 = 7665446; round to 7665400, which lies between 7600000 and 7700000 in the table.

7665400 - 7600000 = 65400; moving the decimal five places to the left yields 0.654.

N	C	DIFF IN C	ALLOWABLE DIFF IN N	F
7 600 000	60.157	.691	1.53	0.21
7 700 000			1.54	0.21

C = 60.157 + (0.654 × .691) = 60.157 + .452 = 60.609 mil

3834767 - 3830679 = 4088; rounding to the nearest 100 and moving the decimal three places to the left yields 4.1, which is larger than the closest ALLOWABLE DIFF IN N (1.54). Therefore, further computations are required.

4.1 squared = 4.1 × 4.1 = 16.8; 16.8 × F = 16.8 × 0.21 = 3.53; rounding to the nearest whole number and moving the decimal three places to the left yields .004.

C = 60.609 + .004 = 60.613 mil

N	C	DIFF IN C	ALLOWABLE DIF IN N	F
0	0.0	.842	★	★
100 000	0.842	.842	0.18	15.24
200 000	1.684	.841	0.26	7.62
300 000	2.525	.842	0.31	5.08
400 000	3.367	.841	0.36	3.81
500 000	4.208	.841	0.40	3.05
600 000	5.049	.841	0.44	2.54
700 000	5.890	.840	0.48	2.18
800 000	6.730	.840	0.51	1.91
900 000	7.570	.840	0.54	1.70
1 000 000	8.410	.838	0.57	1.53
1 100 000	9.248	.839	0.60	1.39
1 200 000	10.087	.837	0.63	1.27
1 300 000	10.924	.837	0.65	1.18
1 400 000	11.761	.837	0.68	1.09
1 500 000	12.598	.835	0.70	1.02
1 600 000	13.433	.835	0.72	0.96
1 700 000	14.268	.833	0.75	0.90
1 800 000	15.101	.833	0.77	0.85
1 900 000	15.934	.832	0.79	0.81
2 000 000	16.766	.830	0.81	0.77
2 100 000	17.596	.830	0.83	0.73
2 200 000	18.426	.828	0.85	0.70
2 300 000	19.254	.827	0.87	0.67
2 400 000	20.081	.826	0.88	0.64
2 500 000	20.907	.825	0.90	0.61
2 600 000	21.732	.823	0.92	0.59
2 700 000	22.555	.822	0.94	0.57
2 800 000	23.377	.820	0.95	0.55
2 900 000	24.197	.819	0.97	0.53
3 000 000	25.016	.817	0.99	0.51
3 100 000	25.833	.815	1.00	0.50
3 200 000	26.648	.814	1.02	0.48
3 300 000	27.462	.812	1.03	0.47
3 400 000	28.274	.810	1.05	0.45
3 500 000	29.084	.809	1.06	0.44
3 600 000	29.893	.806	1.08	0.43
3 700 000	30.699	.805	1.09	0.42
3 800 000	31.504	.803	1.11	0.41
3 900 000	32.307	.800	1.12	0.40
4 000 000	33.107	.799	1.14	0.39
4 100 000	33.906	.796	1.15	0.38
4 200 000	34.702	.794	1.16	0.37
4 300 000	35.496	.792	1.18	0.36
4 400 000	36.288	.790	1.19	0.35
4 500 000	37.078	.787	1.20	0.35
4 600 000	37.865	.785	1.22	0.34
4 700 000	38.650	.782	1.23	0.33
4 800 000	39.432	.780	1.24	0.33
4 900 000	40.212	.778	1.25	0.32
5 000 000	40.990	.774	1.26	0.31
5 100 000	41.764	.773	1.28	0.31
5 200 000	42.537	.769	1.29	0.30
5 300 000	43.306	.767	1.30	0.30
5 400 000	44.073	.764	1.31	0.29
5 500 000	44.837	.761	1.32	0.29
5 600 000	45.598	.758	1.33	0.28
5 700 000	46.356	.756	1.35	0.28
5 800 000	47.112	.752	1.36	0.27
5 900 000	47.864	.750	1.37	0.27
6 000 000	48.614	.746	1.38	0.26
6 100 000	49.360	.743	1.39	0.26
6 200 000	50.103	.740	1.40	0.26

★ F CORRECTION NOT REQUIRED

N	C	DIFF IN C	ALLOWABLE DIF IN N	F
6 300 000	50.843	.737	1.41	0.25
6 400 000	51.580	.734	1.42	0.25
6 500 000	52.314	.730	1.43	0.25
6 600 000	53.044	.727	1.44	0.24
6 700 000	53.771	.724	1.45	0.24
6 800 000	54.495	.720	1.46	0.24
6 900 000	55.215	.717	1.47	0.23
7 000 000	55.932	.713	1.48	0.23
7 100 000	56.645	.710	1.49	0.23
7 200 000	57.355	.706	1.50	0.22
7 300 000	58.061	.702	1.51	0.22
7 400 000	58.763	.699	1.52	0.22
7 500 000	59.462	.695	1.52	0.22
7 600 000	60.157	.691	1.53	0.21
7 700 000	60.848	.688	1.54	0.21
7 800 000	61.536	.683	1.55	0.21
7 900 000	62.219	.680	1.56	0.21
8 000 000	62.899	.675	1.57	0.20
8 100 000	63.574	.672	1.58	0.20
8 200 000	64.246	.668	1.59	0.20
8 300 000	64.914	.664	1.59	0.20
8 400 000	65.578	.659	1.60	0.20
8 500 000	66.237	.656	1.61	0.19
8 600 000	66.893	.651	1.62	0.19
8 700 000	67.544	.647	1.63	0.19
8 800 000	68.191	.643	1.63	0.19
8 900 000	68.834	.638	1.64	0.19
9 000 000	69.472	.634	1.65	0.18
9 100 000	70.106	.630	1.66	0.18
9 200 000	70.736	.625	1.66	0.18
9 300 000	71.361	.621	1.67	0.18
9 400 000	71.982	.616	1.68	0.18
9 500 000	72.598	.612	1.69	0.18
9 600 000	73.210	.608	1.69	0.17
9 700 000	73.818	.602	1.70	0.17
9 800 000	74.420	.598	1.71	0.17
9 900 000	75.018	.594	1.71	0.17
10 000 000	75.612	.588	1.72	0.17
10 100 000	76.200	.584	1.73	0.17
10 200 000	76.784	.579	1.74	0.17
10 300 000	77.363	.575	1.74	0.17
10 400 000	77.938	.569	1.75	0.16
10 500 000	78.507	.565	1.75	0.16
10 600 000	79.072	.560	1.76	0.16
10 700 000	79.632	.554	1.77	0.16
10 800 000	80.186	.550	1.77	0.16
10 900 000	80.736	.545	1.78	0.16
11 000 000	81.281	.539	1.79	0.16
11 100 000	81.820	.535	1.79	0.16
11 200 000	82.355	.530	1.80	0.16
11 300 000	82.885	.524	1.80	0.15
11 400 000	83.409	.519	1.81	0.15
11 500 000	83.928	.514	1.82	0.15
11 600 000	84.442	.509	1.82	0.15
11 700 000	84.951	.503	1.83	0.15
11 800 000	85.454	.498	1.83	0.15
11 900 000	85.952	.493	1.84	0.15
12 000 000	86.445	.488	1.84	0.15
12 100 000	86.933	.482	1.85	0.15
12 200 000	87.415	.477	1.85	0.15
12 300 000	87.892	.471	1.86	0.15
12 400 000	88.363	.466	1.86	0.14
12 500 000	88.829	.460	1.87	0.14

N	C	DIFF IN C	ALLOWABLE DIF IN N	F
12 600 000	89.289	.455	1.87	0.14
12 700 000	89.744	.449	1.88	0.14
12 800 000	90.193	.444	1.88	0.14
12 900 000	90.637	.438	1.89	0.14
13 000 000	91.075	.432	1.89	0.14
13 100 000	91.507	.427	1.90	0.14
13 200 000	91.934	.421	1.90	0.14
13 300 000	92.355	.416	1.91	0.14
13 400 000	92.771	.409	1.91	0.14
13 500 000	93.180	.404	1.91	0.14
13 800 000	93.584	.399	1.92	0.14
13 700 000	93.983	.392	1.92	0.14
13 800 000	94.375	.386	1.93	0.14
13 900 000	94.761	.381	1.93	0.13
14 000 000	95.142	.375	1.94	0.13
14 100 000	95.517	.369	1.94	0.13
14 200 000	95.886	.363	1.94	0.13
14 300 000	96.249	.357	1.95	0.13
14 400 000	96.606	.352	1.95	0.13
14 500 000	96.958	.345	1.95	0.13
14 600 000	97.303	.339	1.96	0.13
14 700 000	97.642	.333	1.96	0.13
14 800 000	97.975	.328	1.96	0.13
14 900 000	98.303	.321	1.97	0.13
15 000 000	98.624	.315	1.97	0.13
15 100 000	98.939	.309	1.97	0.13
15 200 000	99.248	.303	1.98	0.13
15 300 000	99.551	.297	1.98	0.13
15 400 000	99.848	.290	1.98	0.13
15 500 000	100.138	.285	1.99	0.13
15 600 000	100.423	.278	1.99	0.13
15 700 000	100.701	.273	1.99	0.13
15 800 000	100.974	.266	1.99	0.13
15 900 000	101.240	.259	2.00	0.13
16 000 000	101.499	.254	2.00	0.13
16 100 000	101.753	.247	2.00	0.13
16 200 000	102.000	.241	2.00	0.12
16 300 000	102.241	.235	2.01	0.12
16 400 000	102.476	.229	2.01	0.12
16 500 000	102.705	.222	2.01	0.12
16 600 000	102.927	.216	2.01	0.12
16 700 000	103.143	.209	2.02	0.12
16 800 000	103.352	.204	2.02	0.12
16 900 000	103.556	.196	2.02	0.12
17 000 000	103.752	.191	2.02	0.12
17 100 000	103.943	.184	2.02	0.12
17 200 000	104.127	.178	2.03	0.12
17 300 000	104.305	.171	2.03	0.12
17 400 000	104.476	.165	2.03	0.12
17 500 000	104.641	.159	2.03	0.12
17 600 000	104.800	.152	2.03	0.12
17 700 000	104.952	.146	2.03	0.12
17 800 000	105.098	.139	2.04	0.12
17 900 000	105.237	.133	2.04	0.12
18 000 000	105.370		2.04	0.12

By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

R. L. DILWORTH
Brigadier General, United States Army
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5/5 change 1; 7 April 1988

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Table 10a (1). Apparent Places of Stars, 1988 (Degrees)—Continued

Star No.	Right ascension Declination	(Hr Min) (° ′)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA	14 05	57.5	58.7	59.7	60.5	60.8	60.9	60.8	60.3	59.8	59.5	59.7	60.4	61.4
	DEC	-36 18	36	41	47	54	59	63	65	65	62	58	55	53	55
51	RA	14 15	06.4	07.5	08.4	09.0	09.3	09.4	09.2	08.8	08.4	08.1	08.2	08.6	09.5
	DEC	19 14	28	21	19	20	24	29	32	34	33	30	24	16	07
52	RA	14 38	44.7	46.6	48.2	49.4	50.1	50.3	49.9	49.1	48.0	47.3	47.2	47.9	49.4
	DEC	-60 47	02	04	09	18	26	34	39	41	39	34	26	21	18
53	RA	14 50	11.9	13.0	14.0	14.7	15.2	15.4	15.4	15.1	14.7	14.3	14.4	14.8	15.7
	DEC	-15 59	35	41	45	49	50	51	50	49	48	46	46	48	52
54	RA	14 50	42.5	45.1	47.5	49.5	50.2	49.6	48.0	45.8	43.4	41.5	40.5	40.7	42.4
	DEC	74 11	53	48	48	54	63	73	79	80	77	70	59	47	37
55	RA	15 34	09.9	10.9	11.9	12.7	13.3	13.5	13.5	13.1	12.6	12.1	11.9	12.1	12.7
	DEC	26 44	62	54	51	53	58	65	71	74	75	72	66	58	49
56	RA	15 59	36.1	37.2	38.2	39.1	39.8	40.3	40.4	40.2	39.8	39.3	39.2	39.4	40.1
	DEC	-22 35	21	24	28	31	32	33	34	34	33	32	31	31	32
57	RA	16 28	38.9	39.9	40.9	41.9	42.7	43.3	43.5	43.4	42.9	42.4	42.2	42.3	43.0
	DEC	-26 24	26	28	31	33	35	36	38	38	38	37	35	34	35
58	RA	16 47	19.6	21.7	24.0	26.4	28.2	29.5	29.9	29.3	28.0	26.5	25.6	25.6	26.7
	DEC	-69 00	25	21	20	23	29	37	44	51	53	52	46	38	31
59	RA	17 09	40.0	40.8	41.8	42.7	43.5	44.2	44.5	44.5	44.1	43.6	43.3	43.3	43.8
	DEC	-15 42	45	47	50	51	51	49	48	48	47	47	47	47	49
60	RA	17 32	46.0	46.9	48.0	49.2	50.2	51.1	51.5	51.5	51.1	50.5	50.1	50.0	50.5
	DEC	-37 05	51	50	50	51	52	54	57	60	61	61	59	56	54
61	RA	17 34	21.3	22.1	22.9	23.8	24.6	25.3	25.6	25.5	25.1	24.6	24.2	24.1	24.4
	DEC	12 33	54	48	44	43	47	52	58	63	66	66	64	59	52
62	RA	17 56	17.5	18.2	19.2	20.5	21.6	22.3	22.6	22.3	21.4	20.4	19.5	19.0	19.0
	DEC	51 28	72	62	56	55	60	69	79	88	93	94	90	82	72
63	RA	18 23	21.0	21.8	22.8	23.9	25.0	25.9	26.6	26.7	26.4	25.9	25.4	25.2	25.5
	DEC	-34 23	37	35	34	33	33	33	35	37	39	40	39	37	35
64	RA	18 36	30.1	30.7	31.5	32.5	33.5	34.3	34.8	34.7	34.3	33.6	32.8	32.4	32.4
	DEC	38 45	70	61	54	53	57	65	74	83	89	91	89	83	74
65	RA	18 54	29.9	30.6	31.4	32.4	33.4	34.4	35.0	35.3	35.1	34.6	34.1	33.9	34.1
	DEC	-26 18	55	54	53	52	50	48	48	49	50	51	51	50	49
66	RA	19 50	10.6	10.9	11.5	12.3	13.2	14.1	14.8	15.2	15.1	14.7	14.2	13.9	13.8
	DEC	08 49	62	57	54	53	56	62	68	74	79	81	80	78	73
67	RA	20 24	40.6	41.0	41.9	43.2	44.8	46.4	47.7	48.4	48.4	47.8	46.9	46.2	45.8
	DEC	-56 46	43	35	28	22	18	17	19	24	30	35	37	35	29
68	RA	20 40	59.4	59.4	59.8	60.7	61.8	62.9	63.8	64.2	64.1	63.6	62.8	62.1	61.6
	DEC	45 13	74	65	58	53	53	59	68	79	88	95	97	95	89
69	RA	21 40	08.5	07.9	08.8	11.0	14.0	17.5	20.8	23.1	23.6	22.5	20.2	17.6	15.6
	DEC	-77 26	58	48	38	28	21	18	20	26	34	42	46	46	40
70	RA	22 07	28.3	28.2	28.5	29.1	30.2	31.5	32.8	33.8	34.2	34.1	33.5	32.9	32.4
	DEC	-47 00	87	81	75	66	59	54	51	53	57	63	67	69	67
71	RA	22 42	25.3	25.1	25.1	25.5	26.3	27.3	28.4	29.2	29.6	29.6	29.3	28.9	28.4
	DEC	30 09	35	30	25	20	20	23	30	39	47	54	59	59	56
72	RA	22 56	59.1	59.0	59.0	59.4	60.1	61.2	62.3	63.2	63.7	63.8	63.6	63.2	62.8
	DEC	-29 40	82	80	76	70	63	56	51	49	50	53	57	60	61
73	RA	23 04	09.1	08.9	08.9	09.3	09.9	10.9	11.9	12.7	13.2	13.3	13.1	12.8	12.4
	DEC	15 08	28	24	21	19	20	25	32	39	45	50	52	52	49

Table 10a (2). Apparent Places of Stars, 1989 (Degrees)

Star No.	Right ascension / Declination	(Hr Min) (° ′)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
1	RA	00 07	48.9	48.6	48.4	48.5	49.1	50.0	51.1	52.1	52.8	53.1	53.1	52.8	52.4
	DEC	29 01	59	55	51	47	45	47	52	60	68	74	79	81	81
2	RA	00 08	34.4	33.5	33.0	33.1	33.9	35.2	36.9	38.4	39.3	39.7	39.6	39.0	38.1
	DEC	59 05	41	37	30	22	17	15	18	26	36	46	55	61	63
3	RA	00 25	13.6	11.1	09.6	09.3	10.4	12.7	15.6	18.9	21.3	22.2	21.3	19.3	16.6
	DEC	−77 18	75	70	61	49	38	29	24	24	29	38	47	52	53
4	RA	00 25	45.3	44.8	44.5	44.5	45.0	45.9	47.1	48.2	49.1	49.5	49.4	49.0	48.5
	DEC	−42 21	68	66	61	53	43	34	28	25	27	32	39	44	47
5	RA	00 39	52.4	51.5	51.0	50.9	51.5	52.7	54.2	55.7	56.8	57.4	57.4	57.1	56.3
	DEC	56 28	58	55	50	42	36	34	36	43	52	62	71	77	80
6	RA	00 43	02.9	02.5	02.3	02.3	02.7	03.4	04.4	05.4	06.2	06.6	06.6	06.5	06.2
	DEC	−18 02	53	53	51	47	41	33	27	21	20	21	25	28	31
7	RA	00 56	02.1	01.1	0 .3	0 .2	0 .7	02.0	03.7	05.4	06.6	07.3	07.5	07.1	06.3
	DEC	60 39	48	46	41	33	26	23	24	30	39	49	59	66	69
8	RA	01 25	05.6	04.6	03.8	03.5	03.9	05.1	06.7	08.4	09.8	10.7	11.0	10.8	10.1
	DEC	60 10	65	64	59	52	45	41	41	46	54	63	73	80	85
9	RA	01 37	20.1	19.1	18.3	17.9	18.0	18.7	19.9	21.4	22.7	23.5	23.7	23.3	22.4
	DEC	−57 16	105	104	99	90	79	68	60	56	58	64	73	81	85
10	SEE TABLE 11. APPARENT PLACES OF POLARIS, 1989														
11	RA	02 06	33.9	33.5	33.1	32.9	33.1	33.7	34.6	35.7	36.7	37.3	37.7	37.8	37.7
	DEC	23 24	51	50	48	45	44	45	48	53	59	63	67	69	69
12	RA	02 57	52.3	51.7	51.1	50.5	50.4	50.7	51.4	52.5	53.6	54.4	55.0	55.1	54.8
	DEC	−40 20	59	62	61	56	47	37	28	21	19	22	29	38	44
13	RA	03 01	43.4	43.1	42.7	42.4	42.4	42.7	43.5	44.5	45.4	46.1	46.7	46.9	46.9
	DEC	04 02	57	54	53	54	56	59	64	69	74	75	75	73	71
14	RA	03 23	33.6	33.0	32.4	31.8	31.6	32.1	33.1	34.5	35.9	37.1	38.0	38.4	38.4
	DEC	49 49	41	43	42	38	32	28	25	26	30	36	42	48	53
15	RA	04 35	19.0	18.8	18.4	17.9	17.7	17.8	18.4	19.3	20.2	21.1	22.0	22.5	22.8
	DEC	16 29	26	25	24	24	24	24	26	29	32	33	34	33	32
16	RA	05 14	02.2	02.1	01.7	01.2	0 .8	0 .8	01.2	02.0	02.8	03.7	04.5	05.1	05.4
	DEC	−08 12	44	48	50	50	48	43	38	32	28	28	31	36	41
17	RA	05 15	54.9	54.7	54.2	53.5	53.0	53.0	53.6	54.7	55.9	57.2	58.4	59.3	59.8
	DEC	45 59	28	32	34	33	30	25	21	19	19	20	22	26	31
18	RA	05 24	34.2	34.1	33.7	33.2	32.9	32.9	33.3	34.1	34.9	35.8	36.7	37.4	37.7
	DEC	06 20	33	30	29	29	30	32	35	38	41	42	40	38	35
19	RA	05 25	37.7	37.6	37.3	36.7	36.3	36.3	36.8	37.7	38.7	39.7	40.7	41.5	41.9
	DEC	28 36	06	07	08	07	06	04	03	03	04	05	06	06	08
20	RA	05 35	41.0	41.0	40.6	40.1	39.8	39.7	40.1	40.8	41.6	42.5	43.3	44.0	44.4
	DEC	−01 12	24	27	29	29	27	24	20	16	12	12	14	18	23
21	RA	05 40	13.9	13.9	13.5	13.0	12.7	12.6	12.9	13.6	14.5	15.3	16.2	16.9	17.3
	DEC	−01 56	46	50	52	52	50	47	43	38	35	35	37	41	46
22	RA	05 54	36.4	36.4	36.1	35.6	35.2	35.1	35.4	36.1	37.0	37.8	38.7	39.5	40.0
	DEC	07 24	27	25	24	24	24	26	29	32	34	34	33	30	26
23	RA	06 23	44.9	44.6	43.9	42.8	41.8	41.2	41.1	41.7	42.6	43.8	45.1	46.0	46.4
	DEC	−52 40	76	86	92	94	91	84	75	65	58	56	60	69	80
24	RA	06 37	06.5	06.7	06.4	06.0	05.5	05.3	05.6	06.2	07.0	07.9	08.9	09.7	10.4
	DEC	16 24	40	38	38	38	39	39	40	41	41	41	39	36	34
25	RA	06 44	41.6	41.7	41.4	40.8	40.3	40.1	40.2	40.7	41.4	42.2	43.2	44.0	44.5
	DEC	−16 41	56	63	67	69	67	63	57	51	47	46	49	55	63

Table 10a (2). Apparent Places of Stars, 1989 (Degrees)—Continued

Star No.	Right Ascension / Declination	(Hr Min) (° ′)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
26	RA	06 58	13.4	13.5	13.2	12.5	12.0	11.6	11.6	12.0	12.7	13.6	14.6	15.5	16.0
	DEC	-28 57	17	26	31	34	32	27	20	13	07	05	08	15	24
27	RA	07 07	58.4	58.5	58.2	57.7	57.1	56.7	56.7	57.1	57.8	58.7	59.6	60.5	61.1
	DEC	-26 22	24	33	38	41	39	35	28	21	15	13	16	23	32
28	RA	07 33	56.2	56.5	56.4	55.9	55.4	55.0	55.1	55.6	56.4	57.3	58.4	59.5	60.3
	DEC	31 54	50	51	54	55	56	55	53	50	47	45	42	40	40
29	RA	07 38	45.4	45.7	45.6	45.2	44.7	44.4	44.5	44.8	45.4	46.2	47.2	48.1	48.8
	DEC	05 15	18	14	12	12	12	14	16	18	19	19	15	11	06
30	RA	07 44	40.7	41.1	41.0	40.6	40.1	39.7	39.8	40.2	40.9	41.8	42.8	43.9	44.8
	DEC	28 03	14	15	16	18	19	18	17	15	12	10	07	04	03
31	RA	08 09	13.5	13.7	13.4	12.7	11.9	11.1	10.8	10.9	11.4	12.3	13.5	14.7	15.6
	DEC	-47 17	64	75	84	89	90	87	81	72	64	59	60	67	77
32	RA	08 22	19.5	19.8	19.3	18.3	17.1	16.0	15.4	15.3	15.8	16.9	18.4	19.9	20.9
	DEC	-59 28	14	26	36	43	45	42	35	26	17	12	12	18	28
33	RA	09 07	36.9	37.5	37.4	37.0	36.3	35.6	35.2	35.1	35.4	36.1	37.2	38.4	39.4
	DEC	-43 23	05	16	25	32	35	34	29	21	14	08	08	13	22
34	RA	09 13	07.2	08.0	07.6	06.4	04.7	03.0	01.6	01.0	01.2	02.4	04.4	06.5	08.2
	DEC	-69 40	04	16	26	36	40	40	36	27	18	11	08	12	21
35	RA	09 27	04.2	04.8	04.9	04.7	04.3	04.0	03.8	03.8	04.1	04.7	05.5	06.5	07.4
	DEC	-08 36	35	42	46	49	50	48	45	42	39	38	40	46	53
36	RA	10 07	48.6	49.4	49.7	49.6	49.3	48.9	48.7	48.7	48.8	49.3	50.1	51.1	52.1
	DEC	12 00	73	69	68	68	70	72	73	73	72	69	65	59	53
37	RA	11 01	13.3	14.6	15.2	15.3	14.7	13.9	13.1	12.7	12.6	13.0	14.0	15.4	17.1
	DEC	56 25	72	74	79	86	93	96	94	89	81	71	62	54	51
38	RA	11 03	06.0	07.5	08.2	08.2	07.6	06.5	05.6	05.0	04.9	05.3	06.4	08.0	09.8
	DEC	61 47	80	82	88	96	102	105	103	97	89	79	69	61	58
39	RA	11 48	30.8	31.8	32.3	32.6	32.5	32.2	31.9	31.7	31.6	31.7	32.2	33.1	34.2
	DEC	14 37	52	47	46	47	49	52	54	54	53	49	44	37	30
40	RA	11 53	16.9	18.3	19.1	19.4	19.1	18.4	17.7	17.1	16.8	16.9	17.5	18.7	20.2
	DEC	53 44	62	61	65	72	79	84	85	81	74	65	54	45	39
41	RA	12 15	14.7	15.7	16.4	16.7	16.7	16.5	16.2	15.9	15.7	15.8	16.2	17.1	18.2
	DEC	-17 28	50	57	63	68	71	71	70	68	65	62	62	65	72
42	RA	12 25	58.5	60.3	61.3	61.9	61.7	61.1	60.2	59.2	58.4	58.3	59.0	60.5	62.4
	DEC	-63 02	03	11	20	31	41	47	49	47	40	32	25	22	25
43	RA	12 30	32.8	34.3	35.3	35.8	35.8	35.3	34.6	33.8	33.2	33.1	33.7	35.0	36.6
	DEC	-57 02	53	61	70	81	89	95	97	95	89	81	75	72	75
44	RA	12 47	03.9	05.6	06.7	07.3	07.4	06.9	06.2	05.3	04.6	04.3	04.9	06.2	08.0
	DEC	-59 37	31	37	46	57	66	72	75	73	68	60	53	50	52
45	RA	12 53	33.8	35.3	36.4	37.0	36.9	36.3	35.5	34.7	34.1	33.8	34.1	35.1	36.5
	DEC	56 00	48	45	48	55	63	70	72	70	64	55	44	34	26
46	RA	13 23	29.6	31.1	32.2	32.9	33.0	32.5	31.8	31.0	30.3	29.9	30.0	30.8	32.1
	DEC	54 58	35	31	33	40	48	55	59	58	53	45	34	23	15
47	RA	13 24	36.8	37.8	38.6	39.2	39.4	39.3	39.1	38.8	38.5	38.4	38.6	39.3	40.3
	DEC	-11 06	18	24	29	33	34	34	33	31	29	28	29	32	38
48	RA	13 47	06.7	08.1	09.1	09.9	10.1	09.8	09.2	08.5	07.8	07.4	07.4	08.0	09.2
	DEC	49 21	43	38	39	45	53	60	65	65	61	54	44	33	24
49	RA	14 03	01.2	03.1	04.5	05.7	06.2	06.2	05.7	04.8	03.9	03.3	03.5	04.4	06.1
	DEC	-60 19	04	07	14	23	32	40	44	45	42	35	28	23	22

Table 10a (2). Apparent Places of Stars, 1989 (Degrees)—Continued

Star No.	Right ascension / Declination	(Hr Min) (° ′)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH											
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA	14 06	01.4	02.7	03.7	04.5	04.8	04.9	04.7	04.3	03.8	03.5	03.6	04.3	05.4
	DEC	-36 18	55	60	66	73	78	82	84	84	81	77	73	71	73
51	RA	14 15	09.5	10.5	11.4	12.1	12.4	12.4	12.2	11.8	11.4	11.1	11.1	11.6	12.5
	DEC	19 13	67	61	59	60	64	69	73	74	74	70	64	57	48
52	RA	14 38	49.4	51.3	52.8	54.1	54.8	55.0	54.6	53.8	52.7	51.9	51.8	52.6	54.1
	DEC	-60 47	18	20	25	33	42	49	55	57	55	49	42	36	33
53	RA	14 50	15.7	16.7	17.6	18.4	18.9	19.1	19.1	18.8	18.4	18.0	18.0	18.5	19.3
	DEC	-15 59	52	56	61	64	66	66	66	65	63	62	61	63	67
54	RA	14 50	42.4	44.9	47.2	49.1	49.9	49.3	47.7	45.4	43.1	41.2	40.1	40.3	41.9
	DEC	74 11	37	32	32	38	47	57	63	65	62	55	44	32	22
55	RA	15 34	12.7	13.7	14.7	15.5	16.1	16.3	16.3	15.9	15.4	14.8	14.6	14.8	15.5
	DEC	26 44	49	42	39	40	45	52	58	62	63	60	54	46	37
56	RA	15 59	40.1	41.1	42.1	43.1	43.8	44.2	44.4	44.2	43.7	43.3	43.0	43.3	44.1
	DEC	-22 35	32	35	38	41	43	44	44	44	44	42	40	40	42
57	RA	16 28	43.0	44.0	45.0	46.0	46.8	47.4	47.6	47.5	47.0	46.5	46.2	46.4	47.1
	DEC	-26 24	35	36	39	41	43	44	45	46	46	44	42	41	42
58	RA	16 47	26.7	28.8	31.0	33.5	35.4	36.6	37.0	36.5	35.1	33.6	32.6	32.6	33.8
	DEC	-69 00	31	27	26	29	35	43	50	56	59	57	51	44	37
59	RA	17 09	43.8	44.6	45.5	46.5	47.4	48.0	48.3	48.3	47.9	47.4	47.0	47.1	47.6
	DEC	-15 42	49	52	54	55	54	53	52	51	51	50	50	50	52
60	RA	17 32	50.5	51.5	52.5	53.7	54.8	55.6	56.0	56.1	55.6	55.0	54.5	54.5	55.0
	DEC	-37 05	54	52	52	53	54	56	58	61	63	62	60	57	55
61	RA	17 34	24.4	25.2	26.0	26.9	27.7	28.3	28.7	28.6	28.2	27.7	27.2	27.2	27.5
	DEC	12 33	52	46	42	42	45	51	57	62	64	65	62	58	51
62	RA	17 56	19.0	19.7	20.7	22.0	23.1	23.9	24.1	23.8	23.0	22.0	21.0	20.5	20.6
	DEC	51 28	72	62	56	56	61	70	80	89	94	95	91	84	73
63	RA	18 23	25.5	26.2	27.2	28.3	29.4	30.3	30.9	31.1	30.8	30.2	29.7	29.5	29.8
	DEC	-34 23	35	32	31	30	30	30	32	34	36	36	35	33	31
64	RA	18 36	32.4	32.9	33.7	34.8	35.8	36.6	37.0	37.0	36.5	35.8	35.1	34.6	34.7
	DEC	38 45	74	65	59	58	61	69	79	88	94	96	94	89	79
65	RA	18 54	34.1	34.7	35.5	36.5	37.5	38.4	39.1	39.4	39.2	38.7	38.2	37.9	38.1
	DEC	-26 18	49	48	47	45	44	42	42	42	44	44	44	43	43
66	RA	19 50	13.8	14.2	14.7	15.6	16.5	17.4	18.0	18.4	18.3	17.9	17.4	17.1	17.1
	DEC	08 50	13	09	05	05	08	13	20	26	30	32	32	30	25
67	RA	20 24	45.8	46.2	47.0	48.4	50.0	51.5	52.8	53.6	53.6	52.9	52.0	51.2	51.0
	DEC	-56 46	29	22	15	08	04	03	05	10	16	21	23	21	15
68	RA	20 41	01.6	01.7	02.1	03.0	04.1	05.2	06.1	06.6	06.4	05.9	05.1	04.4	04.0
	DEC	45 14	29	20	12	08	08	14	23	34	43	50	53	51	44
69	RA	21 40	15.6	14.9	15.7	17.9	21.0	24.5	27.7	30.0	30.6	29.4	27.0	24.4	22.4
	DEC	-77 26	40	30	20	10	03	00	01	07	15	23	28	27	21
70	RA	22 07	32.4	32.3	32.5	33.2	34.3	35.6	36.8	37.8	38.3	38.1	37.6	36.9	36.5
	DEC	-47 00	67	62	55	47	39	34	31	33	37	43	48	49	47
71	RA	22 42	28.4	28.2	28.3	28.7	29.4	30.5	31.5	32.4	32.8	32.8	32.4	32.0	31.6
	DEC	30 09	56	51	46	42	41	44	51	60	69	75	80	80	78
72	RA	22 57	02.8	02.6	02.6	03.0	03.8	04.8	05.8	06.8	07.3	07.4	07.1	06.7	06.4
	DEC	-29 40	61	59	55	48	41	34	29	27	28	32	36	39	39
73	RA	23 04	12.4	12.2	12.2	12.6	13.3	14.2	15.2	16.0	16.5	16.6	16.4	16.1	15.8
	DEC	15 08	49	46	43	41	42	47	53	61	67	71	74	74	71

Table 10a (3). Apparent Places of Stars, 1990 (Degrees)—Continued

Star No.	Right Ascension Declination	(Hr Min) (° ′)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA	14 06	05.4	06.6	07.6	08.4	08.8	08.9	08.6	08.2	07.7	07.4	07.5	08.2	09.3
	DEC	-36 19	13	18	24	31	36	40	42	42	39	35	31	29	31
51	RA	14 15	12.5	13.5	14.4	15.0	15.3	15.4	15.1	14.8	14.3	14.0	14.0	14.5	15.4
	DEC	19 13	48	42	40	41	45	50	54	56	55	52	46	38	30
52	RA	14 38	54.1	55.9	57.5	58.8	59.6	59.7	59.3	58.4	57.4	56.6	56.5	57.2	58.8
	DEC	-60 47	33	35	40	48	57	64	70	71	69	64	56	50	47
53	RA	14 50	19.3	20.4	21.3	22.1	22.6	22.8	22.7	22.4	22.0	21.7	21.6	22.0	22.9
	DEC	-16 00	07	12	16	19	21	21	21	19	18	17	16	17	21
54	RA	14 50	41.9	44.4	46.8	48.7	49.4	48.8	47.2	45.0	42.6	40.7	39.6	39.8	41.3
	DEC	74 11	22	17	17	24	33	42	48	51	48	40	30	18	08
55	RA	15 34	15.5	16.5	17.4	18.3	18.8	19.1	19.0	18.6	18.1	17.6	17.3	17.5	18.2
	DEC	26 44	37	30	27	29	34	41	47	51	52	49	43	35	26
56	RA	15 59	44.1	45.1	46.0	47.0	47.7	48.1	48.2	48.0	47.6	47.1	46.9	47.1	47.9
	DEC	-22 35	42	45	48	50	52	53	54	53	52	51	50	49	50
57	RA	16 28	47.1	48.0	49.0	50.1	50.9	51.4	51.6	51.5	51.0	50.5	50.2	50.4	51.0
	DEC	-26 24	42	43	46	48	50	51	52	52	52	51	49	48	48
58	RA	16 47	33.8	35.9	38.1	40.5	42.5	43.7	44.0	43.5	42.2	40.7	39.6	39.6	40.8
	DEC	-69 00	37	32	32	34	40	48	55	61	64	62	56	48	41
59	RA	17 09	47.6	48.4	49.3	50.3	51.1	51.8	52.1	52.0	51.6	51.1	50.8	50.8	51.3
	DEC	-15 42	52	55	57	58	57	56	55	54	53	53	53	53	55
60	RA	17 32	55.0	55.9	57.0	58.2	59.2	60.0	60.5	60.5	60.1	59.5	58.9	58.9	59.4
	DEC	-37 05	55	53	53	53	55	57	59	61	63	63	61	57	55
61	RA	17 34	27.5	28.2	29.0	30.0	30.8	31.4	31.7	31.6	31.2	30.7	30.2	30.1	30.5
	DEC	12 33	51	45	41	41	44	50	56	61	64	64	62	57	51
62	RA	17 56	20.6	21.3	22.3	23.5	24.6	25.4	25.6	25.3	24.5	23.5	22.5	22.0	22.1
	DEC	51 28	73	63	58	57	62	71	81	90	96	97	93	86	75
63	RA	18 23	29.8	30.6	31.5	32.6	33.7	34.7	35.2	35.4	35.1	34.6	34.0	33.8	34.1
	DEC	-34 23	31	29	27	26	26	26	28	30	31	32	31	29	26
64	RA	18 36	34.7	35.1	35.9	37.0	38.0	38.8	39.2	39.2	38.7	38.0	37.3	36.8	36.9
	DEC	38 46	19	10	04	03	07	15	24	33	40	42	40	34	26
65	RA	18 54	38.1	38.7	39.5	40.5	41.6	42.5	43.1	43.4	43.2	42.7	42.1	41.9	42.1
	DEC	-26 18	43	41	40	38	37	35	35	35	36	37	37	36	35
66	RA	19 50	17.1	17.4	17.9	18.7	19.7	20.6	21.2	21.5	21.5	21.1	20.6	20.2	20.2
	DEC	08 50	25	20	17	17	20	26	32	38	43	45	44	42	38
67	RA	20 24	51.0	51.3	52.1	53.4	55.0	56.6	57.8	58.5	58.5	57.9	56.9	56.1	55.9
	DEC	-56 45	75	68	61	54	50	49	51	56	61	66	68	66	61
68	RA	20 41	04.0	04.0	04.4	05.3	06.4	07.5	08.4	08.9	08.8	08.2	07.4	06.7	06.3
	DEC	45 14	44	35	28	23	24	30	39	49	59	66	68	66	60
69	RA	21 40	22.4	21.7	22.5	24.6	27.6	31.2	34.3	36.4	37.1	36.0	33.5	30.8	28.8
	DEC	-77 25	81	71	61	51	44	41	43	48	56	64	69	69	62
70	RA	22 07	36.5	36.3	36.5	37.2	38.3	39.6	40.8	41.7	42.2	42.1	41.5	40.8	40.3
	DEC	-47 00	47	42	35	27	19	14	12	13	17	23	28	29	27
71	RA	22 42	31.6	31.4	31.4	31.8	32.6	33.6	34.6	35.5	35.9	35.9	35.6	35.1	34.7
	DEC	30 10	18	12	07	03	02	06	12	21	30	37	41	41	39
72	RA	22 57	06.4	06.1	06.2	06.6	07.3	08.3	09.4	10.3	10.8	10.9	10.6	10.2	09.8
	DEC	-29 40	39	37	33	27	20	13	08	06	07	10	15	18	18
73	RA	23 04	15.8	15.5	15.5	15.9	16.6	17.5	18.5	19.3	19.8	19.9	19.7	19.3	19.0
	DEC	15 09	11	08	04	03	04	08	15	22	28	33	35	35	33

Table 10a (4). Apparent Places of Stars, 1991 (Degrees)

Star No.	Right ascension Oecli-nation	(Hr Min) (° ′)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
1	RA	00 07	55.9	55.5	55.3	55.4	55.9	56.8	57.9	58.9	59.6	59.9	59.9	59.6	59.2
	DEC	29 02	42	38	34	29	28	30	35	42	50	56	61	63	62
2	RA	00 08	41.9	40.9	40.4	40.5	41.3	42.7	44.3	45.7	46.7	47.2	47.0	46.4	45.5
	DEC	59 05	84	80	73	65	59	57	60	68	78	88	97	103	104
3	RA	00 25	19.1	16.6	15.1	14.6	15.5	17.8	20.8	24.0	26.3	27.2	26.4	24.3	21.5
	DEC	-77 17	92	87	78	67	55	46	41	41	47	55	64	70	71
4	RA	00 25	51.5	51.0	50.7	50.6	51.1	52.0	53.1	54.2	55.1	55.5	55.4	55.0	54.4
	DEC	-42 20	86	84	79	71	62	53	46	44	46	51	58	63	66
5	RA	00 39	60.3	59.4	58.8	58.7	59.3	60.6	62.0	63.5	64.6	65.2	65.3	64.8	64.1
	DEC	56 29	40	38	32	24	18	16	18	24	33	43	52	58	60
6	RA	00 43	09.3	09.0	08.7	08.7	09.1	09.8	10.8	11.7	12.5	12.9	13.0	12.7	12.4
	DEC	-18 01	70	71	69	65	59	52	45	40	39	40	43	47	50
7	RA	00 56	10.5	09.5	08.7	08.5	09.1	10.4	12.0	13.6	15.0	15.7	15.9	15.4	14.6
	DEC	60 40	30	28	22	14	07	04	05	11	19	29	39	46	49
8	RA	01 25	14.7	13.7	12.9	12.5	12.9	14.1	15.6	17.3	18.7	19.7	20.0	19.8	19.1
	DEC	60 11	44	43	38	30	23	19	19	24	32	41	51	58	62
9	RA	01 37	24.6	23.6	22.8	22.3	22.3	23.1	24.3	25.7	27.0	27.8	28.0	27.5	26.7
	DEC	-57 16	67	66	61	52	42	31	23	19	21	27	36	44	49
10		SEE TABLE 11. APPARENT PLACES OF POLARIS,1991													
11	RA	02 06	41.4	41.0	40.6	40.3	40.5	41.1	42.0	43.0	44.0	44.7	45.1	45.2	45.0
	DEC	23 25	26	25	22	19	18	19	22	27	32	37	40	42	42
12	RA	02 57	57.1	56.5	55.8	55.2	55.1	55.4	56.1	57.2	58.2	59.1	59.6	59.7	59.3
	DEC	-40 19	91	94	93	88	80	70	61	54	52	55	62	71	78
13	RA	03 01	50.3	49.9	49.5	49.2	49.1	49.5	50.3	51.2	52.1	52.8	53.4	53.6	53.5
	DEC	04 03	24	22	21	21	22	26	31	36	40	42	41	39	37
14	RA	03 23	43.2	42.6	41.9	41.2	41.1	41.6	42.6	43.9	45.3	46.5	47.4	47.8	47.8
	DEC	49 49	65	67	66	61	56	51	49	50	53	58	65	71	76
15	RA	04 35	26.5	26.3	25.9	25.4	25.1	25.3	25.8	26.6	27.6	28.5	29.3	29.9	30.1
	DEC	16 29	38	37	36	35	34	35	37	40	42	43	44	43	42
16	RA	05 14	08.5	08.4	08.0	07.4	07.0	07.0	07.4	08.1	08.9	09.8	10.6	11.2	11.5
	DEC	-08 12	39	43	46	46	44	39	34	28	25	24	27	32	38
17	RA	05 16	04.6	04.4	03.9	03.1	02.6	02.6	03.2	04.2	05.4	06.7	07.9	08.8	09.2
	DEC	45 59	32	36	37	36	33	28	24	22	21	22	25	28	33
18	RA	05 24	41.2	41.1	40.7	40.2	39.8	39.8	40.2	40.9	41.8	42.7	43.5	44.2	44.5
	DEC	06 20	35	33	32	31	32	34	37	40	43	43	42	39	36
19	RA	05 25	46.0	45.9	45.5	44.9	44.5	44.6	45.0	45.8	46.8	47.8	48.8	49.5	49.9
	DEC	28 36	08	09	10	09	07	06	05	05	05	06	07	07	08
20	RA	05 35	47.7	47.6	47.2	46.7	46.3	46.3	46.6	47.2	48.1	49.0	49.8	50.5	50.8
	DEC	-01 12	23	26	28	29	27	24	20	16	13	12	14	19	24
21	RA	05 40	20.5	20.5	20.1	19.5	19.2	19.1	19.4	20.0	20.9	21.8	22.6	23.3	23.6
	DEC	-01 56	47	50	52	53	51	48	44	39	36	36	38	42	48
22	RA	05 54	43.4	43.5	43.1	42.6	42.2	42.1	42.4	43.0	43.9	44.8	45.7	46.4	46.8
	DEC	07 24	24	22	21	20	21	23	25	28	30	30	29	26	22
23	RA	06 23	47.8	47.6	46.8	45.7	44.7	44.1	44.1	44.5	45.5	46.7	47.9	48.8	49.2
	DEC	-52 41	24	34	40	42	40	33	24	14	07	05	09	18	29
24	RA	06 37	14.1	14.2	13.9	13.4	13.0	12.8	13.0	13.5	14.3	15.2	16.2	17.0	17.6
	DEC	16 24	29	28	27	27	27	28	28	29	29	29	27	25	22
25	RA	06 44	47.4	47.4	47.1	46.6	46.0	45.8	45.9	46.3	47.0	47.9	48.8	49.6	50.1
	DEC	-16 42	11	18	22	23	22	18	13	07	02	01	04	11	19

Table 10a (4). Apparent Places of Stars, 1991 (Degrees)—Continued

Star No.	Right ascension / Declination	(Hr Min) (° ′)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
26	RA	06 58	18.6	18.7	18.3	17.7	17.1	16.7	16.7	17.1	17.8	18.7	19.7	20.5	21.1
	DEC	-28 57	32	41	46	49	47	43	36	28	22	21	23	30	40
27	RA	07 08	03.8	03.9	03.6	03.0	02.4	02.0	02.0	02.4	03.0	03.9	04.9	05.7	06.3
	DEC	-26 22	41	49	55	57	56	52	45	38	33	31	33	40	50
28	RA	07 34	04.4	04.8	04.6	04.1	03.5	03.2	03.3	03.7	04.4	05.3	06.5	07.5	08.3
	DEC	31 54	29	30	32	34	34	33	31	29	26	23	20	18	18
29	RA	07 38	52.2	52.5	52.4	51.9	51.4	51.2	51.2	51.5	52.1	52.9	53.8	54.7	55.4
	DEC	05 14	54	50	48	48	48	49	51	54	55	54	51	47	42
30	RA	07 44	48.7	49.1	48.9	48.4	47.9	47.6	47.6	47.9	48.6	49.5	50.6	51.6	52.4
	DEC	28 02	51	52	53	55	56	55	54	52	49	46	43	41	39
31	RA	08 09	17.6	17.9	17.6	16.9	16.0	15.3	15.0	15.0	15.5	16.5	17.7	18.8	19.7
	DEC	-47 18	31	42	50	56	57	54	47	39	31	26	27	33	44
32	RA	08 22	22.4	22.7	22.3	21.3	20.1	19.0	18.3	18.2	18.8	19.8	21.3	22.8	23.9
	DEC	-59 28	43	54	64	71	73	71	64	55	46	41	41	46	57
33	RA	09 07	41.9	42.4	42.4	41.9	41.2	40.6	40.2	40.0	40.3	41.1	42.1	43.3	44.3
	DEC	-43 23	40	51	60	67	70	69	64	56	48	43	42	47	57
34	RA	09 13	09.2	09.9	09.6	08.4	06.7	05.0	03.6	03.0	03.2	04.4	06.4	08.5	10.2
	DEC	-69 40	39	50	61	70	75	75	71	62	53	46	43	47	56
35	RA	09 27	10.6	11.2	11.4	11.1	10.7	10.4	10.1	10.1	10.4	11.0	11.8	12.8	13.7
	DEC	-08 37	11	18	23	26	26	25	22	18	15	15	17	22	29
36	RA	10 07	55.5	56.3	56.5	56.4	56.1	55.7	55.5	55.4	55.6	56.0	56.8	57.7	58.8
	DEC	12 00	33	29	28	28	30	31	32	33	32	29	25	19	13
37	RA	11 01	20.7	22.0	22.6	22.6	22.0	21.2	20.4	19.9	19.8	20.2	21.2	22.5	24.1
	DEC	56 25	29	31	36	44	50	53	52	47	39	29	19	12	08
38	RA	11 03	13.5	15.0	15.7	15.6	14.9	13.9	13.0	12.3	12.1	12.5	13.6	15.1	16.9
	DEC	61 47	36	38	44	52	59	62	60	55	46	36	26	19	15
39	RA	11 48	37.4	38.3	38.9	39.1	39.0	38.7	38.4	38.1	38.0	38.1	38.6	39.5	40.5
	DEC	14 36	68	63	62	63	66	68	70	71	70	66	61	54	47
40	RA	11 53	23.4	24.8	25.6	25.8	25.4	24.8	24.1	23.4	23.0	23.1	23.8	24.9	26.3
	DEC	53 43	78	78	82	89	96	101	102	98	91	82	72	63	57
41	RA	12 15	21.5	22.5	23.1	23.4	23.4	23.2	22.9	22.6	22.4	22.5	22.9	23.7	24.8
	DEC	-17 29	33	40	46	51	53	54	53	50	47	45	45	47	53
42	RA	12 26	06.3	08.1	09.2	09.7	09.6	09.0	08.0	07.0	06.2	06.1	06.8	08.2	10.2
	DEC	-63 02	46	53	63	73	83	89	91	89	82	74	67	64	66
43	RA	12 30	40.5	42.0	43.0	43.5	43.4	43.0	42.3	41.4	40.8	40.8	41.3	42.6	44.2
	DEC	-57 03	36	44	53	63	72	78	80	77	71	63	57	54	57
44	RA	12 47	12.0	13.7	14.8	15.4	15.5	15.0	14.3	13.4	12.6	12.5	13.0	14.2	16.0
	DEC	-59 38	12	19	28	38	47	54	56	54	48	41	34	30	32
45	RA	12 53	39.1	40.6	41.7	42.2	42.1	41.5	40.8	39.9	39.2	39.0	39.3	40.1	41.5
	DEC	55 59	66	64	67	74	82	89	92	90	84	75	64	54	47
46	RA	13 23	34.5	36.0	37.1	37.7	37.8	37.3	36.6	35.7	35.0	34.6	34.7	35.4	36.7
	DEC	54 57	55	52	54	61	69	77	80	80	75	67	56	45	37
47	RA	13 24	43.7	44.8	45.5	46.0	46.2	46.2	46.0	45.6	45.3	45.2	45.4	46.0	47.0
	DEC	-11 06	57	63	68	71	73	72	71	69	67	66	67	70	75
48	RA	13 47	11.6	12.9	14.0	14.6	14.8	14.6	14.0	13.2	12.5	12.1	12.1	12.7	13.8
	DEC	49 20	66	61	62	68	76	84	88	89	86	78	68	58	49
49	RA	14 03	10.9	12.7	14.2	15.3	15.8	15.8	15.3	14.4	13.5	12.9	13.0	14.0	15.6
	DEC	-60 19	39	43	49	58	67	74	79	80	76	70	62	57	55

Table 10a.(4). Apparent Places of Stars, 1991 (Degrees)—Continued

Star No.	Right ascansion Declination	(Hr Min) (° ′)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Saconds (tima of RA or arc of daclination)												
50	RA	14 06	09.3	10.6	11.5	12.2	12.6	12.7	12.5	12.1	11.6	11.3	11.4	12.0	13.1
	DEC	-36 19	31	36	42	48	53	58	60	59	56	52	48	46	48
51	RA	14 15	15.4	16.4	17.3	17.9	18.2	18.2	18.0	17.6	17.1	16.8	16.9	17.3	18.1
	DEC	19 13	30	23	21	22	27	31	35	38	37	34	28	20	12
52	RA	14 38	58.8	60.6	62.1	63.4	64.1	64.3	63.9	63.0	62.0	61.2	61.1	61.8	63.3
	DEC	-60 47	47	49	54	62	70	78	84	85	83	77	70	64	61
53	RA	14 50	22.9	24.0	24.9	25.6	26.1	26.3	26.3	25.9	25.5	25.2	25.2	25.6	26.4
	DEC	-16 00	21	26	30	33	35	35	35	33	32	30	30	31	34
54	RA	14 50	41.3	43.8	46.2	48.1	48.8	48.2	46.7	44.4	42.0	40.0	39.0	39.2	40.7
	DEC	74 10	68	63	63	70	79	88	95	97	94	87	76	65	55
55	RA	15 34	18.2	19.2	20.1	20.9	21.5	21.7	21.6	21.2	20.7	20.2	19.9	20.1	20.7
	DEC	26 44	26	19	16	18	23	30	36	40	41	39	33	25	16
56	RA	15 59	47.9	48.9	49.9	50.8	51.5	51.9	52.1	51.8	51.4	50.9	50.7	50.9	51.6
	DEC	-22 35	50	53	56	59	60	61	62	62	61	59	58	57	58
57	RA	16 28	51.0	52.0	53.0	54.0	54.8	55.4	55.6	55.4	54.9	54.4	54.1	54.3	54.9
	DEC	-26 24	48	50	52	54	55	57	58	58	58	56	54	53	53
58	RA	16 47	40.8	42.9	45.1	47.4	49.3	50.6	51.0	50.4	49.0	47.6	46.5	46.4	47.5
	DEC	-69 00	41	37	36	39	44	52	59	65	68	66	60	52	45
59	RA	17 09	51.3	52.1	53.0	54.0	54.8	55.4	55.7	55.6	55.3	54.8	54.4	54.4	54.9
	DEC	-15 42	55	57	59	60	59	58	57	56	55	55	54	55	56
60	RA	17 32	59.4	60.3	61.4	62.5	63.5	64.4	64.8	64.8	64.3	63.8	63.3	63.2	63.6
	DEC	-37 05	55	53	53	54	55	57	59	61	63	62	60	57	54
61	RA	17 34	30.5	31.2	32.0	32.9	33.7	34.3	34.6	34.6	34.2	33.6	33.2	33.1	33.4
	DEC	12 33	51	44	41	41	44	50	56	61	64	65	62	58	51
62	RA	17 56	22.1	22.7	23.7	25.0	26.1	26.9	27.1	26.8	26.0	25.0	24.0	23.4	23.5
	DEC	51 28	75	65	60	59	64	73	83	92	98	99	96	88	78
63	RA	18 23	34.1	34.9	35.8	36.9	37.9	38.9	39.5	39.6	39.3	38.7	38.2	37.9	38.2
	DEC	-34 23	26	24	23	22	21	22	23	25	27	27	26	24	22
64	RA	18 36	36.9	37.4	38.1	39.1	40.1	41.0	41.4	41.4	40.9	40.2	39.4	39.0	39.0
	DEC	38 46	26	16	11	09	13	21	31	40	46	49	47	41	32
65	RA	18 54	42.1	42.7	43.5	44.5	45.5	46.4	47.0	47.3	47.0	46.6	46.0	45.8	45.9
	DEC	-26 18	35	34	33	31	29	28	27	28	29	29	30	29	27
66	RA	19 50	20.2	20.5	21.1	21.9	22.8	23.7	24.3	24.6	24.6	24.2	23.7	23.3	23.2
	DEC	08 50	38	33	30	29	32	38	45	51	55	57	57	55	50
67	RA	20 24	55.9	56.2	57.0	58.3	59.8	61.4	62.7	63.4	63.3	62.7	61.8	60.9	60.6
	DEC	-56 45	61	53	46	40	35	34	36	41	47	52	54	52	46
68	RA	20 41	06.3	06.3	06.7	07.5	08.7	09.8	10.7	11.1	11.0	10.5	09.7	09.0	08.5
	DEC	45 14	60	51	44	39	40	45	54	65	75	81	84	82	76
69	RA	21 40	28.8	28.2	28.9	30.9	33.8	37.4	40.5	42.7	43.2	42.1	39.7	37.0	34.9
	DEC	-77 25	62	53	43	33	25	22	24	30	38	46	50	50	44
70	RA	22 07	40.3	40.2	40.4	41.1	42.1	43.4	44.6	45.5	46.0	45.8	45.3	44.6	44.1
	DEC	-46 59	87	82	75	67	60	54	52	53	58	63	68	70	68
71	RA	22 42	34.7	34.5	34.5	34.9	35.7	36.7	37.7	38.5	38.9	39.0	38.6	38.2	37.8
	DEC	30 10	39	34	28	24	23	27	33	42	50	57	61	62	59
72	RA	22 57	09.8	09.6	09.6	10.0	10.7	11.7	12.8	13.7	14.2	14.3	14.0	13.5	13.1
	DEC	-29 39	78	76	72	66	59	52	47	45	46	50	54	57	57
73	RA	23 04	19.0	18.8	18.8	19.1	19.8	20.7	21.7	22.5	23.0	23.1	22.9	22.5	22.2
	DEC	15 09	33	29	26	24	25	29	36	43	49	54	56	56	54

Table 10a.(5). Apparent Places of Stars, 1992 (Degrees)—Continued

Ster No.	Right ascension / Declination	(Hr Min) (° ′)	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA	14 06	13.1	14.3	15.3	16.1	16.4	16.5	16.3	15.8	15.3	15.0	15.1	15.7	16.8
	DEC	-36 19	48	52	58	65	70	74	76	75	72	68	64	62	64
51	RA	14 15	18.1	19.2	20.0	20.7	20.9	20.9	20.7	20.3	19.9	19.5	19.6	20.0	20.9
	DEC	19 12	72	66	63	65	69	74	78	80	80	77	71	63	55
52	RA	14 39	03.3	05.1	06.7	08.0	08.7	08.8	08.4	07.5	06.4	05.7	05.6	06.3	07.7
	DEC	-60 48	01	03	08	16	24	31	37	39	36	30	23	17	14
53	RA	14 50	26.4	27.5	28.4	29.1	29.6	29.8	29.7	29.4	28.9	28.6	28.6	29.0	29.8
	DEC	-16 00	34	39	43	47	48	48	48	46	45	43	42	44	47
54	RA	14 50	40.7	43.2	45.6	47.5	48.2	47.5	45.9	43.7	41.3	39.3	38.3	38.5	40.1
	DEC	74 10	55	49	50	56	66	75	82	84	81	74	63	52	42
55	RA	15 34	20.7	21.7	22.7	23.5	24.0	24.2	24.2	23.8	23.2	22.7	22.4	22.6	23.3
	DEC	26 44	16	09	06	08	13	20	27	31	32	29	23	15	06
56	RA	15 59	51.6	52.6	53.6	54.5	55.2	55.6	55.7	55.5	55.0	54.5	54.3	54.5	55.2
	DEC	-22 35	58	61	64	67	68	69	69	69	68	67	65	65	66
57	RA	16 28	54.9	55.9	56.9	57.9	58.6	59.2	59.4	59.2	58.7	58.2	57.9	58.0	58.6
	DEC	-26 24	53	55	57	59	61	62	63	63	63	61	59	58	58
58	RA	16 47	47.5	49.6	51.9	54.2	56.1	57.3	57.7	57.0	55.6	54.1	53.1	53.1	54.2
	DEC	-69 00	45	40	40	43	48	55	63	69	71	69	63	55	48
59	RA	17 09	54.9	55.7	56.6	57.6	58.3	59.0	59.3	59.2	58.8	58.3	57.9	57.9	58.3
	DEC	-15 42	56	59	61	62	61	60	58	58	57	56	56	56	58
60	RA	17 33	03.6	04.6	05.6	06.8	07.8	08.6	09.0	09.0	08.5	07.9	07.4	07.3	07.7
	DEC	-37 05	54	53	53	53	54	56	58	61	62	62	59	56	54
61	RA	17 34	33.4	34.1	34.9	35.8	36.6	37.2	37.5	37.4	37.0	36.4	36.0	35.9	36.2
	DEC	12 33	51	45	41	41	45	51	57	61	65	65	63	58	52
62	RA	17 56	23.5	24.2	25.2	26.5	27.5	28.3	28.5	28.2	27.4	26.3	25.4	24.8	24.9
	DEC	51 29	18	08	02	02	07	16	26	35	41	42	39	31	20
63	RA	18 23	38.2	39.0	39.9	41.0	42.0	42.9	43.5	43.7	43.3	42.7	42.2	41.9	42.2
	DEC	-34 23	22	19	18	17	16	17	18	20	22	22	21	19	17
64	RA	18 36	39.0	39.5	40.3	41.3	42.3	43.1	43.5	43.5	43.0	42.2	41.5	41.0	41.0
	DEC	38 46	32	23	17	16	20	28	37	46	53	55	53	47	38
65	RA	18 54	45.9	46.5	47.3	48.3	49.3	50.2	50.8	51.1	50.8	50.3	49.8	49.5	49.6
	DEC	-26 18	27	26	25	23	22	20	19	20	21	22	22	21	20
66	RA	19 50	23.2	23.6	24.1	24.9	25.8	26.7	27.4	27.7	27.5	27.1	26.6	26.3	26.2
	DEC	08 50	50	46	43	42	45	51	57	63	68	70	70	67	63
67	RA	20 25	0 .6	0 .9	01.8	03.0	04.5	06.1	07.3	08.0	07.9	07.3	06.3	05.5	05.1
	DEC	-56 45	46	39	31	25	21	20	22	27	33	37	39	37	32
68	RA	20 41	08.5	08.5	09.0	09.8	10.9	12.1	12.9	13.4	13.2	12.7	11.9	11.2	10.7
	DEC	45 14	76	67	59	55	55	61	70	81	90	97	100	97	91
69	RA	21 40	34.9	34.2	34.9	37.0	39.9	43.3	46.5	48.6	49.1	47.9	45.5	42.8	40.6
	DEC	-77 25	44	34	24	14	07	04	05	11	20	28	32	32	26
70	RA	22 07	44.1	43.9	44.1	44.8	45.8	47.0	48.3	49.2	49.6	49.4	48.9	48.2	47.6
	DEC	-46 59	68	62	55	47	40	34	32	34	38	44	49	50	49
71	RA	22 42	37.8	37.5	37.5	37.9	38.7	39.7	40.7	41.5	41.9	41.9	41.6	41.1	40.7
	DEC	30 10	59	54	49	44	43	47	54	62	71	77	82	82	79
72	RA	22 57	13.1	12.9	13.0	13.3	14.0	15.0	16.1	17.0	17.4	17.5	17.2	16.8	16.3
	DEC	-29 39	57	55	51	45	38	31	27	25	26	29	34	37	37
73	RA	23 04	22.2	22.0	22.0	22.3	22.9	23.8	24.8	25.6	26.1	26.2	25.9	25.6	25.2
	DEC	15 09	54	50	47	45	46	50	57	64	70	74	76	76	74

Table 10b.(1). Apparent Places of Stars, 1988 (Mils of Declination)

Star No.	Right ascension / Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
1	RA	00 07	45.5	45.1	44.9	45.0	45.6	46.5	47.6	48.6	49.3	49.6	49.6	49.4	48.9
	DEC	515	1.03	1.01	1.00	.98	.97	.98	1.00	1.04	1.08	1.11	1.13	1.15	1.14
2	RA	00 08	30.8	29.9	29.3	29.4	30.2	31.6	33.2	34.6	35.6	36.1	35.9	35.3	34.4
	DEC	1050	.46	.44	.41	.37	.34	.34	.35	.39	.44	.49	.54	.56	.57
3	RA	00 25	10.5	08.0	06.6	06.2	07.3	09.6	12.7	15.9	18.3	19.2	18.4	16.4	13.6
	DEC	-1374	.71	.68	.63	.58	.52	.47	.45	.45	.47	.52	.56	.59	.59
4	RA	00 25	42.1	41.6	41.3	41.3	41.8	42.7	43.9	45.1	45.9	46.3	46.3	45.9	45.3
	DEC	- 753	.33	.32	.29	.25	.21	.17	.13	.12	.13	.15	.19	.21	.22
5	RA	00 39	48.5	47.7	47.1	47.0	47.6	48.9	50.4	51.8	52.9	53.5	53.6	53.1	52.4
	DEC	1003	1.03	1.02	.99	.95	.93	.91	.93	.96	1.00	1.05	1.10	1.13	1.14
6	RA	00 42	59.5	59.2	59.0	59.0	59.4	60.1	61.1	62.1	62.9	63.3	63.4	63.2	62.9
	DEC	- 320	.96	.96	.95	.93	.90	.86	.83	.80	.80	.80	.82	.84	.85
7	RA	00 55	58.0	57.0	56.2	56.0	56.6	57.9	59.5	61.2	62.4	63.2	63.3	62.9	62.1
	DEC	1078	.36	.35	.32	.28	.25	.23	.24	.27	.31	.36	.41	.44	.46
8	RA	01 24	61.2	60.2	59.4	59.0	59.4	60.6	62.2	63.9	65.3	66.2	66.6	66.3	65.6
	DEC	1069	.85	.84	.82	.78	.75	.73	.73	.76	.80	.84	.89	.93	.95
9	RA	01 37	17.7	16.7	16.0	15.5	15.6	16.3	17.6	19.1	20.4	21.2	21.4	21.0	20.1
	DEC	-1018	.69	.69	.66	.61	.56	.51	.47	.45	.45	.48	.53	.57	.59
10	SEE TABLE 11. APPARENT PLACES OF POLARIS, 1988														
11	RA	02 06	30.1	29.8	29.4	29.1	29.3	29.9	30.9	31.9	32.9	33.6	34.0	34.1	33.9
	DEC	416	.16	.16	.15	.13	.13	.13	.15	.17	.20	.22	.24	.25	.25
12	RA	02 57	49.8	49.2	48.6	48.0	47.9	48.2	49.0	50.1	51.1	52.0	52.5	52.6	52.3
	DEC	- 717	.41	.42	.41	.39	.34	.29	.25	.21	.20	.22	.25	.29	.33
13	RA	03 01	39.9	39.6	39.2	38.9	38.9	39.3	40.1	41.0	41.9	42.7	43.2	43.5	43.4
	DEC	71	.91	.90	.90	.90	.91	.92	.95	.98	1.00	1.00	1.00	1.00	.99
14	RA	03 23	28.8	28.3	27.6	26.9	26.8	27.3	28.4	29.7	31.1	32.3	33.2	33.7	33.6
	DEC	885	.76	.77	.77	.75	.72	.70	.69	.70	.71	.74	.77	.81	.83
15	RA	04 35	15.1	15.0	14.6	14.1	13.8	14.0	14.6	15.5	16.4	17.4	18.2	18.7	19.0
	DEC	293	.13	.13	.12	.12	.12	.12	.13	.15	.16	.17	.17	.17	.17
16	RA	05 13	59.0	58.9	58.5	58.0	57.6	57.6	58.1	58.8	59.6	60.5	61.4	62.0	62.2
	DEC	- 145	1.01	1.03	1.04	1.04	1.03	1.01	.98	.95	.94	.93	.95	.97	1.00
17	RA	05 15	49.9	49.8	49.3	48.5	48.0	48.1	48.7	49.8	51.0	52.3	53.6	54.4	54.9
	DEC	817	.60	.62	.63	.63	.61	.59	.58	.57	.56	.57	.58	.60	.62
18	RA	05 24	30.6	30.6	30.2	29.7	29.3	29.3	29.8	30.5	31.4	32.3	33.2	33.8	34.2
	DEC	112	.74	.73	.73	.73	.73	.74	.76	.77	.79	.79	.78	.77	.76
19	RA	05 25	33.5	33.5	33.1	32.5	32.1	32.2	32.7	33.5	34.5	35.5	36.6	37.3	37.7
	DEC	508	.46	.47	.47	.47	.46	.45	.45	.45	.45	.46	.46	.47	.47
20	RA	05 35	37.6	37.6	37.3	36.7	36.4	36.3	36.7	37.4	38.2	39.1	40.0	40.7	41.0
	DEC	- 21	.46	.48	.48	.48	.48	.46	.44	.42	.40	.40	.41	.43	.45
21	RA	05 40	10.6	10.5	10.2	09.7	09.3	09.2	09.6	10.3	11.1	12.0	12.9	13.6	13.9
	DEC	- 34	.61	.62	.63	.63	.62	.61	.59	.56	.55	.54	.55	.57	.60
22	RA	05 54	32.8	32.8	32.5	32.0	31.6	31.5	31.9	32.5	33.4	34.3	35.2	35.9	36.4
	DEC	131	.69	.68	.67	.67	.68	.69	.70	.72	.73	.73	.72	.71	.69
23	RA	06 23	43.4	43.2	42.4	41.3	40.3	39.7	39.7	40.2	41.2	42.4	43.6	44.5	44.9
	DEC	- 936	.66	.71	.74	.75	.73	.70	.65	.60	.56	.56	.58	.62	.67
24	RA	06 37	02.7	02.9	02.6	02.1	01.7	01.5	01.8	02.4	03.2	04.1	05.1	06.0	06.5
	DEC	291	.77	.77	.77	.77	.77	.77	.77	.78	.78	.78	.77	.76	.75
25	RA	06 44	38.7	38.8	38.5	37.9	37.4	37.2	37.3	37.8	38.5	39.3	40.3	41.1	41.6
	DEC	- 296	.84	.87	.89	.90	.89	.87	.84	.81	.79	.79	.80	.83	.87

Table 10b.(1). Apparent Places of Stars, 1988 (Mils of Declination)—Continued

Star No.	Right Ascension / Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
26	RA	06 58	10.8	10.9	10.6	09.9	09.3	09.0	09.0	09.4	10.1	11.0	12.0	12.9	13.4
	DEC	- 514	.72	.77	.79	.80	.80	.77	.74	.70	.67	.66	.67	.71	.75
27	RA	07 07	55.7	55.8	55.5	54.9	54.3	54.0	54.0	54.4	55.1	56.0	57.0	57.8	58.4
	DEC	- 468	.82	.87	.89	.90	.90	.87	.84	.80	.78	.77	.79	.81	.86
28	RA	07 33	51.9	52.3	52.2	51.7	51.1	50.8	50.9	51.4	52.1	53.1	54.3	55.3	56.2
	DEC	567	.40	.41	.42	.43	.44	.43	.42	.41	.39	.38	.37	.36	.36
29	RA	07 38	41.9	42.2	42.1	41.7	41.2	40.9	41.0	41.4	42.0	42.8	43.8	44.7	45.4
	DEC	93	.48	.46	.45	.45	.45	.46	.47	.48	.49	.48	.47	.45	.42
30	RA	07 44	36.7	37.1	37.0	36.5	36.0	35.7	35.8	36.2	36.9	37.8	38.9	39.9	40.7
	DEC	498	.79	.79	.80	.81	.81	.81	.80	.80	.78	.77	.75	.74	.74
31	RA	08 09	11.4	11.7	11.4	10.6	09.8	09.1	08.7	08.8	09.3	10.3	11.5	12.6	13.5
	DEC	- 840	.84	.90	.94	.97	.98	.96	.93	.88	.84	.82	.82	.86	.91
32	RA	08 22	18.1	18.4	17.9	16.9	15.7	14.6	14.0	13.8	14.4	15.5	17.0	18.4	19.5
	DEC	-1057	.19	.24	.29	.33	.34	.32	.29	.24	.20	.18	.18	.20	.25
33	RA	09 07	34.4	35.0	35.0	34.5	33.8	33.1	32.7	32.6	32.9	33.7	34.7	35.9	36.9
	DEC	- 771	.20	.26	.30	.34	.35	.34	.32	.28	.24	.21	.21	.24	.28
34	RA	09 13	06.4	07.2	06.8	05.5	03.8	02.1	0 .8	0 .1	0 .3	01.5	03.5	05.6	07.2
	DEC	-1238	.45	.51	.57	.61	.63	.63	.61	.57	.52	.49	.47	.49	.54
35	RA	09 27	0 .9	01.5	01.7	01.4	01.0	0 .7	0 .5	0 .6	0 .8	01.4	02.3	03.3	04.2
	DEC	- 152	.97	1.01	1.03	1.04	1.04	1.04	1.02	1.01	.99	.99	1.00	1.03	1.06
36	RA	10 07	45.1	45.8	46.2	46.1	45.7	45.4	45.2	45.1	45.3	45.8	46.6	47.6	48.6
	DEC	213	.79	.77	.77	.77	.78	.79	.79	.79	.79	.77	.75	.72	.69
37	RA	11 01	09.3	10.7	11.4	11.4	10.8	10.0	09.3	08.9	08.8	09.2	10.2	11.6	13.3
	DEC	1003	.43	.43	.46	.50	.53	.54	.54	.51	.47	.42	.37	.34	.32
38	RA	11 03	01.9	03.5	04.3	04.3	03.6	02.6	01.7	01.1	01.0	01.4	02.6	04.2	06.0
	DEC	1098	.87	.88	.91	.95	.98	1.00	.99	.96	.91	.86	.81	.78	.77
39	RA	11 48	27.4	28.4	29.0	29.2	29.1	28.8	28.5	28.3	28.2	28.4	28.9	29.8	30.8
	DEC	260	.22	.20	.19	.19	.21	.22	.23	.23	.22	.20	.17	.14	.11
40	RA	11 53	13.5	14.9	15.8	16.0	15.7	15.0	14.4	13.8	13.4	13.6	14.3	15.4	16.9
	DEC	955	.67	.67	.69	.73	.76	.78	.79	.77	.73	.69	.63	.59	.57
41	RA	12 15	11.3	12.3	13.0	13.2	13.2	13.0	12.8	12.5	12.3	12.3	12.8	13.7	14.7
	DEC	- 310	.65	.69	.72	.75	.76	.76	.76	.75	.73	.72	.72	.74	.77
42	RA	12 25	54.6	56.4	57.5	58.0	57.9	57.2	56.3	55.3	54.5	54.4	55.2	56.6	58.5
	DEC	-1120	.50	.54	.58	.64	.68	.72	.73	.72	.68	.65	.61	.60	.61
43	RA	12 30	29.0	30.5	31.5	32.0	31.9	31.5	30.8	30.0	29.4	29.3	29.9	31.2	32.8
	DEC	-1014	.08	.12	.16	.21	.26	.29	.30	.29	.25	.22	.19	.18	.19
44	RA	12 46	59.9	61.6	62.7	63.3	63.3	62.9	62.2	61.2	60.5	60.3	60.9	62.2	63.9
	DEC	-1059	.90	.93	.98	1.02	1.07	1.10	1.12	1.11	1.08	1.04	1.01	1.00	1.00
45	RA	12 53	30.9	32.5	33.6	34.2	34.1	33.5	32.8	32.0	31.3	31.1	31.4	32.4	33.8
	DEC	995	.90	.89	.90	.94	.98	1.00	1.02	1.01	.98	.94	.88	.83	.79
46	RA	13 23	27.0	28.5	29.7	30.3	30.4	30.0	29.3	28.5	27.7	27.3	27.5	28.3	29.6
	DEC	977	.46	.44	.45	.48	.53	.56	.58	.57	.55	.51	.45	.40	.36
47	RA	13 24	33.2	34.3	35.1	35.6	35.8	35.8	35.6	35.3	35.0	34.9	35.1	35.8	36.8
	DEC	- 197	.32	.35	.38	.39	.40	.40	.40	.39	.38	.37	.38	.39	.42
48	RA	13 47	04.1	05.5	06.6	07.3	07.5	07.2	06.7	06.0	05.3	04.9	05.0	05.6	06.7
	DEC	877	.64	.62	.62	.65	.69	.73	.75	.75	.73	.69	.64	.59	.55
49	RA	14 02	56.4	58.3	59.8	60.8	61.4	61.4	60.9	60.0	59.0	58.5	58.7	59.6	61.2
	DEC	-1072	.22	.24	.27	.32	.36	.40	.42	.43	.41	.38	.35	.32	.32

Table 10b.(1). Apparent Places of Stars, 1988 (Mils of Declination)—Continued

Star No.	Right ascension Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA	14 05	57.5	58.7	59.7	60.5	60.8	60.9	60.8	60.3	59.8	59.5	59.7	60.4	61.4
	DEC	- 645	.51	.54	.57	.60	.62	.64	.65	.65	.64	.62	.60	.60	.60
51	RA	14 15	06.4	07.5	08.4	09.0	09.3	09.4	09.2	08.8	08.4	08.1	08.2	08.6	09.5
	DEC	341	1.06	1.03	1.02	1.02	1.04	1.07	1.08	1.09	1.09	1.07	1.04	1.00	.96
52	RA	14 38	44.7	46.6	48.2	49.4	50.1	50.3	49.9	49.1	48.0	47.3	47.2	47.9	49.4
	DEC	-1080	.60	.61	.64	.68	.72	.76	.79	.80	.79	.76	.72	.70	.68
53	RA	14 50	11.9	13.0	14.0	14.7	15.2	15.4	15.4	15.1	14.7	14.3	14.4	14.8	15.7
	DEC	- 284	.32	.35	.37	.39	.40	.40	.40	.39	.39	.38	.38	.39	.40
54	RA	14 50	42.5	45.1	47.5	49.5	50.2	49.6	48.0	45.8	43.4	41.5	40.5	40.7	42.4
	DEC	1318	1.08	1.05	1.05	1.08	1.13	1.18	1.20	1.21	1.20	1.16	1.11	1.05	1.00
55	RA	15 34	09.9	10.9	11.9	12.7	13.3	13.5	13.5	13.1	12.6	12.1	11.9	12.1	12.7
	DEC	475	.57	.53	.51	.52	.55	.58	.61	.62	.63	.61	.59	.55	.50
56	RA	15 59	36.1	37.2	38.2	39.1	39.8	40.3	40.4	40.2	39.8	39.3	39.2	39.4	40.1
	DEC	- 401	.59	.60	.62	.63	.64	.64	.65	.65	.64	.64	.63	.63	.64
57	RA	16 28	38.9	39.9	40.9	41.9	42.7	43.3	43.5	43.4	42.9	42.4	42.2	42.3	43.0
	DEC	- 469	.46	.47	.49	.50	.51	.51	.52	.52	.52	.52	.51	.50	.51
58	RA	16 47	19.6	21.7	24.0	26.4	28.2	29.5	29.9	29.3	28.0	26.5	25.6	25.6	26.7
	DEC	-1226	.79	.77	.77	.78	.81	.85	.88	.92	.93	.92	.89	.85	.82
59	RA	17 09	40.0	40.8	41.8	42.7	43.5	44.2	44.5	44.5	44.1	43.6	43.3	43.3	43.8
	DEC	- 279	.33	.34	.36	.36	.36	.35	.35	.35	.34	.34	.34	.34	.35
60	RA	17 32	46.0	46.9	48.0	49.2	50.2	51.1	51.5	51.5	51.1	50.5	50.1	50.0	50.5
	DEC	- 659	.51	.51	.51	.51	.52	.53	.54	.56	.56	.56	.55	.54	.53
61	RA	17 34	21.3	22.1	22.9	23.8	24.6	25.3	25.6	25.5	25.1	24.6	24.2	24.1	24.4
	DEC	223	.38	.35	.33	.32	.34	.37	.40	.42	.44	.44	.43	.40	.37
62	RA	17 56	17.5	18.2	19.2	20.5	21.6	22.3	22.6	22.3	21.4	20.4	19.5	19.0	19.0
	DEC	915	.32	.27	.24	.23	.26	.30	.35	.40	.42	.43	.41	.37	.32
63	RA	18 23	21.0	21.8	22.8	23.9	25.0	25.9	26.6	26.7	26.4	25.9	25.4	25.2	25.5
	DEC	- 611	.44	.43	.43	.42	.42	.42	.43	.44	.45	.46	.45	.44	.43
64	RA	18 36	30.1	30.7	31.5	32.5	33.5	34.3	34.8	34.7	34.3	33.6	32.8	32.4	32.4
	DEC	689	.23	.19	.16	.15	.17	.21	.25	.30	.33	.34	.33	.30	.25
65	RA	18 54	29.9	30.6	31.4	32.4	33.4	34.4	35.0	35.3	35.1	34.6	34.1	33.9	34.1
	DEC	- 467	.83	.82	.82	.81	.80	.79	.79	.80	.80	.81	.81	.80	.80
66	RA	19 50	10.6	10.9	11.5	12.3	13.2	14.1	14.8	15.2	15.1	14.7	14.2	13.9	13.8
	DEC	157	.05	.02	.01	0.00	.02	.05	.08	.11	.13	.14	.14	.13	.10
67	RA	20 24	40.6	41.0	41.9	43.2	44.8	46.4	47.7	48.4	48.4	47.8	46.9	46.2	45.8
	DEC	-1009	.40	.36	.32	.29	.27	.27	.28	.30	.33	.36	.37	.36	.33
68	RA	20 40	59.4	59.4	59.8	60.7	61.8	62.9	63.8	64.2	64.1	63.6	62.8	62.1	61.6
	DEC	804	.22	.17	.14	.11	.11	.14	.19	.24	.29	.32	.33	.32	.29
69	RA	21 40	08.5	07.9	08.8	11.0	14.0	17.5	20.8	23.1	23.6	22.5	20.2	17.6	15.6
	DEC	-1376	.88	.83	.78	.73	.70	.68	.69	.72	.76	.80	.82	.82	.79
70	RA	22 07	28.3	28.2	28.5	29.1	30.2	31.5	32.8	33.8	34.2	34.1	33.5	32.9	32.4
	DEC	- 835	.99	.96	.93	.88	.85	.82	.81	.82	.84	.87	.89	.90	.89
71	RA	22 42	25.3	25.1	25.1	25.5	26.3	27.3	28.4	29.2	29.6	29.6	29.3	28.9	28.4
	DEC	536	.17	.15	.12	.10	.10	.11	.15	.19	.23	.27	.29	.29	.28
72	RA	22 56	59.1	59.0	59.0	59.4	60.1	61.2	62.3	63.2	63.7	63.8	63.6	63.2	62.8
	DEC	- 527	.81	.80	.78	.75	.72	.68	.66	.65	.65	.67	.69	.70	.71
73	RA	23 04	09.1	08.9	08.9	09.3	09.9	10.9	11.9	12.7	13.2	13.3	13.1	12.8	12.4
	DEC	269	.18	.16	.14	.13	.14	.16	.20	.23	.26	.28	.29	.29	.28

Table 10b.(2). Apparent Places of Stars, 1989 (Mils of Declination)—Continued

Star No.	Right Ascension / Declination	(Hr Min) / MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA	14 06	01.4	02.7	03.7	04.5	04.8	04.9	04.7	04.3	03.8	03.5	03.6	04.3	05.4
	DEC	- 645	.60	.63	.66	.69	.72	.74	.75	.75	.73	.71	.69	.68	.69
51	RA	14 15	09.5	10.5	11.4	12.1	12.4	12.4	12.2	11.8	11.4	11.1	11.1	11.6	12.5
	DEC	341	.96	.93	.92	.93	.95	.97	.99	1.00	1.00	.98	.95	.91	.87
52	RA	14 38	49.4	51.3	52.8	54.1	54.8	55.0	54.6	53.8	52.7	51.9	51.8	52.6	54.1
	DEC	-1080	.68	.69	.72	.76	.80	.83	.86	.87	.86	.83	.80	.77	.76
53	RA	14 50	15.7	16.7	17.6	18.4	18.9	19.1	19.1	18.8	18.4	18.0	18.0	18.5	19.3
	DEC	- 284	.40	.42	.45	.46	.47	.47	.47	.47	.46	.45	.45	.46	.48
54	RA	14 50	42.4	44.9	47.2	49.1	49.9	49.3	47.7	45.4	43.1	41.2	40.1	40.3	41.9
	DEC	1318	1.00	.97	.97	1.00	1.05	1.10	1.13	1.14	1.12	1.09	1.03	.97	.92
55	RA	15 34	12.7	13.7	14.7	15.5	16.1	16.3	16.3	15.9	15.4	14.8	14.6	14.8	15.5
	DEC	475	.50	.47	.45	.46	.48	.52	.55	.57	.57	.56	.53	.49	.44
56	RA	15 59	40.1	41.1	42.1	43.1	43.8	44.2	44.4	44.2	43.7	43.3	43.0	43.3	44.1
	DEC	- 401	.64	.65	.67	.68	.69	.70	.70	.70	.70	.69	.68	.68	.69
57	RA	16 28	43.0	44.0	45.0	46.0	46.8	47.4	47.6	47.5	47.0	46.5	46.2	46.4	47.1
	DEC	- 469	.51	.51	.53	.54	.55	.55	.56	.56	.56	.55	.54	.54	.54
58	RA	16 47	26.7	28.8	31.0	33.5	35.4	36.6	37.0	36.5	35.1	33.6	32.6	32.6	33.8
	DEC	-1226	.82	.80	.80	.81	.84	.88	.91	.94	.96	.95	.92	.88	.85
59	RA	17 09	43.8	44.6	45.5	46.5	47.4	48.0	48.3	48.3	47.9	47.4	47.0	47.1	47.6
	DEC	- 279	.35	.37	.38	.38	.38	.37	.37	.36	.36	.36	.36	.36	.37
60	RA	17 32	50.5	51.5	52.5	53.7	54.8	55.6	56.0	56.1	55.6	55.0	54.5	54.5	55.0
	DEC	- 659	.53	.52	.52	.52	.53	.54	.55	.56	.57	.57	.56	.54	.53
61	RA	17 34	24.4	25.2	26.0	26.9	27.7	28.3	28.7	28.6	28.2	27.7	27.2	27.2	27.5
	DEC	223	.37	.34	.32	.32	.33	.36	.39	.42	.43	.43	.42	.40	.36
62	RA	17 56	19.0	19.7	20.7	22.0	23.1	23.9	24.1	23.8	23.0	22.0	21.0	20.5	20.6
	DEC	915	.32	.27	.24	.24	.26	.31	.36	.40	.43	.43	.41	.38	.32
63	RA	18 23	25.5	26.2	27.2	28.3	29.4	30.3	30.9	31.1	30.8	30.2	29.7	29.5	29.8
	DEC	- 611	.43	.42	.41	.41	.41	.41	.42	.43	.44	.44	.43	.42	.41
64	RA	18 36	32.4	32.9	33.7	34.8	35.8	36.6	37.0	37.0	36.5	35.8	35.1	34.6	34.7
	DEC	689	.25	.21	.18	.18	.19	.23	.28	.32	.35	.36	.35	.33	.28
65	RA	18 54	34.1	34.7	35.5	36.5	37.5	38.4	39.1	39.4	39.2	38.7	38.2	37.9	38.1
	DEC	- 467	.80	.79	.79	.78	.77	.76	.76	.76	.77	.77	.77	.77	.77
66	RA	19 50	13.8	14.2	14.7	15.6	16.5	17.4	18.0	18.4	18.3	17.9	17.4	17.1	17.1
	DEC	157	.10	.08	.06	.06	.08	.10	.14	.17	.19	.20	.20	.19	.16
67	RA	20 24	45.8	46.2	47.0	48.4	50.0	51.5	52.8	53.6	53.6	52.9	52.0	51.2	51.0
	DEC	-1009	.33	.29	.26	.22	.20	.20	.21	.23	.26	.29	.30	.29	.26
68	RA	20 41	01.6	01.7	02.1	03.0	04.1	05.2	06.1	06.6	06.4	05.9	05.1	04.4	04.0
	DEC	804	.29	.25	.21	.19	.19	.22	.26	.32	.36	.40	.41	.40	.37
69	RA	21 40	15.6	14.9	15.7	17.9	21.0	24.5	27.7	30.0	30.6	29.4	27.0	24.4	22.4
	DEC	-1376	.79	.74	.69	.64	.61	.59	.60	.63	.67	.71	.73	.73	.70
70	RA	22 07	32.4	32.3	32.5	33.2	34.3	35.6	36.8	37.8	38.3	38.1	37.6	36.9	36.5
	DEC	- 835	.89	.86	.83	.79	.75	.72	.71	.72	.74	.77	.79	.80	.79
71	RA	22 42	28.4	28.2	28.3	28.7	29.4	30.5	31.5	32.4	32.8	32.8	32.4	32.0	31.6
	DEC	536	.28	.25	.23	.21	.20	.22	.25	.30	.34	.37	.40	.40	.39
72	RA	22 57	02.8	02.6	02.6	03.0	03.8	04.8	05.8	06.8	07.3	07.4	07.1	06.7	06.4
	DEC	- 527	.71	.70	.68	.64	.61	.58	.55	.54	.55	.57	.59	.60	.60
73	RA	23 04	12.4	12.2	12.2	12.6	13.3	14.2	15.2	16.0	16.5	16.6	16.4	16.1	15.8
	DEC	269	.28	.26	.25	.24	.24	.27	.30	.34	.37	.39	.40	.40	.39

Table 10b.(3). Apparent Places of Stars, 1990 (Mils of Declination)

Star No.	Right ascension / Declination	(Hr Min) / MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
1	RA	00 07	52.4	52.0	51.8	52.0	52.5	53.5	54.5	55.5	56.2	56.5	56.5	56.2	55.9
	DEC	516	.25	.23	.21	.19	.18	.19	.22	.25	.29	.33	.35	.36	.36
2	RA	00 08	38.1	37.2	36.7	36.8	37.6	39.0	40.5	42.0	43.1	43.5	43.3	42.7	41.9
	DEC	1050	.68	.66	.63	.59	.56	.55	.57	.60	.65	.70	.75	.78	.79
3	RA	00 25	16.6	14.0	12.5	12.1	13.1	15.4	18.4	21.5	23.9	24.8	24.0	21.9	19.1
	DEC	-1374	.48	.46	.42	.36	.30	.26	.23	.23	.26	.30	.35	.38	.38
4	RA	00 25	48.5	47.9	47.6	47.6	48.1	49.0	50.1	51.3	52.2	52.6	52.5	52.1	51.5
	DEC	- 752	1.12	1.11	1.09	1.05	1.00	.95	.92	.91	.92	.94	.98	1.01	1.02
5	RA	00 39	56.3	55.4	54.9	54.8	55.5	56.7	58.1	59.6	60.8	61.3	61.3	61.0	60.3
	DEC	1004	.25	.23	.20	.16	.14	.12	.13	.17	.21	.26	.31	.34	.35
6	RA	00 43	06.2	05.8	05.5	05.6	05.9	06.7	07.6	08.6	09.4	09.8	09.8	09.6	09.3
	DEC	- 320	.75	.75	.74	.72	.69	.65	.62	.60	.59	.59	.61	.63	.64
7	RA	00 56	06.3	05.2	04.5	04.4	04.9	06.2	07.8	09.5	10.8	11.5	11.7	11.3	10.5
	DEC	1078	.56	.55	.53	.49	.45	.44	.44	.47	.52	.57	.61	.65	.67
8	RA	01 25	10.1	09.1	08.3	08.0	08.4	09.6	11.2	12.9	14.3	15.2	15.5	15.3	14.7
	DEC	1069	1.05	1.04	1.02	.98	.95	.93	.93	.95	.99	1.04	1.08	1.12	1.14
9	RA	01 37	22.4	21.4	20.6	20.1	20.2	21.0	22.2	23.6	24.9	25.7	25.9	25.4	24.6
	DEC	-1018	.49	.49	.47	.42	.37	.32	.28	.26	.27	.30	.34	.38	.40
10	SEE TABLE 11. APPARENT PLACES OF POLARIS,1990														
11	RA	02 06	37.7	37.3	36.9	36.7	36.8	37.4	38.3	39.4	40.4	41.1	41.4	41.5	41.4
	DEC	416	.34	.34	.32	.31	.30	.31	.32	.35	.38	.40	.41	.42	.42
12	RA	02 57	54.8	54.1	53.5	52.9	52.8	53.1	53.8	54.9	56.0	56.8	57.3	57.4	57.1
	DEC	- 717	.25	.27	.27	.24	.20	.15	.11	.08	.06	.08	.11	.16	.19
13	RA	03 01	46.9	46.5	46.1	45.8	45.8	46.2	46.9	47.9	48.8	49.6	50.0	50.3	50.3
	DEC	72	.05	.04	.04	.04	.04	.06	.09	.11	.13	.14	.14	.13	.12
14	RA	03 23	38.4	37.8	37.1	36.5	36.4	36.9	37.9	39.3	40.7	41.9	42.7	43.2	43.2
	DEC	885	.89	.90	.90	.88	.85	.83	.82	.82	.84	.86	.90	.93	.95
15	RA	04 35	22.8	22.6	22.2	21.7	21.5	21.6	22.1	23.0	24.0	24.9	25.7	26.2	26.5
	DEC	293	.20	.19	.19	.19	.18	.19	.20	.20	.22	.23	.23	.22	.22
16	RA	05 14	05.4	05.3	04.9	04.3	04.0	04.0	04.3	05.0	05.9	06.8	07.6	08.2	08.5
	DEC	- 145	.98	1.00	1.01	1.01	1.00	.98	.95	.93	.91	.91	.92	.95	.97
17	RA	05 15	59.8	59.6	59.1	58.3	57.9	57.9	58.4	59.5	60.8	62.0	63.2	64.1	64.6
	DEC	817	.63	.65	.66	.65	.63	.61	.60	.59	.58	.59	.60	.62	.64
18	RA	05 24	37.7	37.6	37.3	36.8	36.4	36.4	36.8	37.5	38.4	39.3	40.1	40.8	41.2
	DEC	112	.77	.75	.75	.74	.75	.76	.77	.79	.80	.80	.80	.79	.77
19	RA	05 25	41.9	41.8	41.4	40.9	40.5	40.5	40.9	41.8	42.8	43.8	44.8	45.5	46.0
	DEC	508	.48	.49	.49	.48	.48	.47	.47	.46	.47	.47	.48	.48	.48
20	RA	05 35	44.4	44.3	43.9	43.4	43.1	43.0	43.4	44.0	44.9	45.8	46.6	47.3	47.7
	DEC	- 21	.45	.46	.47	.48	.47	.45	.43	.41	.39	.39	.40	.42	.45
21	RA	05 40	17.3	17.2	16.8	16.3	16.0	15.9	16.2	16.9	17.7	18.6	19.4	20.1	20.5
	DEC	- 34	.60	.62	.63	.63	.62	.60	.58	.56	.55	.54	.55	.58	.60
22	RA	05 54	40.0	39.9	39.6	39.1	38.7	38.7	39.0	39.6	40.5	41.4	42.2	43.0	43.4
	DEC	131	.68	.67	.67	.66	.67	.68	.69	.70	.71	.72	.71	.69	.67
23	RA	06 23	46.4	46.1	45.3	44.3	43.3	42.7	42.6	43.1	44.1	45.3	46.5	47.4	47.8
	DEC	- 936	.69	.74	.77	.78	.77	.73	.69	.64	.60	.59	.61	.66	.71
24	RA	06 37	10.4	10.5	10.2	09.7	09.3	09.1	09.3	09.9	10.7	11.6	12.6	13.4	14.1
	DEC	291	.72	.72	.72	.72	.72	.72	.72	.73	.73	.73	.72	.71	.70
25	RA	06 44	44.5	44.6	44.3	43.7	43.2	43.0	43.1	43.5	44.3	45.1	46.0	46.8	47.4
	DEC	- 296	.90	.94	.96	.97	.96	.94	.91	.88	.86	.85	.87	.90	.94

Table 10b.(3). Apparent Places of Stars, 1990 (Mils of Declination)—Continued

Star No.	Right ascension / Declination	(Hr Min) / MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or erc of declination)												
26	RA	06 58	16.0	16.1	15.8	15.1	14.6	14.2	14.2	14.6	15.3	16.2	17.2	18.0	18.6
	DEC	- 514	.79	.83	.85	.87	.86	.84	.80	.77	.74	.73	.74	.78	.82
27	RA	07 07	61.1	61.2	60.9	60.3	59.8	59.4	59.4	59.8	60.5	61.3	62.3	63.1	63.8
	DEC	- 468	.90	.94	.97	.98	.98	.95	.92	.88	.86	.85	.86	.90	.94
28	RA	07 33	60.3	60.7	60.5	60.0	59.5	59.2	59.2	59.7	60.4	61.4	62.5	63.5	64.4
	DEC	567	.31	.31	.32	.33	.33	.33	.32	.31	.29	.28	.26	.25	.25
29	RA	07 38	48.8	49.1	49.0	48.6	48.1	47.8	47.9	48.2	48.8	49.6	50.5	51.4	52.2
	DEC	93	.36	.34	.33	.33	.33	.34	.35	.36	.37	.36	.35	.33	.30
30	RA	07 44	44.8	45.1	45.0	44.6	44.1	43.7	43.7	44.1	44.8	45.7	46.8	47.8	48.7
	DEC	498	.68	.69	.69	.70	.70	.70	.69	.68	.67	.66	.64	.63	.62
31	RA	08 09	15.6	15.8	15.5	14.8	14.0	13.2	12.9	13.0	13.5	14.4	15.6	16.8	17.6
	DEC	- 840	.97	1.03	1.07	1.10	1.11	1.09	1.06	1.01	.97	.95	.95	.99	1.04
32	RA	08 22	20.9	21.2	20.8	19.8	18.6	17.5	16.8	16.7	17.3	18.4	19.9	21.3	22.4
	DEC	-1057	.32	.38	.43	.47	.48	.46	.43	.39	.34	.31	.31	.34	.40
33	RA	09 07	39.4	39.9	39.9	39.5	38.8	38.1	37.7	37.6	37.9	38.6	39.7	40.9	41.9
	DEC	- 771	.37	.42	.47	.51	.52	.51	.49	.45	.41	.39	.38	.41	.46
34	RA	09 13	08.2	08.9	08.6	07.4	05.7	03.9	02.6	01.9	02.2	03.4	05.3	07.5	09.2
	DEC	-1238	.62	.68	.74	.78	.80	.80	.78	.74	.70	.66	.65	.66	.71
35	RA	09 27	07.4	08.0	08.2	08.0	07.6	07.2	07.0	07.0	07.3	07.9	08.7	09.6	10.6
	DEC	- 153	.15	.19	.21	.22	.22	.21	.20	.19	.17	.17	.18	.20	.24
36	RA	10 07	52.1	52.8	53.1	53.0	52.7	52.4	52.1	52.1	52.3	52.7	53.5	54.4	55.5
	DEC	213	.60	.58	.57	.57	.58	.59	.60	.60	.59	.58	.56	.53	.50
37	RA	11 01	17.1	18.4	19.0	19.0	18.5	17.6	16.9	16.4	16.3	16.7	17.7	19.0	20.7
	DEC	1003	.21	.22	.25	.28	.31	.33	.32	.30	.25	.21	.16	.13	.11
38	RA	11 03	09.8	11.3	12.1	12.0	11.4	10.3	09.4	08.7	08.6	09.0	10.1	11.6	13.5
	DEC	1098	.66	.67	.70	.74	.77	.78	.78	.75	.70	.65	.60	.57	.55
39	RA	11 48	34.2	35.1	35.7	35.9	35.8	35.5	35.2	34.9	34.8	35.0	35.5	36.3	37.4
	DEC	259	1.00	.98	.97	.98	.99	1.00	1.01	1.01	1.00	.99	.96	.93	.89
40	RA	11 53	20.2	21.6	22.4	22.7	22.4	21.7	21.0	20.3	20.0	20.1	20.7	21.9	23.4
	DEC	955	.45	.45	.47	.51	.54	.57	.57	.55	.52	.47	.42	.38	.35
41	RA	12 15	18.2	19.2	19.8	20.1	20.1	19.9	19.6	19.3	19.1	19.2	19.6	20.4	21.5
	DEC	- 310	.87	.91	.94	.96	.97	.98	.97	.96	.94	.93	.93	.95	.98
42	RA	12 26	02.4	04.1	05.2	05.8	05.7	05.0	04.1	03.1	02.3	02.2	02.9	04.4	06.3
	DEC	-1120	.72	.75	.80	.85	.90	.93	.94	.93	.90	.86	.82	.80	.82
43	RA	12 30	36.6	38.1	39.1	39.7	39.6	39.1	38.4	37.6	37.1	36.9	37.5	38.8	40.5
	DEC	-1014	.30	.34	.38	.43	.47	.50	.51	.50	.47	.43	.40	.39	.40
44	RA	12 47	08.0	09.6	10.7	11.4	11.4	11.0	10.2	09.3	08.6	08.4	09.0	10.2	12.0
	DEC	-1060	.11	.14	.18	.24	.28	.31	.33	.32	.29	.25	.22	.20	.21
45	RA	12 53	36.5	38.0	39.1	39.6	39.6	39.0	38.2	37.4	36.7	36.5	36.8	37.7	39.1
	DEC	995	.68	.67	.69	.72	.76	.80	.81	.80	.77	.73	.67	.62	.59
46	RA	13 23	32.1	33.6	34.7	35.4	35.5	35.0	34.3	33.4	32.7	32.3	32.4	33.1	34.5
	DEC	977	.26	.24	.25	.28	.32	.36	.38	.38	.35	.31	.26	.20	.16
47	RA	13 24	40.3	41.3	42.1	42.6	42.8	42.8	42.6	42.3	42.0	41.8	42.0	42.7	43.7
	DEC	- 197	.52	.55	.58	.59	.60	.60	.59	.59	.58	.57	.57	.59	.61
48	RA	13 47	09.2	10.5	11.6	12.3	12.5	12.2	11.7	10.9	10.2	09.8	09.8	10.4	11.6
	DEC	877	.45	.43	.43	.46	.50	.54	.56	.57	.55	.51	.46	.41	.36
49	RA	14 03	06.1	07.9	09.4	10.5	11.1	11.0	10.5	09.7	08.7	08.2	08.3	09.2	10.9
	DEC	-1072	.40	.42	.45	.50	.54	.58	.60	.61	.59	.56	.52	.49	.49

Table 10b.(3). Apparent Places of Stars, 1990 (Mils of Declination)—Continued

Star No.	Right ascension / Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA	14 06	05.4	06.6	07.6	08.4	08.8	08.9	08.6	08.2	07.7	07.4	07.5	08.2	09.3
	DEC	- 645	.69	.72	.75	.78	.81	.83	.84	.84	.82	.80	.78	.77	.78
51	RA	14 15	12.5	13.5	14.4	15.0	15.3	15.4	15.1	14.8	14.3	14.0	14.0	14.5	15.4
	DEC	341	.87	.84	.83	.83	.85	.88	.90	.91	.90	.89	.86	.82	.78
52	RA	14 38	54.1	55.9	57.5	58.8	59.6	59.7	59.3	58.4	57.4	56.6	56.5	57.2	58.8
	DEC	-1080	.76	.77	.79	.83	.87	.91	.94	.94	.93	.91	.87	.84	.82
53	RA	14 50	19.3	20.4	21.3	22.1	22.6	22.8	22.7	22.4	22.0	21.7	21.6	22.0	22.9
	DEC	- 284	.48	.50	.52	.54	.55	.55	.55	.54	.53	.53	.52	.53	.55
54	RA	14 50	41.9	44.4	46.8	48.7	49.4	48.8	47.2	45.0	42.6	40.7	39.6	39.8	41.3
	DEC	1318	.92	.90	.90	.93	.98	1.02	1.05	1.07	1.05	1.01	.96	.90	.85
55	RA	15 34	15.5	16.5	17.4	18.3	18.8	19.1	19.0	18.6	18.1	17.6	17.3	17.5	18.2
	DEC	475	.44	.41	.39	.40	.43	.46	.49	.51	.52	.50	.47	.43	.39
56	RA	15 59	44.1	45.1	46.0	47.0	47.7	48.1	48.2	48.0	47.6	47.1	46.9	47.1	47.9
	DEC	- 401	.69	.70	.72	.73	.74	.74	.75	.74	.74	.73	.73	.72	.73
57	RA	16 28	47.1	48.0	49.0	50.1	50.9	51.4	51.6	51.5	51.0	50.5	50.2	50.4	51.0
	DEC	- 469	.54	.55	.56	.57	.58	.59	.59	.59	.59	.59	.58	.57	.57
58	RA	16 47	33.8	35.9	38.1	40.5	42.5	43.7	44.0	43.5	42.2	40.7	39.6	39.6	40.8
	DEC	-1226	.85	.82	.82	.83	.86	.90	.94	.97	.98	.97	.94	.90	.87
59	RA	17 09	47.6	48.4	49.3	50.3	51.1	51.8	52.1	52.0	51.6	51.1	50.8	50.8	51.3
	DEC	- 279	.37	.38	.39	.40	.39	.39	.38	.38	.37	.37	.37	.37	.38
60	RA	17 32	55.0	55.9	57.0	58.2	59.2	60.0	60.5	60.5	60.1	59.5	58.9	58.9	59.4
	DEC	- 659	.53	.52	.52	.52	.53	.54	.55	.56	.57	.57	.56	.54	.53
61	RA	17 34	27.5	28.2	29.0	30.0	30.8	31.4	31.7	31.6	31.2	30.7	30.2	30.1	30.5
	DEC	223	.36	.33	.31	.31	.33	.36	.39	.41	.43	.43	.42	.39	.36
62	RA	17 56	20.6	21.3	22.3	23.5	24.6	25.4	25.6	25.3	24.5	23.5	22.5	22.0	22.1
	DEC	915	.32	.27	.25	.24	.27	.31	.36	.41	.44	.44	.42	.39	.33
63	RA	18 23	29.8	30.6	31.5	32.6	33.7	34.7	35.2	35.4	35.1	34.6	34.0	33.8	34.1
	DEC	- 611	.41	.40	.39	.39	.39	.39	.40	.41	.41	.42	.41	.40	.39
64	RA	18 36	34.7	35.1	35.9	37.0	38.0	38.8	39.2	39.2	38.7	38.0	37.3	36.8	36.9
	DEC	689	.28	.23	.20	.20	.22	.26	.30	.35	.38	.39	.38	.35	.31
65	RA	18 54	38.1	38.7	39.5	40.5	41.6	42.5	43.1	43.4	43.2	42.7	42.1	41.9	42.1
	DEC	- 467	.77	.76	.75	.74	.74	.73	.73	.73	.73	.74	.74	.73	.73
66	RA	19 50	17.1	17.4	17.9	18.7	19.7	20.6	21.2	21.5	21.5	21.1	20.6	20.2	20.2
	DEC	157	.16	.14	.12	.12	.14	.17	.20	.22	.25	.26	.25	.24	.22
67	RA	20 24	51.0	51.3	52.1	53.4	55.0	56.6	57.8	58.5	58.5	57.9	56.9	56.1	55.9
	DEC	-1009	.26	.22	.19	.16	.14	.13	.14	.17	.19	.21	.22	.21	.19
68	RA	20 41	04.0	04.0	04.4	05.3	06.4	07.5	08.4	08.9	08.8	08.2	07.4	06.7	06.3
	DEC	804	.37	.32	.29	.26	.27	.30	.34	.39	.44	.47	.48	.47	.44
69	RA	21 40	22.4	21.7	22.5	24.6	27.6	31.2	34.3	36.4	37.1	36.0	33.5	30.8	28.8
	DEC	-1376	.70	.65	.60	.55	.51	.50	.51	.53	.57	.61	.64	.64	.60
70	RA	22 07	36.5	36.3	36.5	37.2	38.3	39.6	40.8	41.7	42.2	42.1	41.5	40.8	40.3
	DEC	- 835	.79	.76	.73	.69	.65	.62	.61	.62	.64	.67	.69	.70	.69
71	RA	22 42	31.6	31.4	31.4	31.8	32.6	33.6	34.6	35.5	35.9	35.9	35.6	35.1	34.7
	DEC	536	.39	.36	.33	.31	.31	.33	.36	.40	.44	.48	.50	.50	.49
72	RA	22 57	06.4	06.1	06.2	06.6	07.3	08.3	09.4	10.3	10.8	10.9	10.6	10.2	09.8
	DEC	- 527	.60	.59	.57	.54	.51	.47	.45	.44	.44	.46	.48	.50	.50
73	RA	23 04	15.8	15.5	15.5	15.9	16.6	17.5	18.5	19.3	19.8	19.9	19.7	19.3	19.0
	DEC	269	.39	.37	.35	.35	.35	.37	.41	.44	.47	.50	.51	.51	.50

Table 10b.(2). Apparent Places of Stars, 1989 (Mils of Declination)—Continued

Star No.	Right Ascension / Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA	14 06	01.4	02.7	03.7	04.5	04.8	04.9	04.7	04.3	03.8	03.5	03.6	04.3	05.4
	DEC	- 645	.60	.63	.66	.69	.72	.74	.75	.75	.73	.71	.69	.68	.69
51	RA	14 15	09.5	10.5	11.4	12.1	12.4	12.4	12.2	11.8	11.4	11.1	11.1	11.6	12.5
	DEC	341	.96	.93	.92	.93	.95	.97	.99	1.00	1.00	.98	.95	.91	.87
52	RA	14 38	49.4	51.3	52.8	54.1	54.8	55.0	54.6	53.8	52.7	51.9	51.8	52.6	54.1
	DEC	-1080	.68	.69	.72	.76	.80	.83	.86	.87	.86	.83	.80	.77	.76
53	RA	14 50	15.7	16.7	17.6	18.4	18.9	19.1	19.1	18.8	18.4	18.0	18.0	18.5	19.3
	DEC	- 284	.40	.42	.45	.46	.47	.47	.47	.47	.46	.45	.45	.46	.48
54	RA	14 50	42.4	44.9	47.2	49.1	49.9	49.3	47.7	45.4	43.1	41.2	40.1	40.3	41.9
	DEC	1318	1.00	.97	.97	1.00	1.05	1.10	1.13	1.14	1.12	1.09	1.03	.97	.92
55	RA	15 34	12.7	13.7	14.7	15.5	16.1	16.3	16.3	15.9	15.4	14.8	14.6	14.8	15.5
	DEC	475	.50	.47	.45	.46	.48	.52	.55	.57	.57	.56	.53	.49	.44
56	RA	15 59	40.1	41.1	42.1	43.1	43.8	44.2	44.4	44.2	43.7	43.3	43.0	43.3	44.1
	DEC	- 401	.64	.65	.67	.68	.69	.70	.70	.70	.70	.69	.68	.68	.69
57	RA	16 28	43.0	44.0	45.0	46.0	46.8	47.4	47.6	47.5	47.0	46.5	46.2	46.4	47.1
	DEC	- 469	.51	.51	.53	.54	.55	.55	.56	.56	.56	.55	.54	.54	.54
58	RA	16 47	26.7	28.8	31.0	33.5	35.4	36.6	37.0	36.5	35.1	33.6	32.6	32.6	33.8
	DEC	-1226	.82	.80	.80	.81	.84	.88	.91	.94	.96	.95	.92	.88	.85
59	RA	17 09	43.8	44.6	45.5	46.5	47.4	48.0	48.3	48.3	47.9	47.4	47.0	47.1	47.6
	DEC	- 279	.35	.37	.38	.38	.38	.37	.37	.36	.36	.36	.36	.36	.37
60	RA	17 32	50.5	51.5	52.5	53.7	54.8	55.6	56.0	56.1	55.6	55.0	54.5	54.5	55.0
	DEC	- 659	.53	.52	.52	.52	.53	.54	.55	.56	.57	.57	.56	.54	.53
61	RA	17 34	24.4	25.2	26.0	26.9	27.7	28.3	28.7	28.6	28.2	27.7	27.2	27.2	27.5
	DEC	223	.37	.34	.32	.32	.33	.36	.39	.42	.43	.43	.42	.40	.36
62	RA	17 56	19.0	19.7	20.7	22.0	23.1	23.9	24.1	23.8	23.0	22.0	21.0	20.5	20.6
	DEC	915	.32	.27	.24	.24	.26	.31	.36	.40	.43	.43	.41	.38	.32
63	RA	18 23	25.5	26.2	27.2	28.3	29.4	30.3	30.9	31.1	30.8	30.2	29.7	29.5	29.8
	DEC	- 611	.43	.42	.41	.41	.41	.41	.42	.43	.44	.44	.43	.42	.41
64	RA	18 36	32.4	32.9	33.7	34.8	35.8	36.6	37.0	37.0	36.5	35.8	35.1	34.6	34.7
	DEC	689	.25	.21	.18	.18	.19	.23	.28	.32	.35	.36	.35	.33	.28
65	RA	18 54	34.1	34.7	35.5	36.5	37.5	38.4	39.1	39.4	39.2	38.7	38.2	37.9	38.1
	DEC	- 467	.80	.79	.79	.78	.77	.76	.76	.76	.77	.77	.77	.77	.77
66	RA	19 50	13.8	14.2	14.7	15.6	16.5	17.4	18.0	18.4	18.3	17.9	17.4	17.1	17.1
	DEC	157	.10	.08	.06	.06	.08	.10	.14	.17	.19	.20	.20	.19	.16
67	RA	20 24	45.8	46.2	47.0	48.4	50.0	51.5	52.8	53.6	53.6	52.9	52.0	51.2	51.0
	DEC	-1009	.33	.29	.26	.22	.20	.20	.21	.23	.26	.29	.30	.29	.26
68	RA	20 41	01.6	01.7	02.1	03.0	04.1	05.2	06.1	06.6	06.4	05.9	05.1	04.4	04.0
	DEC	804	.29	.25	.21	.19	.19	.22	.26	.32	.36	.40	.41	.40	.37
69	RA	21 40	15.6	14.9	15.7	17.9	21.0	24.5	27.7	30.0	30.6	29.4	27.0	24.4	22.4
	DEC	-1376	.79	.74	.69	.64	.61	.59	.60	.63	.67	.71	.73	.73	.70
★70	RA	21 43	38.0	38.0	38.3	38.9	39.7	40.7	41.6	42.2	42.5	42.3	41.9	41.6	41.3
	DEC	174	.65	.63	.61	.61	.62	.65	.68	.72	.74	.76	.76	.76	.74
★71	RA	22 07	32.4	32.3	32.5	33.2	34.3	35.6	36.8	37.8	38.3	38.1	37.6	36.9	36.5
	DEC	- 835	.89	.86	.83	.79	.75	.72	.71	.72	.74	.77	.79	.80	.79
72	RA	22 57	02.8	02.6	02.6	03.0	03.8	04.8	05.8	06.8	07.3	07.4	07.1	06.7	06.4
	DEC	- 527	.71	.70	.68	.64	.61	.58	.55	.54	.55	.57	.59	.60	.60
73	RA	23 04	12.4	12.2	12.2	12.6	13.3	14.2	15.2	16.0	16.5	16.6	16.4	16.1	15.8
	DEC	269	.28	.26	.25	.24	.24	.27	.30	.34	.37	.39	.40	.40	.39

Table 10b.(3). Apparent Places of Stars, 1990 (Mils of Declination)

Star No.	Right ascension / Declination	(Hr Min) / MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
1	RA	00 07	52.4	52.0	51.8	52.0	52.5	53.5	54.5	55.5	56.2	56.5	56.5	56.2	55.9
	DEC	516	.25	.23	.21	.19	.18	.19	.22	.25	.29	.33	.35	.36	.36
2	RA	00 08	38.1	37.2	36.7	36.8	37.6	39.0	40.5	42.0	43.1	43.5	43.3	42.7	41.9
	DEC	1050	.68	.66	.63	.59	.56	.55	.57	.60	.65	.70	.75	.78	.79
3	RA	00 25	16.6	14.0	12.5	12.1	13.1	15.4	18.4	21.5	23.9	24.8	24.0	21.9	19.1
	DEC	-1374	.48	.46	.42	.36	.30	.26	.23	.23	.26	.30	.35	.38	.38
4	RA	00 25	48.5	47.9	47.6	47.6	48.1	49.0	50.1	51.3	52.2	52.6	52.5	52.1	51.5
	DEC	- 752	1.12	1.11	1.09	1.05	1.00	.95	.92	.91	.92	.94	.98	1.01	1.02
5	RA	00 39	56.3	55.4	54.9	54.8	55.5	56.7	58.1	59.6	60.8	61.3	61.3	61.0	60.3
	DEC	1004	.25	.23	.20	.16	.14	.12	.13	.17	.21	.26	.31	.34	.35
6	RA	00 43	06.2	05.8	05.5	05.6	05.9	06.7	07.6	08.6	09.4	09.8	09.8	09.6	09.3
	DEC	- 320	.75	.75	.74	.72	.69	.65	.62	.60	.59	.59	.61	.63	.64
7	RA	00 56	06.3	05.2	04.5	04.4	04.9	06.2	07.8	09.5	10.8	11.5	11.7	11.3	10.5
	DEC	1078	.56	.55	.53	.49	.45	.44	.44	.47	.52	.57	.61	.65	.67
8	RA	01 25	10.1	09.1	08.3	08.0	08.4	09.6	11.2	12.9	14.3	15.2	15.5	15.3	14.7
	DEC	1069	1.05	1.04	1.02	.98	.95	.93	.93	.95	.99	1.04	1.08	1.12	1.14
9	RA	01 37	22.4	21.4	20.6	20.1	20.2	21.0	22.2	23.6	24.9	25.7	25.9	25.4	24.6
	DEC	-1018	.49	.49	.47	.42	.37	.32	.28	.26	.27	.30	.34	.38	.40
10	SEE TABLE 11. APPARENT PLACES OF POLARIS,1990														
11	RA	02 06	37.7	37.3	36.9	36.7	36.8	37.4	38.3	39.4	40.4	41.1	41.4	41.5	41.4
	DEC	416	.34	.34	.32	.31	.30	.31	.32	.35	.38	.40	.41	.42	.42
12	RA	02 57	54.8	54.1	53.5	52.9	52.8	53.1	53.8	54.9	56.0	56.8	57.3	57.4	57.1
	DEC	- 717	.25	.27	.27	.24	.20	.15	.11	.08	.06	.08	.11	.16	.19
13	RA	03 01	46.9	46.5	46.1	45.8	45.8	46.2	46.9	47.9	48.8	49.6	50.0	50.3	50.3
	DEC	72	.05	.04	.04	.04	.04	.06	.09	.11	.13	.14	.14	.13	.12
14	RA	03 23	38.4	37.8	37.1	36.5	36.4	36.9	37.9	39.3	40.7	41.9	42.7	43.2	43.2
	DEC	885	.89	.90	.90	.88	.85	.83	.82	.82	.84	.86	.90	.93	.95
15	RA	04 35	22.8	22.6	22.2	21.7	21.5	21.6	22.1	23.0	24.0	24.9	25.7	26.2	26.5
	DEC	293	.20	.19	.19	.19	.18	.19	.20	.20	.22	.23	.23	.22	.22
16	RA	05 14	05.4	05.3	04.9	04.3	04.0	04.0	04.3	05.0	05.9	06.8	07.6	08.2	08.5
	DEC	- 145	.98	1.00	1.01	1.01	1.00	.98	.95	.93	.91	.91	.92	.95	.97
17	RA	05 15	59.8	59.6	59.1	58.3	57.9	57.9	58.4	59.5	60.8	62.0	63.2	64.1	64.6
	DEC	817	.63	.65	.66	.65	.63	.61	.60	.59	.58	.59	.60	.62	.64
18	RA	05 24	37.7	37.6	37.3	36.8	36.4	36.4	36.8	37.5	38.4	39.3	40.1	40.8	41.2
	DEC	112	.77	.75	.75	.74	.75	.76	.77	.79	.80	.80	.80	.79	.77
19	RA	05 25	41.9	41.8	41.4	40.9	40.5	40.5	40.9	41.8	42.8	43.8	44.8	45.5	46.0
	DEC	508	.48	.49	.49	.48	.48	.47	.47	.46	.47	.47	.48	.48	.48
20	RA	05 35	44.4	44.3	43.9	43.4	43.1	43.0	43.4	44.0	44.9	45.8	46.6	47.3	47.7
	DEC	- 21	.45	.46	.47	.48	.47	.45	.43	.41	.39	.39	.40	.42	.45
21	RA	05 40	17.3	17.2	16.8	16.3	16.0	15.9	16.2	16.9	17.7	18.6	19.4	20.1	20.5
	DEC	- 34	.60	.62	.63	.63	.62	.60	.58	.56	.55	.54	.55	.58	.60
22	RA	05 54	40.0	39.9	39.6	39.1	38.7	38.7	39.0	39.6	40.5	41.4	42.2	43.0	43.4
	DEC	131	.68	.67	.67	.66	.67	.68	.69	.70	.71	.72	.71	.69	.67
23	RA	06 23	46.4	46.1	45.3	44.3	43.3	42.7	42.6	43.1	44.1	45.3	46.5	47.4	47.8
	DEC	- 936	.69	.74	.77	.78	.77	.73	.69	.64	.60	.59	.61	.66	.71
24	RA	06 37	10.4	10.5	10.2	09.7	09.3	09.1	09.3	09.9	10.7	11.6	12.6	13.4	14.1
	DEC	291	.72	.72	.72	.72	.72	.72	.72	.73	.73	.73	.72	.71	.70
25	RA	06 44	44.5	44.6	44.3	43.7	43.2	43.0	43.1	43.5	44.3	45.1	46.0	46.8	47.4
	DEC	- 296	.90	.94	.96	.97	.96	.94	.91	.88	.86	.85	.87	.90	.94

Table 10b.(3). Apparent Places of Stars, 1990 (Mils of Declination)—Continued

Star No.	Right ascension / Declination	(Hr Min) / MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
26	RA	06 58	16.0	16.1	15.8	15.1	14.6	14.2	14.2	14.6	15.3	16.2	17.2	18.0	18.6
	DEC	- 514	.79	.83	.85	.87	.86	.84	.80	.77	.74	.73	.74	.78	.82
27	RA	07 07	61.1	61.2	60.9	60.3	59.8	59.4	59.4	59.8	60.5	61.3	62.3	63.1	63.8
	DEC	- 468	.90	.94	.97	.98	.98	.95	.92	.88	.86	.85	.86	.90	.94
28	RA	07 33	60.3	60.7	60.5	60.0	59.5	59.2	59.2	59.7	60.4	61.4	62.5	63.5	64.4
	DEC	567	.31	.31	.32	.33	.33	.33	.32	.31	.29	.28	.26	.25	.25
29	RA	07 38	48.8	49.1	49.0	48.6	48.1	47.8	47.9	48.2	48.8	49.6	50.5	51.4	52.2
	DEC	93	.36	.34	.33	.33	.33	.34	.35	.36	.37	.36	.35	.33	.30
30	RA	07 44	44.8	45.1	45.0	44.6	44.1	43.7	43.7	44.1	44.8	45.7	46.8	47.8	48.7
	DEC	498	.68	.69	.69	.70	.70	.70	.69	.68	.67	.66	.64	.63	.62
31	RA	08 09	15.6	15.8	15.5	14.8	14.0	13.2	12.9	13.0	13.5	14.4	15.6	16.8	17.6
	DEC	- 840	.97	1.03	1.07	1.10	1.11	1.09	1.06	1.01	.97	.95	.95	.99	1.04
32	RA	08 22	20.9	21.2	20.8	19.8	18.6	17.5	16.8	16.7	17.3	18.4	19.9	21.3	22.4
	DEC	-1057	.32	.38	.43	.47	.48	.46	.43	.39	.34	.31	.31	.34	.40
33	RA	09 07	39.4	39.9	39.9	39.5	38.8	38.1	37.7	37.6	37.9	38.6	39.7	40.9	41.9
	DEC	- 771	.37	.42	.47	.51	.52	.51	.49	.45	.41	.39	.38	.41	.46
34	RA	09 13	08.2	08.9	08.6	07.4	05.7	03.9	02.6	01.9	02.2	03.4	05.3	07.5	09.2
	DEC	-1238	.62	.68	.74	.78	.80	.80	.78	.74	.70	.66	.65	.66	.71
35	RA	09 27	07.4	08.0	08.2	08.0	07.6	07.2	07.0	07.0	07.3	07.9	08.7	09.6	10.6
	DEC	- 153	.15	.19	.21	.22	.22	.21	.20	.19	.17	.17	.18	.20	.24
36	RA	10 07	52.1	52.8	53.1	53.0	52.7	52.4	52.1	52.1	52.3	52.7	53.5	54.4	55.5
	DEC	213	.60	.58	.57	.57	.58	.59	.60	.60	.59	.58	.56	.53	.50
37	RA	11 01	17.1	18.4	19.0	19.0	18.5	17.6	16.9	16.4	16.3	16.7	17.7	19.0	20.7
	DEC	1003	.21	.22	.25	.28	.31	.33	.32	.30	.25	.21	.16	.13	.11
38	RA	11 03	09.8	11.3	12.1	12.0	11.4	10.3	09.4	08.7	08.6	09.0	10.1	11.6	13.5
	DEC	1098	.66	.67	.70	.74	.77	.78	.78	.75	.70	.65	.60	.57	.55
39	RA	11 48	34.2	35.1	35.7	35.9	35.8	35.5	35.2	34.9	34.8	35.0	35.5	36.3	37.4
	DEC	259	1.00	.98	.97	.98	.99	1.00	1.01	1.01	1.00	.99	.96	.93	.89
40	RA	11 53	20.2	21.6	22.4	22.7	22.4	21.7	21.0	20.3	20.0	20.1	20.7	21.9	23.4
	DEC	955	.45	.45	.47	.51	.54	.57	.57	.55	.52	.47	.42	.38	.35
41	RA	12 15	18.2	19.2	19.8	20.1	20.1	19.9	19.6	19.3	19.1	19.2	19.6	20.4	21.5
	DEC	- 310	.87	.91	.94	.96	.97	.98	.97	.96	.94	.93	.93	.95	.98
42	RA	12 26	02.4	04.1	05.2	05.8	05.7	05.0	04.1	03.1	02.3	02.2	02.9	04.4	06.3
	DEC	-1120	.72	.75	.80	.85	.90	.93	.94	.93	.90	.86	.82	.80	.82
43	RA	12 30	36.6	38.1	39.1	39.7	39.6	39.1	38.4	37.6	37.1	36.9	37.5	38.8	40.5
	DEC	-1014	.30	.34	.38	.43	.47	.50	.51	.50	.47	.43	.40	.39	.40
44	RA	12 47	08.0	09.6	10.7	11.4	11.4	11.0	10.2	09.3	08.6	08.4	09.0	10.2	12.0
	DEC	-1060	.11	.14	.18	.24	.28	.31	.33	.32	.29	.25	.22	.20	.21
45	RA	12 53	36.5	38.0	39.1	39.6	39.6	39.0	38.2	37.4	36.7	36.5	36.8	37.7	39.1
	DEC	995	.68	.67	.69	.72	.76	.80	.81	.80	.77	.73	.67	.62	.59
46	RA	13 23	32.1	33.6	34.7	35.4	35.5	35.0	34.3	33.4	32.7	32.3	32.4	33.1	34.5
	DEC	977	.26	.24	.25	.28	.32	.36	.38	.38	.35	.31	.26	.20	.16
47	RA	13 24	40.3	41.3	42.1	42.6	42.8	42.8	42.6	42.3	42.0	41.8	42.0	42.7	43.7
	DEC	- 197	.52	.55	.58	.59	.60	.60	.59	.59	.58	.57	.57	.59	.61
48	RA	13 47	09.2	10.5	11.6	12.3	12.5	12.2	11.7	10.9	10.2	09.8	09.8	10.4	11.6
	DEC	877	.45	.43	.43	.46	.50	.54	.56	.57	.55	.51	.46	.41	.36
49	RA	14 03	06.1	07.9	09.4	10.5	11.1	11.0	10.5	09.7	08.7	08.2	08.3	09.2	10.9
	DEC	-1072	.40	.42	.45	.50	.54	.58	.60	.61	.59	.56	.52	.49	.49

Table 10b.(3). Apparent Places of Stars, 1990 (Mils of Declination)—Continued

Star No.	Right ascension / Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA	14 06	05.4	06.6	07.6	08.4	08.8	08.9	08.6	08.2	07.7	07.4	07.5	08.2	09.3
	DEC	- 645	.69	.72	.75	.78	.81	.83	.84	.84	.82	.80	.78	.77	.78
51	RA	14 15	12.5	13.5	14.4	15.0	15.3	15.4	15.1	14.8	14.3	14.0	14.0	14.5	15.4
	DEC	341	.87	.84	.83	.83	.85	.88	.90	.91	.90	.89	.86	.82	.78
52	RA	14 38	54.1	55.9	57.5	58.8	59.6	59.7	59.3	58.4	57.4	56.6	56.5	57.2	58.8
	DEC	-1080	.76	.77	.79	.83	.87	.91	.94	.94	.93	.91	.87	.84	.82
53	RA	14 50	19.3	20.4	21.3	22.1	22.6	22.8	22.7	22.4	22.0	21.7	21.6	22.0	22.9
	DEC	- 284	.48	.50	.52	.54	.55	.55	.55	.54	.53	.53	.52	.53	.55
54	RA	14 50	41.9	44.4	46.8	48.7	49.4	48.8	47.2	45.0	42.6	40.7	39.6	39.8	41.3
	DEC	1318	.92	.90	.90	.93	.98	1.02	1.05	1.07	1.05	1.01	.96	.90	.85
55	RA	15 34	15.5	16.5	17.4	18.3	18.8	19.1	19.0	18.6	18.1	17.6	17.3	17.5	18.2
	DEC	475	.44	.41	.39	.40	.43	.46	.49	.51	.52	.50	.47	.43	.39
56	RA	15 59	44.1	45.1	46.0	47.0	47.7	48.1	48.2	48.0	47.6	47.1	46.9	47.1	47.9
	DEC	- 401	.69	.70	.72	.73	.74	.74	.75	.74	.74	.73	.73	.72	.73
57	RA	16 28	47.1	48.0	49.0	50.1	50.9	51.4	51.6	51.5	51.0	50.5	50.2	50.4	51.0
	DEC	- 469	.54	.55	.56	.57	.58	.59	.59	.59	.59	.59	.58	.57	.57
58	RA	16 47	33.8	35.9	38.1	40.5	42.5	43.7	44.0	43.5	42.2	40.7	39.6	39.6	40.8
	DEC	-1226	.85	.82	.82	.83	.86	.90	.94	.97	.98	.97	.94	.90	.87
59	RA	17 09	47.6	48.4	49.3	50.3	51.1	51.8	52.1	52.0	51.6	51.1	50.8	50.8	51.3
	DEC	- 279	.37	.38	.39	.40	.39	.39	.38	.38	.37	.37	.37	.37	.38
60	RA	17 32	55.0	55.9	57.0	58.2	59.2	60.0	60.5	60.5	60.1	59.5	58.9	58.9	59.4
	DEC	- 659	.53	.52	.52	.52	.53	.54	.55	.56	.57	.57	.56	.54	.53
61	RA	17 34	27.5	28.2	29.0	30.0	30.8	31.4	31.7	31.6	31.2	30.7	30.2	30.1	30.5
	DEC	223	.36	.33	.31	.31	.33	.36	.39	.41	.43	.43	.42	.39	.36
62	RA	17 56	20.6	21.3	22.3	23.5	24.6	25.4	25.6	25.3	24.5	23.5	22.5	22.0	22.1
	DEC	915	.32	.27	.25	.24	.27	.31	.36	.41	.44	.44	.42	.39	.33
63	RA	18 23	29.8	30.6	31.5	32.6	33.7	34.7	35.2	35.4	35.1	34.6	34.0	33.8	34.1
	DEC	- 611	.41	.40	.39	.39	.39	.39	.40	.41	.41	.42	.41	.40	.39
64	RA	18 36	34.7	35.1	35.9	37.0	38.0	38.8	39.2	39.2	38.7	38.0	37.3	36.8	36.9
	DEC	689	.28	.23	.20	.20	.22	.26	.30	.35	.38	.39	.38	.35	.31
65	RA	18 54	38.1	38.7	39.5	40.5	41.6	42.5	43.1	43.4	43.2	42.7	42.1	41.9	42.1
	DEC	- 467	.77	.76	.75	.74	.74	.73	.73	.73	.73	.74	.74	.73	.73
66	RA	19 50	17.1	17.4	17.9	18.7	19.7	20.6	21.2	21.5	21.5	21.1	20.6	20.2	20.2
	DEC	157	.16	.14	.12	.12	.14	.17	.20	.22	.25	.26	.25	.24	.22
67	RA	20 24	51.0	51.3	52.1	53.4	55.0	56.6	57.8	58.5	58.5	57.9	56.9	56.1	55.9
	DEC	-1009	.26	.22	.19	.16	.14	.13	.14	.17	.19	.21	.22	.21	.19
68	RA	20 41	04.0	04.0	04.4	05.3	06.4	07.5	08.4	08.9	08.8	08.2	07.4	06.7	06.3
	DEC	804	.37	.32	.29	.26	.27	.30	.34	.39	.44	.47	.48	.47	.44
69	RA	21 40	22.4	21.7	22.5	24.6	27.6	31.2	34.3	36.4	37.1	36.0	33.5	30.8	28.8
	DEC	-1376	.70	.65	.60	.55	.51	.50	.51	.53	.57	.61	.64	.64	.60
★70	RA	21 43	41.3	41.3	41.5	42.1	42.9	43.9	44.8	45.4	45.7	45.5	45.1	44.7	44.5
	DEC	174	.74	.72	.71	.71	.72	.75	.78	.81	.84	.85	.85	.85	.84
★71	RA	22 07	36.5	36.3	36.5	37.2	38.3	39.6	40.8	41.7	42.2	42.1	41.5	40.8	40.3
	DEC	- 835	.79	.76	.73	.69	.65	.62	.61	.62	.64	.67	.69	.70	.69
72	RA	22 57	06.4	06.1	06.2	06.6	07.3	08.3	09.4	10.3	10.8	10.9	10.6	10.2	09.8
	DEC	- 527	.60	.59	.57	.54	.51	.47	.45	.44	.44	.46	.48	.50	.50
73	RA	23 04	15.8	15.5	15.5	15.9	16.6	17.5	18.5	19.3	19.8	19.9	19.7	19.3	19.0
	DEC	269	.39	.37	.35	.35	.35	.37	.41	.44	.47	.50	.51	.51	.50

Table 10b.(4). Apparent Places of Stars, 1991 (Mils of Declination)—Continued

Star No.	Right ascension / Declination	(Hr Min) / MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA	14 06	09.3	10.6	11.5	12.2	12.6	12.7	12.5	12.1	11.6	11.3	11.4	12.0	13.1
	DEC	- 645	.78	.81	.84	.87	.89	.92	.93	.92	.91	.89	.87	.86	.87
51	RA	14 15	15.4	16.4	17.3	17.9	18.2	18.2	18.0	17.6	17.1	16.8	16.9	17.3	18.1
	DEC	341	.78	.74	.73	.74	.76	.78	.80	.82	.81	.80	.77	.73	.69
52	RA	14 38	58.8	60.6	62.1	63.4	64.1	64.3	63.9	63.0	62.0	61.2	61.1	61.8	63.3
	DEC	-1080	.82	.83	.86	.90	.94	.98	1.01	1.01	1.00	.97	.94	.91	.89
53	RA	14 50	22.9	24.0	24.9	25.6	26.1	26.3	26.3	25.9	25.5	25.2	25.2	25.6	26.4
	DEC	- 284	.55	.57	.59	.61	.62	.62	.62	.61	.60	.59	.59	.60	.61
54	RA	14 50	41.3	43.8	46.2	48.1	48.8	48.2	46.7	44.4	42.0	40.0	39.0	39.2	40.7
	DEC	1318	.85	.83	.83	.86	.91	.95	.99	1.00	.98	.95	.89	.84	.79
55	RA	15 34	18.2	19.2	20.1	20.9	21.5	21.7	21.6	21.2	20.7	20.2	19.9	20.1	20.7
	DEC	475	.39	.35	.34	.35	.37	.41	.44	.46	.46	.45	.42	.38	.34
56	RA	15 59	47.9	48.9	49.9	50.8	51.5	51.9	52.1	51.8	51.4	50.9	50.7	50.9	51.6
	DEC	- 401	.73	.74	.76	.77	.78	.78	.79	.79	.78	.77	.77	.76	.77
57	RA	16 28	51.0	52.0	53.0	54.0	54.8	55.4	55.6	55.4	54.9	54.4	54.1	54.3	54.9
	DEC	- 469	.57	.58	.59	.60	.60	.61	.62	.62	.62	.61	.60	.60	.60
58	RA	16 47	40.8	42.9	45.1	47.4	49.3	50.6	51.0	50.4	49.0	47.6	46.5	46.4	47.5
	DEC	-1226	.87	.85	.84	.86	.88	.92	.96	.99	1.00	.99	.96	.92	.89
59	RA	17 09	51.3	52.1	53.0	54.0	54.8	55.4	55.7	55.6	55.3	54.8	54.4	54.4	54.9
	DEC	- 279	.38	.39	.40	.41	.40	.40	.39	.39	.38	.38	.38	.38	.39
60	RA	17 32	59.4	60.3	61.4	62.5	63.5	64.4	64.8	64.8	64.3	63.8	63.3	63.2	63.6
	DEC	- 659	.53	.52	.52	.53	.53	.54	.55	.56	.57	.57	.56	.54	.53
61	RA	17 34	30.5	31.2	32.0	32.9	33.7	34.3	34.6	34.6	34.2	33.6	33.2	33.1	33.4
	DEC	223	.36	.33	.31	.31	.33	.36	.39	.41	.43	.43	.42	.40	.36
62	RA	17 56	22.1	22.7	23.7	25.0	26.1	26.9	27.1	26.8	26.0	25.0	24.0	23.4	23.5
	DEC	915	.33	.28	.26	.25	.28	.32	.37	.42	.45	.45	.44	.40	.35
63	RA	18 23	34.1	34.9	35.8	36.9	37.9	38.9	39.5	39.6	39.3	38.7	38.2	37.9	38.2
	DEC	- 611	.39	.38	.37	.37	.36	.37	.37	.38	.39	.39	.39	.38	.37
64	RA	18 36	36.9	37.4	38.1	39.1	40.1	41.0	41.4	41.4	40.9	40.2	39.4	39.0	39.0
	DEC	689	.31	.26	.24	.23	.25	.29	.34	.38	.41	.43	.42	.39	.34
65	RA	18 54	42.1	42.7	43.5	44.5	45.5	46.4	47.0	47.3	47.0	46.6	46.0	45.8	45.9
	DEC	- 467	.73	.72	.72	.71	.70	.69	.69	.69	.70	.70	.70	.70	.69
66	RA	19 50	20.2	20.5	21.1	21.9	22.8	23.7	24.3	24.6	24.6	24.2	23.7	23.3	23.2
	DEC	157	.22	.20	.19	.18	.20	.22	.26	.29	.31	.32	.32	.31	.28
67	RA	20 24	55.9	56.2	57.0	58.3	59.8	61.4	62.7	63.4	63.3	62.7	61.8	60.9	60.6
	DEC	-1009	.19	.15	.12	.09	.06	.06	.07	.09	.12	.15	.16	.15	.12
68	RA	20 41	06.3	06.3	06.7	07.5	08.7	09.8	10.7	11.1	11.0	10.5	09.7	09.0	08.5
	DEC	804	.44	.40	.37	.34	.35	.37	.41	.47	.52	.55	.56	.55	.52
69	RA	21 40	28.8	28.2	28.9	30.9	33.8	37.4	40.5	42.7	43.2	42.1	39.7	37.0	34.9
	DEC	-1376	.60	.56	.51	.46	.42	.40	.41	.44	.48	.52	.54	.54	.51
70	RA	22 07	40.3	40.2	40.4	41.1	42.1	43.4	44.6	45.5	46.0	45.8	45.3	44.6	44.1
	DEC	- 835	.69	.66	.63	.59	.56	.53	.52	.52	.55	.57	.60	.60	.60
71	RA	22 42	34.7	34.5	34.5	34.9	35.7	36.7	37.7	38.5	38.9	39.0	38.6	38.2	37.8
	DEC	536	.49	.46	.43	.41	.41	.43	.46	.50	.54	.58	.60	.60	.59
72	RA	22 57	09.8	09.6	09.6	10.0	10.7	11.7	12.8	13.7	14.2	14.3	14.0	13.5	13.1
	DEC	- 527	.50	.49	.47	.44	.40	.37	.34	.33	.34	.36	.38	.39	.39
73	RA	23 04	19.0	18.8	18.8	19.1	19.8	20.7	21.7	22.5	23.0	23.1	22.9	22.5	22.2
	DEC	269	.50	.48	.46	.45	.46	.48	.51	.55	.58	.60	.61	.61	.60

Table 10b.(5). Apparent Places of Stars, 1992 (Mils of Declination)

Ster No.	Right ascension / Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
1	RA	00 07	59.2	58.8	58.6	58.7	59.2	60.2	61.2	62.2	62.9	63.2	63.1	62.9	62.4
	DEC	516	.45	.44	.41	.40	.39	.40	.42	.45	.49	.52	.55	.56	.55
2	RA	00 08	45.5	44.6	44.1	44.1	44.9	46.3	47.9	49.4	50.4	50.8	50.6	50.0	49.1
	DEC	1050	.88	.87	.83	.79	.76	.76	.77	.80	.85	.90	.95	.98	.98
3	RA	00 25	21.5	18.9	17.4	17.0	17.9	20.1	23.1	26.3	28.6	29.4	28.6	26.5	23.6
	DEC	-1374	.28	.25	.21	.15	.10	.05	.02	.03	.05	.10	.14	.17	.18
4	RA	00 25	54.4	53.9	53.5	53.5	54.0	54.8	56.0	57.1	57.9	58.3	58.2	57.8	57.2
	DEC	- 752	.92	.91	.88	.84	.80	.76	.73	.71	.72	.75	.78	.81	.82
5	RA	00 40	04.1	03.3	02.7	02.6	03.1	04.4	05.9	07.3	08.4	09.0	09.0	08.6	07.8
	DEC	1004	.44	.43	.40	.37	.34	.32	.33	.37	.41	.45	.50	.53	.54
6	RA	00 43	12.4	12.0	11.8	11.8	12.1	12.8	13.8	14.8	15.5	15.9	15.9	15.7	15.3
	DEC	- 320	.54	.55	.54	.52	.49	.45	.42	.40	.39	.40	.41	.43	.45
7	RA	00 56	14.6	13.6	12.9	12.6	13.2	14.5	16.1	17.8	19.0	19.8	19.9	19.5	18.6
	DEC	1078	.76	.75	.72	.68	.65	.63	.64	.67	.71	.76	.80	.84	.85
8	RA	01 25	19.1	18.1	17.3	16.9	17.3	18.5	20.1	21.7	23.1	24.0	24.4	24.1	23.3
	DEC	1070	.23	.23	.20	.16	.13	.11	.11	.13	.17	.22	.26	.30	.32
9	RA	01 37	26.7	25.6	24.8	24.3	24.4	25.1	26.3	27.7	29.0	29.8	29.9	29.5	28.6
	DEC	-1018	.32	.31	.29	.24	.19	.14	.10	.08	.09	.12	.17	.21	.23
10	SEE TABLE 11. APPARENT PLACES OF POLARIS,1992														
11	RA	02 06	45.0	44.6	44.2	43.9	44.0	44.6	45.6	46.6	47.5	48.2	48.6	48.7	48.4
	DEC	416	.50	.50	.48	.47	.46	.46	.48	.50	.53	.55	.57	.58	.58
12	RA	02 57	59.3	58.7	58.1	57.5	57.3	57.6	58.4	59.4	60.5	61.3	61.8	61.8	61.5
	DEC	- 716	1.13	1.14	1.14	1.11	1.07	1.02	.98	.95	.94	.95	.99	1.03	1.07
13	RA	03 01	53.5	53.2	52.8	52.4	52.4	52.8	53.5	54.4	55.3	56.0	56.6	56.8	56.7
	DEC	72	.18	.17	.16	.16	.17	.19	.21	.24	.26	.26	.26	.25	.24
14	RA	03 23	47.8	47.2	46.5	45.8	45.7	46.2	47.2	48.5	49.9	51.0	51.9	52.3	52.2
	DEC	885	1.00	1.01	1.01	.99	.96	.94	.92	.93	.95	.97	1.00	1.03	1.05
15	RA	04 35	30.1	29.9	29.5	28.9	28.7	28.8	29.4	30.2	31.2	32.1	32.9	33.4	33.6
	DEC	293	.24	.24	.23	.23	.23	.23	.24	.25	.26	.27	.27	.27	.26
16	RA	05 14	11.5	11.4	10.9	10.4	10.0	10.0	10.4	11.0	11.9	12.7	13.6	14.1	14.4
	DEC	- 145	.97	.99	1.00	1.00	.99	.97	.94	.91	.90	.89	.91	.93	.96
17	RA	05 16	09.2	09.1	08.5	07.7	07.2	07.2	07.8	08.8	10.0	11.3	12.5	13.3	13.7
	DEC	817	.64	.66	.67	.66	.64	.62	.60	.59	.59	.60	.60	.62	.64
18	RA	05 24	44.5	44.4	44.1	43.5	43.1	43.1	43.5	44.2	45.1	46.0	46.8	47.4	47.7
	DEC	112	.77	.76	.75	.75	.75	.76	.78	.80	.80	.81	.80	.79	.77
19	RA	05 25	49.9	49.9	49.5	48.8	48.4	48.4	48.9	49.7	50.7	51.7	52.7	53.4	53.8
	DEC	508	.48	.49	.49	.49	.48	.47	.47	.47	.47	.47	.47	.48	.48
20	RA	05 35	50.8	50.8	50.4	49.8	49.4	49.4	49.7	50.4	51.2	52.1	52.9	53.5	53.9
	DEC	- 21	.45	.47	.48	.48	.47	.46	.44	.42	.40	.40	.41	.43	.45
21	RA	05 40	23.6	23.6	23.2	22.7	22.3	22.2	22.5	23.2	24.0	24.9	25.7	26.4	26.7
	DEC	- 34	.61	.62	.63	.64	.63	.61	.59	.57	.56	.55	.57	.59	.61
22	RA	05 54	46.8	46.8	46.5	45.9	45.5	45.4	45.7	46.4	47.2	48.1	49.0	49.7	50.1
	DEC	131	.66	.65	.64	.64	.65	.65	.67	.68	.69	.69	.68	.67	.65
23	RA	06 23	49.2	49.0	48.2	47.1	46.1	45.5	45.4	45.9	46.9	48.1	49.3	50.2	50.6
	DEC	- 936	.74	.79	.82	.82	.81	.78	.74	.69	.65	.65	.67	.71	.77
24	RA	06 37	17.6	17.8	17.5	17.0	16.5	16.3	16.5	17.1	17.9	18.8	19.7	20.6	21.1
	DEC	291	.66	.66	.66	.66	.66	.66	.66	.67	.67	.66	.66	.64	.63
25	RA	06 44	50.1	50.2	49.9	49.3	48.8	48.5	48.6	49.1	49.7	50.6	51.5	52.3	52.8
	DEC	- 296	.98	1.02	1.04	1.04	1.04	1.02	.99	.96	.94	.93	.95	.98	1.02

Table 10b.(5). Apparent Places of Stars, 1992 (Mils of Declination)—Continued

Star No.	Right Ascension / Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
26	RA	06 58	21.1	21.1	20.8	20.1	19.5	19.1	19.2	19.6	20.2	21.1	22.1	22.9	23.5
	DEC	- 514	.86	.91	.93	.95	.94	.92	.88	.84	.81	.81	.82	.86	.90
27	RA	07 08	06.3	06.4	06.1	05.5	04.9	04.5	04.5	04.9	05.6	06.4	07.4	08.2	08.8
	DEC	- 468	.99	1.03	1.06	1.07	1.06	1.04	1.01	.97	.94	.94	.95	.98	1.03
28	RA	07 34	08.3	08.7	08.5	08.0	07.4	07.1	07.1	07.5	08.3	09.2	10.3	11.3	12.1
	DEC	567	.20	.20	.21	.22	.22	.22	.21	.20	.19	.17	.16	.15	.15
29	RA	07 38	55.4	55.8	55.6	55.1	54.6	54.4	54.4	54.7	55.3	56.1	57.0	57.9	58.6
	DEC	93	.24	.22	.21	.21	.21	.22	.23	.24	.25	.24	.23	.20	.18
30	RA	07 44	52.4	52.8	52.7	52.2	51.6	51.3	51.3	51.7	52.3	53.2	54.3	55.3	56.1
	DEC	498	.56	.57	.58	.58	.59	.58	.58	.57	.55	.54	.52	.51	.51
31	RA	08 09	19.7	19.9	19.6	18.9	18.0	17.3	17.0	17.0	17.6	18.5	19.7	20.8	21.6
	DEC	- 841	.11	.16	.20	.23	.24	.22	.19	.15	.11	.09	.09	.12	.17
32	RA	08 22	23.9	24.2	23.7	22.7	21.5	20.4	19.8	19.7	20.2	21.3	22.8	24.3	25.3
	DEC	-1057	.47	.53	.58	.60	.62	.60	.58	.53	.48	.46	.46	.49	.54
33	RA	09 07	44.3	44.9	44.8	44.3	43.6	43.0	42.6	42.5	42.7	43.5	44.5	45.7	46.7
	DEC	- 771	.54	.60	.64	.67	.69	.68	.66	.62	.58	.56	.55	.58	.62
34	RA	09 13	10.2	11.0	10.7	09.4	07.7	06.0	04.7	04.0	04.3	05.5	07.5	09.6	11.7
	DEC	-1238	.80	.85	.91	.95	.97	.97	.95	.91	.86	.83	.81	.83	.87
35	RA	09 27	13.7	14.3	14.4	14.2	13.8	13.4	13.2	13.2	13.4	14.0	14.8	15.8	16.7
	DEC	- 153	.33	.36	.39	.40	.40	.40	.38	.36	.35	.34	.36	.38	.42
36	RA	10 07	58.8	59.5	59.8	59.7	59.3	58.9	58.7	58.6	58.8	59.2	60.0	61.0	61.9
	DEC	213	.40	.38	.37	.38	.38	.39	.40	.40	.40	.38	.36	.33	.30
37	RA	11 01	24.1	25.4	26.1	26.0	25.4	24.5	23.8	23.3	23.2	23.5	24.5	25.9	27.4
	DEC	1002	1.00	1.01	1.04	1.08	1.11	1.12	1.12	1.09	1.05	1.00	.96	.92	.90
38	RA	11 03	16.9	18.4	19.2	19.1	18.3	17.3	16.3	15.7	15.5	15.9	16.9	18.5	20.3
	DEC	1098	.44	.45	.49	.53	.56	.57	.57	.54	.49	.44	.40	.36	.35
39	RA	11 48	40.5	41.5	42.0	42.2	42.1	41.8	41.5	41.2	41.0	41.2	41.7	42.5	43.5
	DEC	259	.79	.76	.76	.76	.78	.79	.80	.80	.80	.78	.75	.72	.69
40	RA	11 53	26.3	27.7	28.6	28.8	28.4	27.7	27.0	26.3	26.0	26.0	26.7	27.8	29.3
	DEC	955	.24	.24	.26	.30	.34	.36	.36	.35	.31	.26	.21	.17	.15
41	RA	12 15	24.8	25.8	26.4	26.7	26.7	26.4	26.1	25.8	25.6	25.7	26.1	26.9	28.0
	DEC	- 311	.08	.12	.15	.17	.18	.18	.18	.16	.15	.14	.13	.15	.18
42	RA	12 26	10.2	11.9	13.1	13.6	13.4	12.8	11.8	10.8	10.0	09.9	10.7	12.1	14.0
	DEC	-1120	.92	.96	1.00	1.06	1.10	1.13	1.14	1.13	1.10	1.06	1.02	1.01	1.02
43	RA	12 30	44.2	45.8	46.8	47.2	47.2	46.7	46.0	45.2	44.5	44.5	45.1	46.3	47.9
	DEC	-1014	.50	.54	.59	.64	.68	.71	.72	.70	.67	.63	.60	.59	.60
44	RA	12 47	16.0	17.7	18.8	19.4	19.4	19.0	18.2	17.3	16.6	16.4	16.9	18.2	19.9
	DEC	-1060	.31	.34	.39	.43	.48	.51	.52	.51	.48	.44	.41	.40	.40
45	RA	12 53	41.5	43.1	44.1	44.7	44.5	43.9	43.1	42.3	41.6	41.3	41.6	42.5	43.9
	DEC	995	.49	.48	.49	.53	.57	.60	.61	.61	.58	.54	.48	.43	.40
46	RA	13 23	36.7	38.2	39.3	40.0	40.0	39.5	38.8	37.9	37.1	36.7	36.8	37.6	38.9
	DEC	976	1.07	1.06	1.07	1.10	1.14	1.18	1.20	1.20	1.17	1.13	1.08	1.02	.98
47	RA	13 24	47.0	48.1	48.8	49.3	49.5	49.5	49.2	48.9	48.5	48.4	48.7	49.3	50.3
	DEC	- 197	.70	.74	.76	.78	.78	.78	.77	.76	.75	.75	.75	.77	.79
48	RA	13 47	13.8	15.1	16.2	16.9	17.0	16.7	16.2	15.4	14.7	14.3	14.3	14.9	16.0
	DEC	877	.28	.25	.26	.29	.33	.37	.39	.39	.38	.34	.29	.24	.20
49	RA	14 03	15.6	17.5	18.9	20.0	20.5	20.5	20.0	19.1	18.1	17.6	17.7	18.6	20.2
	DEC	-1072	.57	.59	.62	.66	.71	.74	.77	.77	.75	.72	.68	.66	.65

3000015799

Table 10b.(5). Apparent Places of Stars, 1992 (Mils of Declination)—Continued

Ster No.	Right ascension Declination	(Hr Min) MILS	ZERO HOURS UNIVERSAL TIME (GMT) OF FIRST DAY OF MONTH												
			JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN
			Seconds (time of RA or arc of declination)												
50	RA	14 06	13.1	14.3	15.3	16.1	16.4	16.5	16.3	15.8	15.3	15.0	15.1	15.7	16.8
	DEC	- 645	.87	.89	.92	.95	.98	1.00	1.00	1.00	.99	.97	.95	.94	.95
51	RA	14 15	18.1	19.2	20.0	20.7	20.9	20.9	20.7	20.3	19.9	19.5	19.6	20.0	20.9
	DEC	341	.69	.66	.64	.65	.67	.70	.72	.73	.73	.71	.68	.64	.60
52	RA	14 39	03.3	05.1	06.7	08.0	08.7	08.8	08.4	07.5	06.4	05.7	05.6	06.3	07.7
	DEC	-1080	.89	.90	.93	.97	1.01	1.04	1.07	1.08	1.07	1.04	1.00	.97	.96
53	RA	14 50	26.4	27.5	28.4	29.1	29.6	29.8	29.7	29.4	28.9	28.6	28.6	29.0	29.8
	DEC	- 284	.61	.64	.66	.68	.68	.68	.68	.67	.67	.66	.65	.66	.68
54	RA	14 50	40.7	43.2	45.6	47.5	48.2	47.5	45.9	43.7	41.3	39.3	38.3	38.5	40.1
	DEC	1318	.79	.76	.77	.80	.84	.89	.92	.93	.92	.88	.83	.78	.73
55	RA	15 34	20.7	21.7	22.7	23.5	24.0	24.2	24.2	23.8	23.2	22.7	22.4	22.6	23.3
	DEC	475	.34	.30	.29	.30	.32	.36	.39	.41	.42	.40	.37	.33	.29
56	RA	15 59	51.6	52.6	53.6	54.5	55.2	55.6	55.7	55.5	55.0	54.5	54.3	54.5	55.2
	DEC	- 401	.77	.78	.80	.81	.82	.82	.82	.82	.82	.81	.80	.80	.81
57	RA	16 28	54.9	55.9	56.9	57.9	58.6	59.2	59.4	59.2	58.7	58.2	57.9	58.0	58.6
	DEC	- 469	.60	.60	.61	.62	.63	.64	.64	.64	.64	.63	.62	.62	.62
58	RA	16 47	47.5	49.6	51.9	54.2	56.1	57.3	57.7	57.0	55.6	54.1	53.1	53.1	54.2
	DEC	-1226	.89	.86	.86	.88	.90	.94	.98	1.01	1.02	1.01	.98	.94	.90
59	RA	17 09	54.9	55.7	56.6	57.6	58.3	59.0	59.3	59.2	58.8	58.3	57.9	57.9	58.3
	DEC	- 279	.39	.40	.41	.42	.41	.41	.40	.40	.39	.39	.39	.39	.40
60	RA	17 33	03.6	04.6	05.6	06.8	07.8	08.6	09.0	09.0	08.5	07.9	07.4	07.3	07.7
	DEC	- 659	.53	.52	.52	.52	.53	.54	.55	.56	.57	.57	.55	.54	.53
61	RA	17 34	33.4	34.1	34.9	35.8	36.6	37.2	37.5	37.4	37.0	36.4	36.0	35.9	36.2
	DEC	223	.36	.33	.31	.31	.33	.36	.39	.41	.43	.43	.42	.40	.37
62	RA	17 56	23.5	24.2	25.2	26.5	27.5	28.3	28.5	28.2	27.4	26.3	25.4	24.8	24.9
	DEC	915	.35	.30	.27	.27	.29	.34	.39	.43	.46	.47	.45	.41	.36
63	RA	18 23	38.2	39.0	39.9	41.0	42.0	42.9	43.5	43.7	43.3	42.7	42.2	41.9	42.2
	DEC	- 611	.37	.35	.35	.34	.34	.34	.35	.36	.37	.37	.36	.35	.34
64	RA	18 36	39.0	39.5	40.3	41.3	42.3	43.1	43.5	43.5	43.0	42.2	41.5	41.0	41.0
	DEC	689	.34	.30	.27	.26	.28	.32	.37	.41	.45	.46	.45	.42	.37
65	RA	18 54	45.9	46.5	47.3	48.3	49.3	50.2	50.8	51.1	50.8	50.3	49.8	49.5	49.6
	DEC	- 467	.69	.68	.68	.67	.66	.65	.65	.65	.66	.66	.66	.66	.65
66	RA	19 50	23.2	23.6	24.1	24.9	25.8	26.7	27.4	27.7	27.5	27.1	26.6	26.3	26.2
	DEC	157	.28	.26	.25	.24	.26	.29	.32	.35	.37	.38	.38	.37	.35
67	RA	20 25	0 .6	0 .9	01.8	03.0	04.5	06.1	07.3	08.0	07.9	07.3	06.3	05.5	05.1
	DEC	-1008	1.12	1.08	1.04	1.01	.99	.99	1.00	1.02	1.05	1.07	1.08	1.07	1.05
68	RA	20 41	08.5	08.5	09.0	09.8	10.9	12.1	12.9	13.4	13.2	12.7	11.9	11.2	10.7
	DEC	804	.52	.48	.44	.42	.42	.45	.49	.55	.59	.63	.64	.63	.60
69	RA	21 40	34.9	34.2	34.9	37.0	39.9	43.3	46.5	48.6	49.1	47.9	45.5	42.8	40.6
	DEC	-1376	.51	.46	.41	.37	.33	.32	.32	.35	.40	.43	.45	.45	.42
70	RA	22 07	44.1	43.9	44.1	44.8	45.8	47.0	48.3	49.2	49.6	49.4	48.9	48.2	47.6
	DEC	- 835	.60	.57	.53	.49	.46	.43	.42	.43	.45	.48	.50	.51	.50
71	RA	22 42	37.8	37.5	37.5	37.9	38.7	39.7	40.7	41.5	41.9	41.9	41.6	41.1	40.7
	DEC	536	.59	.56	.54	.51	.51	.53	.56	.60	.65	.68	.70	.70	.69
72	RA	22 57	13.1	12.9	13.0	13.3	14.0	15.0	16.1	17.0	17.4	17.5	17.2	16.8	16.3
	DEC	- 527	.39	.38	.36	.33	.30	.26	.24	.23	.24	.25	.28	.29	.29
73	RA	23 04	22.2	22.0	22.0	22.3	22.9	23.8	24.8	25.6	26.1	26.2	25.9	25.6	25.2
	DEC	269	.60	.58	.57	.56	.56	.58	.61	.65	.68	.70	.71	.71	.70

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