

| UT | SUN | | ARIES | MARS-0.4 | | JUPITER-2.2 | | SATURN1.0 | | MOON | | Lat. | Moon-rise | Diff. |
|-------|----------|----------|----------|----------|--------|-------------|---------|-----------|--------|---------|-----------|-----------------|-----------|-------|
| | GHA | Dec. | GHA | GHA | Dec. | GHA | Dec. | GHA | Dec. | GHA | Dec. | | | |
| 00 00 | 181 15.6 | S23 15.7 | 83 47.1 | 300 52 | N17 51 | 117 59 | S14 42 | 259 22 | N 0 29 | 200 18 | S24 59 | N | | |
| 10 | 183 45.5 | 15.7 | 86 17.5 | 303 23 | | 120 29 | | 261 52 | | 202 43 | 24 59 | | h m | m |
| 20 | 186 15.5 | 15.7 | 88 48.0 | 305 53 | | 122 59 | | 264 22 | | 205 08 | 25 00 | 72 | ■ | * |
| 30 | 188 45.4 | 15.7 | 91 18.4 | 308 23 | | 125 30 | | 266 53 | | 207 32 | 00 | 70 | ■ | * |
| 40 | 191 15.4 | 15.7 | 93 48.8 | 310 54 | | 128 00 | | 269 23 | | 209 57 | 01 | 68 | ■ | * |
| 50 | 193 45.3 | 15.8 | 96 19.2 | 313 24 | | 130 30 | | 271 54 | | 212 22 | 02 | 66 | ■ | * |
| 01 00 | 196 15.3 | S23 15.8 | 98 49.6 | 315 55 | N17 51 | 133 01 | S14 42 | 274 24 | N 0 29 | 214 46 | S25 02 | 64 | 10 16 | +44 |
| 10 | 198 45.2 | 15.8 | 101 20.0 | 318 25 | | 135 31 | | 276 54 | | 217 11 | 03 | 62 | 09 14 | +36 |
| 20 | 201 15.2 | 15.8 | 103 50.4 | 320 55 | | 138 01 | | 279 25 | | 219 36 | 03 | 60 | 08 40 | +34 |
| 30 | 203 45.1 | 15.9 | 106 20.8 | 323 26 | | 140 32 | | 281 55 | | 222 00 | 04 | 58 | 08 15 | +32 |
| 40 | 206 15.1 | 15.9 | 108 51.2 | 325 56 | | 143 02 | | 284 26 | | 224 25 | 04 | 56 | 07 56 | +32 |
| 50 | 208 45.0 | 15.9 | 111 21.6 | 328 26 | | 145 32 | | 286 56 | | 226 50 | 05 | 54 | 07 39 | +31 |
| 02 00 | 211 15.0 | S23 15.9 | 113 52.1 | 330 57 | N17 52 | 148 03 | S14 42 | 289 26 | N 0 29 | 229 14 | S25 06 | 52 | 07 25 | +31 |
| 10 | 213 44.9 | 15.9 | 116 22.5 | 333 27 | | 150 33 | | 291 57 | | 231 39 | 06 | 50 | 07 12 | +30 |
| 20 | 216 14.9 | 16.0 | 118 52.9 | 335 58 | | 153 04 | | 294 27 | | 234 04 | 07 | 45 | 06 47 | +30 |
| 30 | 218 44.8 | 16.0 | 121 23.3 | 338 28 | | 155 34 | | 296 58 | | 236 28 | 07 | 40 | 06 27 | +29 |
| 40 | 221 14.8 | 16.0 | 123 53.7 | 340 58 | | 158 04 | | 299 28 | | 238 53 | 08 | 35 | 06 10 | +28 |
| 50 | 223 44.7 | 16.0 | 126 24.1 | 343 29 | | 160 35 | | 301 58 | | 241 18 | 08 | 30 | 05 55 | +28 |
| 03 00 | 226 14.7 | S23 16.1 | 128 54.5 | 345 59 | N17 52 | 163 05 | S14 42 | 304 29 | N 0 29 | 243 43 | S25 09 | 20 | 05 31 | +27 |
| 10 | 228 44.6 | 16.1 | 131 24.9 | 348 29 | | 165 35 | | 306 59 | | 246 07 | 09 | 10 | 05 09 | +27 |
| 20 | 231 14.6 | 16.1 | 133 55.3 | 351 00 | | 168 06 | | 309 29 | | 248 32 | 10 | 0 | 04 50 | +26 |
| 30 | 233 44.5 | 16.1 | 136 25.8 | 353 30 | | 170 36 | | 312 00 | | 250 57 | 10 | 10 | 04 30 | +26 |
| 40 | 236 14.5 | 16.1 | 138 56.2 | 356 01 | | 173 06 | | 314 30 | | 253 21 | 11 | 20 | 04 09 | +25 |
| 50 | 238 44.4 | 16.2 | 141 26.6 | 358 31 | | 175 37 | | 317 01 | | 255 46 | 11 | 30 | 03 44 | +24 |
| 04 00 | 241 14.4 | S23 16.2 | 143 57.0 | 1 01 | N17 52 | 178 07 | S14 41 | 319 31 | N 0 29 | 258 11 | S25 12 | 35 | 03 30 | +24 |
| 10 | 243 44.3 | 16.2 | 146 27.4 | 3 32 | | 180 37 | | 322 01 | | 260 35 | 12 | 40 | 03 13 | +23 |
| 20 | 246 14.3 | 16.2 | 148 57.8 | 6 02 | | 183 08 | | 324 32 | | 263 00 | 13 | 45 | 02 54 | +23 |
| 30 | 248 44.2 | 16.2 | 151 28.2 | 8 32 | | 185 38 | | 327 02 | | 265 25 | 13 | 50 | 02 29 | +21 |
| 40 | 251 14.2 | 16.3 | 153 58.6 | 11 03 | | 188 08 | | 329 33 | | 267 49 | 14 | 52 | 02 17 | +21 |
| 50 | 253 44.1 | 16.3 | 156 29.0 | 13 33 | | 190 39 | | 332 03 | | 270 14 | 14 | 54 | 02 04 | +20 |
| 05 00 | 256 14.1 | S23 16.3 | 158 59.5 | 16 04 | N17 52 | 193 09 | S14 41 | 334 33 | N 0 29 | 272 39 | S25 15 | 56 | 01 48 | +20 |
| 10 | 258 44.0 | 16.3 | 161 29.9 | 18 34 | | 195 39 | | 337 04 | | 275 03 | 15 | 58 | 01 30 | +19 |
| 20 | 261 14.0 | 16.4 | 164 00.3 | 21 04 | | 198 10 | | 339 34 | | 277 28 | 16 | 60 | 01 07 | +17 |
| 30 | 263 43.9 | 16.4 | 166 30.7 | 23 35 | | 200 40 | | 342 05 | | 279 53 | 16 | S | | |
| 40 | 266 13.8 | 16.4 | 169 01.1 | 26 05 | | 203 10 | | 344 35 | | 282 17 | 17 | | | |
| 50 | 268 43.8 | 16.4 | 171 31.5 | 28 35 | | 205 41 | | 347 05 | | 284 42 | 17 | | | |
| 06 00 | 271 13.7 | S23 16.4 | 174 01.9 | 31 06 | N17 52 | 208 11 | S14 41 | 349 36 | N 0 29 | 287 07 | S25 18 | Moon's P. in A. | | |
| 10 | 273 43.7 | 16.5 | 176 32.3 | 33 36 | | 210 41 | | 352 06 | | 289 31 | 18 | A | C | A |
| 20 | 276 13.6 | 16.5 | 179 02.7 | 36 07 | | 213 12 | | 354 37 | | 291 56 | 19 | I | O | C |
| 30 | 278 43.6 | 16.5 | 181 33.1 | 38 37 | | 215 42 | | 357 07 | | 294 21 | 19 | t | o | r |
| 40 | 281 13.5 | 16.5 | 184 03.6 | 41 07 | | 218 12 | | 359 37 | | 296 46 | 19 | 0 | 55 | 56 |
| 50 | 283 43.5 | 16.5 | 186 34.0 | 43 38 | | 220 43 | | 2 | 08 | 299 10 | 20 | 10 | 55 | 57 |
| 07 00 | 286 13.4 | S23 16.6 | 189 04.4 | 46 08 | N17 52 | 223 13 | S14 41 | 4 38 | N 0 29 | 301 35 | S25 20 | 15 | 53 | 59 |
| 10 | 288 43.4 | 16.6 | 191 34.8 | 48 38 | | 225 43 | | 7 08 | | 304 00 | 21 | 18 | 52 | 60 |
| 20 | 291 13.3 | 16.6 | 194 05.2 | 51 09 | | 228 14 | | 9 39 | | 306 24 | 21 | 21 | 51 | 61 |
| 30 | 293 43.3 | 16.6 | 196 35.6 | 53 39 | | 230 44 | | 12 09 | | 308 49 | 22 | 24 | 50 | 62 |
| 40 | 296 13.2 | 16.6 | 199 06.0 | 56 10 | | 233 14 | | 14 40 | | 311 14 | 22 | 26 | 49 | 63 |
| 50 | 298 43.2 | 16.7 | 201 36.4 | 58 40 | | 235 45 | | 17 10 | | 313 38 | 23 | 29 | 48 | 64 |
| 08 00 | 301 13.1 | S23 16.7 | 204 06.8 | 61 10 | N17 52 | 238 15 | S14 41 | 19 40 | N 0 29 | 316 03 | S25 23 | 31 | 48 | 66 |
| 10 | 303 43.1 | 16.7 | 206 37.3 | 63 41 | | 240 45 | | 22 11 | | 318 28 | 23 | 33 | 47 | 67 |
| 20 | 306 13.0 | 16.7 | 209 07.7 | 66 11 | | 243 16 | | 24 41 | | 320 52 | 24 | 34 | 46 | 68 |
| 30 | 308 43.0 | 16.8 | 211 38.1 | 68 42 | | 245 46 | | 27 12 | | 323 17 | 24 | 36 | 45 | 69 |
| 40 | 311 12.9 | 16.8 | 214 08.5 | 71 12 | | 248 16 | | 29 42 | | 325 42 | 25 | 38 | 44 | 70 |
| 50 | 313 42.9 | 16.8 | 216 38.9 | 73 42 | | 250 47 | | 32 12 | | 328 06 | 25 | 40 | 43 | 71 |
| 09 00 | 316 12.8 | S23 16.8 | 219 09.3 | 76 13 | N17 52 | 253 17 | S14 41 | 34 43 | N 0 29 | 330 31 | S25 25 | 41 | 42 | 72 |
| 10 | 318 42.8 | 16.8 | 221 39.7 | 78 43 | | 255 47 | | 37 13 | | 332 56 | 26 | 43 | 41 | 73 |
| 20 | 321 12.7 | 16.9 | 224 10.1 | 81 13 | | 258 18 | | 39 44 | | 335 20 | 26 | 44 | 40 | 74 |
| 30 | 323 42.7 | 16.9 | 226 40.5 | 83 44 | | 260 48 | | 42 14 | | 337 45 | 27 | 46 | 39 | 75 |
| 40 | 326 12.6 | 16.9 | 229 11.0 | 86 14 | | 263 18 | | 44 44 | | 340 10 | 27 | 47 | 38 | 76 |
| 50 | 328 42.6 | 16.9 | 231 41.4 | 88 45 | | 265 49 | | 47 15 | | 342 34 | 27 | 48 | 37 | 77 |
| 10 00 | 331 12.5 | S23 16.9 | 234 11.8 | 91 15 | N17 52 | 268 19 | S14 41 | 49 45 | N 0 29 | 344 59 | S25 28 | 48 | 36 | 78 |
| 10 | 333 42.5 | 17.0 | 236 42.2 | 93 45 | | 270 49 | | 52 15 | | 347 24 | 28 | 50 | 35 | 79 |
| 20 | 336 12.4 | 17.0 | 239 12.6 | 96 16 | | 273 20 | | 54 46 | | 349 48 | 28 | 51 | 34 | 80 |
| 30 | 338 42.4 | 17.0 | 241 43.0 | 98 46 | | 275 50 | | 57 16 | | 352 13 | 29 | 52 | 33 | |
| 40 | 341 12.3 | 17.0 | 244 13.4 | 101 16 | | 278 21 | | 59 47 | | 354 38 | 29 | 53 | 32 | |
| 50 | 343 42.3 | 17.0 | 246 43.8 | 103 47 | | 280 51 | | 62 17 | | 357 02 | 29 | 54 | 31 | |
| 11 00 | 346 12.2 | S23 17.1 | 249 14.2 | 106 17 | N17 52 | 283 21 | S14 40 | 64 47 | N 0 29 | 359 27 | S25 30 | 55 | 30 | |
| 10 | 348 42.2 | 17.1 | 251 44.6 | 108 48 | | 285 52 | | 67 18 | | 1 52 | 30 | 56 | 29 | |
| 20 | 351 12.1 | 17.1 | 254 15.1 | 111 18 | | 288 22 | | 69 48 | | 4 16 | 31 | 57 | 28 | |
| 30 | 353 42.1 | 17.1 | 256 45.5 | 113 48 | | 290 52 | | 72 19 | | 6 41 | 31 | Sun SD | 16'2 | |
| 40 | 356 12.0 | 17.1 | 259 15.9 | 116 19 | | 293 23 | | 74 49 | | 9 06 | 31 | Moon SD | 15' | |
| 50 | 358 42.0 | 17.2 | 261 46.3 | 118 49 | | 295 53 | | 77 19 | | 11 31 | 32 | Moon ill. | 2% - | |
| Rate | 14 59.7 | S0 00.1 | | 15 02.3 | 0 00.0 | 15 02.0 | N0 00.1 | 15 02.3 | 0 00.0 | 14 28.1 | S0 02.8 * | | | |

698 (DAY 349) GREENWICH P. M. 2009 DECEMBER 15 (TUESDAY)

| UT | SUN | | ARIES | MARS-0.4 | | JUPITER-2.2 | | SATURN1.0 | | MOON | | Lat. | Moon-set | Diff. |
|-------|----------|----------|----------|----------|---------|-------------|---------|-----------|--------|---------|---------|-----------------|-----------|-------|
| | GHA | Dec. | GHA | GHA | Dec. | GHA | Dec. | GHA | Dec. | GHA | Dec. | | | |
| 12 00 | 1 11.9 | S23 17.2 | 264 16.7 | 121 19 | N17 52 | 298 23 | S14 40 | 79 50 | N 0 29 | 13 55 | S25 32 | N | | |
| 10 | 3 41.9 | 17.2 | 266 47.1 | 123 50 | | 300 54 | | 82 20 | | 16 20 | 32 | | h | m |
| 20 | 6 11.8 | 17.2 | 269 17.5 | 126 20 | | 303 24 | | 84 51 | | 18 45 | 33 | 72 | ■ | * |
| 30 | 8 41.8 | 17.2 | 271 47.9 | 128 51 | | 305 54 | | 87 21 | | 21 09 | 33 | 70 | ■ | * |
| 40 | 11 11.7 | 17.3 | 274 18.3 | 131 21 | | 308 25 | | 89 51 | | 23 34 | 33 | 68 | ■ | * |
| 50 | 13 41.7 | 17.3 | 276 48.8 | 133 51 | | 310 55 | | 92 22 | | 25 59 | 33 | 66 | ■ | * |
| 13 00 | 16 11.6 | S23 17.3 | 279 19.2 | 136 22 | N17 52 | 313 25 | S14 40 | 94 52 | N 0 29 | 28 23 | S25 34 | 64 | 11 46 | +11 |
| 10 | 18 41.6 | 17.3 | 281 49.6 | 138 52 | | 315 56 | | 97 23 | | 30 48 | 34 | 62 | 12 48 | +19 |
| 20 | 21 11.5 | 17.3 | 284 20.0 | 141 22 | | 318 26 | | 99 53 | | 33 13 | 34 | 60 | 13 22 | +21 |
| 30 | 23 41.5 | 17.4 | 286 50.4 | 143 53 | | 320 56 | | 102 23 | | 35 37 | 35 | 58 | 13 47 | +22 |
| 40 | 26 11.4 | 17.4 | 289 20.8 | 146 23 | | 323 27 | | 104 54 | | 38 02 | 35 | 56 | 14 07 | +23 |
| 50 | 28 41.4 | 17.4 | 291 51.2 | 148 54 | | 325 57 | | 107 24 | | 40 27 | 35 | 54 | 14 23 | +23 |
| 14 00 | 31 11.3 | S23 17.4 | 294 21.6 | 151 24 | N17 52 | 328 27 | S14 40 | 109 54 | N 0 29 | 42 51 | S25 36 | 52 | 14 38 | +23 |
| 10 | 33 41.3 | 17.4 | 296 52.0 | 153 54 | | 330 58 | | 112 25 | | 45 16 | 36 | 50 | 14 50 | +24 |
| 20 | 36 11.2 | 17.5 | 299 22.5 | 156 25 | | 333 28 | | 114 55 | | 47 41 | 36 | 45 | 15 16 | +24 |
| 30 | 38 41.2 | 17.5 | 301 52.9 | 158 55 | | 335 58 | | 117 26 | | 50 05 | 36 | 40 | 15 36 | +25 |
| 40 | 41 11.1 | 17.5 | 304 23.3 | 161 26 | | 338 29 | | 119 56 | | 52 30 | 37 | 35 | 15 53 | +25 |
| 50 | 43 41.1 | 17.5 | 306 53.7 | 163 56 | | 340 59 | | 122 26 | | 54 55 | 37 | 30 | 16 08 | +25 |
| 15 00 | 46 11.0 | S23 17.5 | 309 24.1 | 166 26 | N17 52 | 343 29 | S14 40 | 124 57 | N 0 29 | 57 19 | S25 37 | 20 | 16 33 | +26 |
| 10 | 48 41.0 | 17.6 | 311 54.5 | 168 57 | | 346 00 | | 127 27 | | 59 44 | 37 | 10 | 16 55 | +26 |
| 20 | 51 10.9 | 17.6 | 314 24.9 | 171 27 | | 348 30 | | 129 58 | | 62 09 | 38 | 0 | 17 15 | +26 |
| 30 | 53 40.9 | 17.6 | 316 55.3 | 173 57 | | 351 00 | | 132 28 | | 64 33 | 38 | 10 | 17 35 | +27 |
| 40 | 56 10.8 | 17.6 | 319 25.7 | 176 28 | | 353 31 | | 134 58 | | 66 58 | 38 | 20 | 17 57 | +27 |
| 50 | 58 40.8 | 17.6 | 321 56.1 | 178 58 | | 356 01 | | 137 29 | | 69 23 | 38 | 30 | 18 22 | +27 |
| 16 00 | 61 10.7 | S23 17.7 | 324 26.6 | 181 29 | N17 52 | 358 31 | S14 40 | 139 59 | N 0 29 | 71 47 | S25 39 | 35 | 18 37 | +27 |
| 10 | 63 40.7 | 17.7 | 326 57.0 | 183 59 | | 1 02 | | 142 30 | | 74 12 | 39 | 40 | 18 54 | +27 |
| 20 | 66 10.6 | 17.7 | 329 27.4 | 186 29 | | 3 32 | | 145 00 | | 76 37 | 39 | 45 | 19 14 | +27 |
| 30 | 68 40.6 | 17.7 | 331 57.8 | 189 00 | | 6 02 | | 147 30 | | 79 02 | 39 | 50 | 19 40 | +28 |
| 40 | 71 10.5 | 17.7 | 334 28.2 | 191 30 | | 8 33 | | 150 01 | | 81 26 | 40 | 52 | 19 52 | +28 |
| 50 | 73 40.5 | 17.8 | 336 58.6 | 194 00 | | 11 03 | | 152 31 | | 83 51 | 40 | 54 | 20 07 | +28 |
| 17 00 | 76 10.4 | S23 17.8 | 339 29.0 | 196 31 | N17 52 | 13 33 | S14 40 | 155 02 | N 0 29 | 86 16 | S25 40 | 56 | 20 23 | +28 |
| 10 | 78 40.4 | 17.8 | 341 59.4 | 199 01 | | 16 04 | | 157 32 | | 88 40 | 40 | 58 | 20 43 | +28 |
| 20 | 81 10.3 | 17.8 | 344 29.8 | 201 32 | | 18 34 | | 160 02 | | 91 05 | 40 | 60 | 21 09 | +29 |
| 30 | 83 40.3 | 17.8 | 347 00.3 | 204 02 | | 21 04 | | 162 33 | | 93 30 | 41 | S | | |
| 40 | 86 10.2 | 17.9 | 349 30.7 | 206 32 | | 23 35 | | 165 03 | | 95 54 | 41 | | | |
| 50 | 88 40.2 | 17.9 | 352 01.1 | 209 03 | | 26 05 | | 167 33 | | 98 19 | 41 | | | |
| 18 00 | 91 10.1 | S23 17.9 | 354 31.5 | 211 33 | N17 52 | 28 35 | S14 39 | 170 04 | N 0 29 | 100 44 | S25 41 | Moon's P. in A. | | |
| 10 | 93 40.1 | 17.9 | 357 01.9 | 214 03 | | 31 06 | | 172 34 | | 103 08 | 41 | A | C | |
| 20 | 96 10.0 | 17.9 | 359 32.3 | 216 34 | | 33 36 | | 175 05 | | 105 33 | 42 | A | C | |
| 30 | 98 40.0 | 18.0 | 2 02.7 | 219 04 | | 36 06 | | 177 35 | | 107 58 | 42 | t. | o. | r. |
| 40 | 101 09.9 | 18.0 | 4 33.1 | 221 35 | | 38 37 | | 180 05 | | 110 22 | 42 | 0 | 56 | 30 |
| 50 | 103 39.9 | 18.0 | 7 03.5 | 224 05 | | 41 07 | | 182 36 | | 112 47 | 42 | 10 | 55 | 57 |
| 19 00 | 106 09.8 | S23 18.0 | 9 34.0 | 226 35 | N17 52 | 43 37 | S14 39 | 185 06 | N 0 29 | 115 12 | S25 42 | 15 | 54 | 59 |
| 10 | 108 39.8 | 18.0 | 12 04.4 | 229 06 | | 46 08 | | 187 37 | | 117 36 | 42 | 18 | 53 | 60 |
| 20 | 111 09.7 | 18.1 | 14 34.8 | 231 36 | | 48 38 | | 190 07 | | 120 01 | 43 | 21 | 52 | 61 |
| 30 | 113 39.7 | 18.1 | 17 05.2 | 234 06 | | 51 09 | | 192 37 | | 122 26 | 43 | 24 | 51 | 62 |
| 40 | 116 09.6 | 18.1 | 19 35.6 | 236 37 | | 53 39 | | 195 08 | | 124 50 | 43 | 26 | 50 | 63 |
| 50 | 118 39.6 | 18.1 | 22 06.0 | 239 07 | | 56 09 | | 197 38 | | 127 15 | 43 | 29 | 49 | 64 |
| 20 00 | 121 09.5 | S23 18.1 | 24 36.4 | 241 38 | N17 52 | 58 40 | S14 39 | 200 09 | N 0 29 | 129 40 | S25 43 | 31 | 48 | 66 |
| 10 | 123 39.5 | 18.2 | 27 06.8 | 244 08 | | 61 10 | | 202 39 | | 132 05 | 43 | 33 | 47 | 67 |
| 20 | 126 09.4 | 18.2 | 29 37.2 | 246 38 | | 63 40 | | 205 09 | | 134 29 | 44 | 34 | 46 | 68 |
| 30 | 128 39.4 | 18.2 | 32 07.6 | 249 09 | | 66 11 | | 207 40 | | 136 54 | 44 | 36 | 45 | 69 |
| 40 | 131 09.3 | 18.2 | 34 38.1 | 251 39 | | 68 41 | | 210 10 | | 139 19 | 44 | 38 | 44 | 70 |
| 50 | 133 39.3 | 18.2 | 37 08.5 | 254 10 | | 71 11 | | 212 40 | | 141 43 | 44 | 40 | 43 | 71 |
| 21 00 | 136 09.2 | S23 18.2 | 39 38.9 | 256 40 | N17 52 | 73 42 | S14 39 | 215 11 | N 0 29 | 144 08 | S25 44 | 41 | 42 | 72 |
| 10 | 138 39.2 | 18.3 | 42 09.3 | 259 10 | | 76 12 | | 217 41 | | 146 33 | 44 | 43 | 41 | 73 |
| 20 | 141 09.1 | 18.3 | 44 39.7 | 261 41 | | 78 42 | | 220 12 | | 148 57 | 44 | 44 | 40 | 74 |
| 30 | 143 39.1 | 18.3 | 47 10.1 | 264 11 | | 81 13 | | 222 42 | | 151 22 | 44 | 44 | 39 | 75 |
| 40 | 146 09.0 | 18.3 | 49 40.5 | 266 41 | | 83 43 | | 225 12 | | 153 47 | 45 | 46 | 38 | 76 |
| 50 | 148 39.0 | 18.3 | 52 10.9 | 269 12 | | 86 13 | | 227 43 | | 156 11 | 45 | 47 | 37 | 77 |
| 22 00 | 151 08.9 | S23 18.4 | 54 41.3 | 271 42 | N17 52 | 88 44 | S14 39 | 230 13 | N 0 29 | 158 36 | S25 45 | 48 | 36 | 78 |
| 10 | 153 38.9 | 18.4 | 57 11.8 | 274 13 | | 91 14 | | 232 44 | | 161 01 | 45 | 50 | 35 | 79 |
| 20 | 156 08.8 | 18.4 | 59 42.2 | 276 43 | | 93 44 | | 235 14 | | 163 25 | 45 | 51 | 34 | 80 |
| 30 | 158 38.8 | 18.4 | 62 12.6 | 279 13 | | 96 15 | | 237 44 | | 165 50 | 45 | 52 | 33 | |
| 40 | 161 08.7 | 18.4 | 64 43.0 | 281 44 | | 98 45 | | 240 15 | | 168 15 | 45 | 54 | 32 | |
| 50 | 163 38.7 | 18.5 | 67 13.4 | 284 14 | | 101 15 | | 242 45 | | 170 40 | 45 | 55 | 31 | |
| 23 00 | 166 08.6 | S23 18.5 | 69 43.8 | 286 44 | N17 53 | 103 46 | S14 39 | 245 16 | N 0 29 | 173 04 | S25 45 | 56 | 30 | |
| 10 | 168 38.6 | 18.5 | 72 14.2 | 289 15 | | 106 16 | | 247 46 | | 175 29 | 45 | 57 | | |
| 20 | 171 08.5 | 18.5 | 74 44.6 | 291 45 | | 108 46 | | 250 16 | | 177 54 | 45 | | | |
| 30 | 173 38.5 | 18.5 | 77 15.0 | 294 16 | | 111 17 | | 252 47 | | 180 18 | 45 | | | |
| 40 | 176 08.4 | 18.5 | 79 45.5 | 296 46 | | 113 47 | | 255 17 | | 182 43 | 46 | | | |
| 50 | 178 38.3 | 18.6 | 82 15.9 | 299 16 | | 116 17 | | 257 48 | | 185 08 | 46 | | | |
| Rate | 14 59.7 | S0 00.1 | | 15 02.3 | N0 00.1 | 15 02.0 | N0 00.1 | 15 02.3 | 0 00.0 | 14 28.1 | S0 01.1 | * | Sun SD | 16'2 |
| | | | | | | | | | | | | | Moon SD | 15' |
| | | | | | | | | | | | | | Moon ill. | 1% - |

STANDARD DOME
REFRACTION

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

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

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

BUBBLE SEXTANT ERROR

| Sextant Number | Alt. | Corr. |
|----------------|------|-------|
| | ° | ' |

CORRECTIONS TO BE APPLIED
TO MARINE SEXTANT ALTITUDES

CORRECTION FOR DIP OF THE HORIZON
To be subtracted from sextant altitude.

| Ht. | Dip | Ht. | Dip | Ht. | Dip | Ht. | Dip | Ht. | Dip |
|-----|-----|-----|-----|-----|-----|-------|-----|-------|-----|
| Ft. | ' | Ft. | ' | Ft. | ' | Ft. | ' | Ft. | ' |
| 0 | 1 | 114 | 11 | 437 | 21 | 968 | 31 | 1 707 | 41 |
| 2 | 2 | 137 | 12 | 481 | 22 | 1 033 | 32 | 1 792 | 42 |
| 6 | 3 | 162 | 13 | 527 | 23 | 1 099 | 33 | 1 880 | 43 |
| 12 | 4 | 189 | 14 | 575 | 24 | 1 168 | 34 | 1 970 | 44 |
| 21 | 5 | 218 | 15 | 625 | 25 | 1 239 | 35 | 2 061 | 45 |
| 31 | 6 | 250 | 16 | 677 | 26 | 1 311 | 36 | 2 155 | 46 |
| 43 | 7 | 283 | 17 | 731 | 27 | 1 386 | 37 | 2 251 | 47 |
| 58 | 8 | 318 | 18 | 787 | 28 | 1 463 | 38 | 2 349 | 48 |
| 75 | 9 | 356 | 19 | 845 | 29 | 1 543 | 39 | 2 449 | 49 |
| 93 | 10 | 395 | 20 | 906 | 30 | 1 624 | 40 | 2 551 | 50 |
| 114 | | 437 | | 968 | | 1 707 | | 2 655 | |

CORRECTIONS

In addition to sextant error and dip, corrections are to be applied for:

- Refraction
- Semi-diameter (for the Sun and Moon)
- Parallax (for the Moon)
- Dome refraction (if applicable)

MARINE SEXTANT
ERROR

Sextant Number

Index Error

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| F1- F2 (flap) | Star chart |
| F3 (flap) | Star list (57 stars) and G.H.A. interpolation tables |
| F4 (flap) | Interpolation of moonrise and moonset for longitude, and star index |
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| A18 - A19 | List of symbols and abbreviations |
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CORRECTIONS TO BE APPLIED TO SEXTANT ALTITUDE A167

REFRACTION

To be subtracted from sextant altitude (referred to as observed altitude in A.P. 3270)

| R_0 | Height above sea level in units of 1 000 ft. | | | | | | | | | | | | R_0 | $R = R_0 \times f$ | | | |
|-------|--|-------|-------|-------|-------|-------|-------|-------|--|-------|-------|-------|-------|--|----|----|----|
| | Sextant Altitude | | | | | | | | | | | | | f | | | |
| | | | | | | | | | | | | | | 0.9 1.0 1.1 1.2 | | | |
| | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | | R | | | |
| 0 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 90 | 0 | 0 | 0 | 0 | 0 |
| 1 | 63 | 59 | 55 | 51 | 46 | 41 | 36 | 31 | 26 | 20 | 17 | 13 | 1 | 1 | 1 | 1 | 1 |
| 2 | 33 | 29 | 26 | 22 | 19 | 16 | 14 | 11 | 9 | 7 | 6 | 4 | 2 | 2 | 2 | 2 | 2 |
| 3 | 21 | 19 | 16 | 14 | 12 | 10 | 8 | 7 | 5 | 4 | 2 40 | 1 40 | 3 | 3 | 3 | 3 | 4 |
| 4 | 16 | 14 | 12 | 10 | 8 | 7 | 6 | 5 | 3 10 | 2 20 | 1 30 | 0 40 | 4 | 4 | 4 | 4 | 5 |
| 5 | 12 | 11 | 9 | 8 | 7 | 5 | 4 00 | 3 10 | 2 10 | 1 30 | 0 39 | +0 05 | 5 | 5 | 5 | 5 | 6 |
| 6 | 10 | 9 | 7 | 5 50 | 4 50 | 3 50 | 3 10 | 2 20 | 1 30 | 0 49 | +0 11 | -0 19 | 6 | 5 | 6 | 7 | 7 |
| 7 | 8 10 | 6 50 | 5 50 | 4 50 | 4 00 | 3 00 | 2 20 | 1 50 | 1 10 | 0 24 | -0 11 | -0 38 | 7 | 6 | 7 | 8 | 8 |
| 8 | 6 50 | 5 50 | 5 00 | 4 00 | 3 10 | 2 30 | 1 50 | 1 20 | 0 38 | +0 04 | -0 28 | -0 54 | 8 | 7 | 8 | 9 | 10 |
| 9 | 6 00 | 5 10 | 4 10 | 3 20 | 2 40 | 2 00 | 1 30 | 1 00 | 0 19 | -0 13 | -0 42 | -1 08 | 9 | 8 | 9 | 10 | 11 |
| 10 | 5 20 | 4 30 | 3 40 | 2 50 | 2 10 | 1 40 | 1 10 | 0 35 | +0 03 | -0 27 | -0 53 | -1 18 | 10 | 9 | 10 | 11 | 12 |
| 12 | 4 30 | 3 40 | 2 50 | 2 20 | 1 40 | 1 10 | 0 37 | +0 11 | -0 16 | -0 43 | -1 08 | -1 31 | 12 | 11 | 12 | 13 | 14 |
| 14 | 3 30 | 2 50 | 2 10 | 1 40 | 1 10 | 0 34 | +0 09 | -0 14 | -0 37 | -1 00 | -1 23 | -1 44 | 14 | 13 | 14 | 15 | 17 |
| 16 | 2 50 | 2 10 | 1 40 | 1 10 | 0 37 | +0 10 | -0 13 | -0 34 | -0 53 | -1 14 | -1 35 | -1 56 | 16 | 14 | 16 | 18 | 19 |
| 18 | 2 20 | 1 40 | 1 20 | 0 43 | +0 15 | -0 08 | -0 31 | -0 52 | -1 08 | -1 27 | -1 46 | -2 05 | 18 | 16 | 18 | 20 | 22 |
| 20 | 1 50 | 1 20 | 0 49 | +0 23 | -0 02 | -0 26 | -0 46 | -1 06 | -1 22 | -1 39 | -1 57 | -2 14 | 20 | 18 | 20 | 22 | 24 |
| 25 | 1 12 | 0 44 | +0 19 | -0 06 | -0 28 | -0 48 | -1 09 | -1 27 | -1 42 | -1 58 | -2 14 | -2 30 | 25 | 22 | 25 | 28 | 30 |
| 30 | 0 34 | +0 10 | -0 13 | -0 36 | -0 55 | -1 14 | -1 32 | -1 51 | -2 06 | -2 21 | -2 34 | -2 49 | 30 | 27 | 30 | 33 | 36 |
| 35 | +0 06 | -0 16 | -0 37 | -0 59 | -1 17 | -1 33 | -1 51 | -2 07 | -2 23 | -2 37 | -2 51 | -3 04 | 35 | 31 | 35 | 38 | 42 |
| 40 | -0 18 | -0 37 | -0 58 | -1 16 | -1 34 | -1 49 | -2 06 | -2 22 | -2 35 | -2 49 | -3 03 | -3 16 | 40 | 36 | 40 | 44 | 48 |
| 45 | | -0 53 | -1 14 | -1 31 | -1 47 | -2 03 | -2 18 | -2 33 | -2 47 | -2 59 | -3 13 | -3 25 | 45 | 40 | 45 | 50 | 54 |
| 50 | | -1 10 | -1 28 | -1 44 | -1 59 | -2 15 | -2 28 | -2 43 | -2 56 | -3 08 | -3 22 | -3 33 | 50 | 45 | 50 | 55 | 60 |
| 55 | | | -1 40 | -1 53 | -2 09 | -2 24 | -2 38 | -2 52 | -3 04 | -3 17 | -3 29 | -3 41 | 55 | 49 | 55 | 60 | 66 |
| 60 | | | | -2 03 | -2 18 | -2 33 | -2 46 | -3 01 | -3 12 | -3 25 | -3 37 | -3 48 | 60 | 54 | 60 | 66 | 72 |
| | | | | | | | -2 53 | -3 07 | -3 19 | -3 31 | -3 42 | -3 53 | | | | | |
| f | Temperature in °C. | | | | | | | | | | | | f | f | | | |
| | 0 | 5 | 10 | 15 | 20 | 25 | 30 | 35 | 40 | 45 | 50 | 55 | | 0.9 1.0 1.1 1.2 | | | |
| 0.9 | +47 | +36 | +27 | +18 | +10 | +3 | -5 | -13 | | | | | 0.9 | Where R_0 is less than 10' or the height greater than 35 000 ft. use $R = R_0$. | | | |
| 1.0 | +26 | +16 | +6 | -4 | -13 | -22 | -31 | -40 | For these heights no temperature correction is necessary, so use $R = R_0$. | | | | 1.0 | | | | |
| 1.1 | +5 | -5 | -15 | -25 | -36 | -46 | -57 | -68 | | | | | 1.1 | | | | |
| 1.2 | -16 | -25 | -36 | -46 | -58 | -71 | -83 | -95 | | | | | 1.2 | | | | |
| | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | |

Choose the column appropriate to height, in units of 1 000 ft., and find the range of altitude in which the sextant altitude lies; the corresponding value of R_0 is the refraction, to be subtracted from sextant altitude, unless conditions are extreme. In that case find f from the lower table, with critical argument temperature. Use the table on the right to form the refraction, $R = R_0 \times f$.

CORIOLIS (Z) CORRECTION

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

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