CAMPANOLA

取扱説明書

INSTRUCTION MANUAL

CAN11

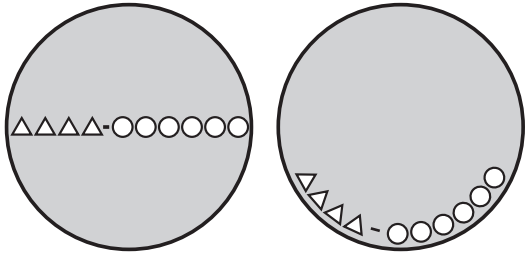
Thank you for your purchase of this Campanola watch.
Before using the watch, read this instruction manual carefully to ensure correct use.
After reading the manual, store it in a safe place for future reference.

Visit the Citizen website (http://www.citizenwatch-global.com/) to view visual guides for operation of your watch. Some models may be equipped with external features (calculation scale, tachymeter, etc.). Visual guides for operation of such external features can also be found on the website.

To check the movement number

A case number–4 alphanumeric characters and 6 or more alphanumeric characters–is engraved on the case back. (Figure on the right)
The first 4 characters of the case number represent the movement number of the watch.
In the example on the right, " △△△△ " is the movement number.

<Engraving position example>



The engraving position may differ depending on watch model.

Safety precautions (IMPORTANT)

This manual contains instructions that should be strictly followed at all times not only for optimal use, but to prevent any injuries to yourself, other persons or property. We encourage you to read the entire booklet (especially, pages 38 to 45) and understand the meaning of the following symbols:

▪ Safety advisories are categorized and depicted in this manual as follows:

⚠ **DANGER**	Highly likely to cause death or serious injury.
⚠ **WARNING**	Can cause serious injury or death.
⚠ **CAUTION**	Can or will cause minor or moderate injury or damage.

▪ Important instructions are categorized and depicted in this manual as follows:

	Warning (caution) symbol followed by instructions that should be followed or precautions that should be observed.
	Warning (caution) symbol followed by prohibited matters.

<Protective stickers>

Be sure to remove any protective stickers that may be on your watch (case back, band, clasp, etc.). Otherwise, perspiration or moisture may enter the gaps between the protective stickers and the parts, which may result in a skin rash and/or corrosion of the metal parts.

<Band adjustment>

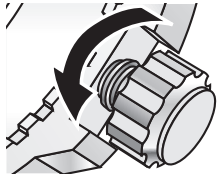
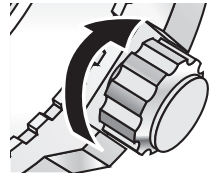
We recommend seeking the assistance of an experienced watch technician for sizing of your watch. If adjustment is not done correctly, the bracelet may unexpectedly become detached leading to loss of your watch or injury.
Consult Citizen Owners' Help Desk.

How to use a specially designed crown

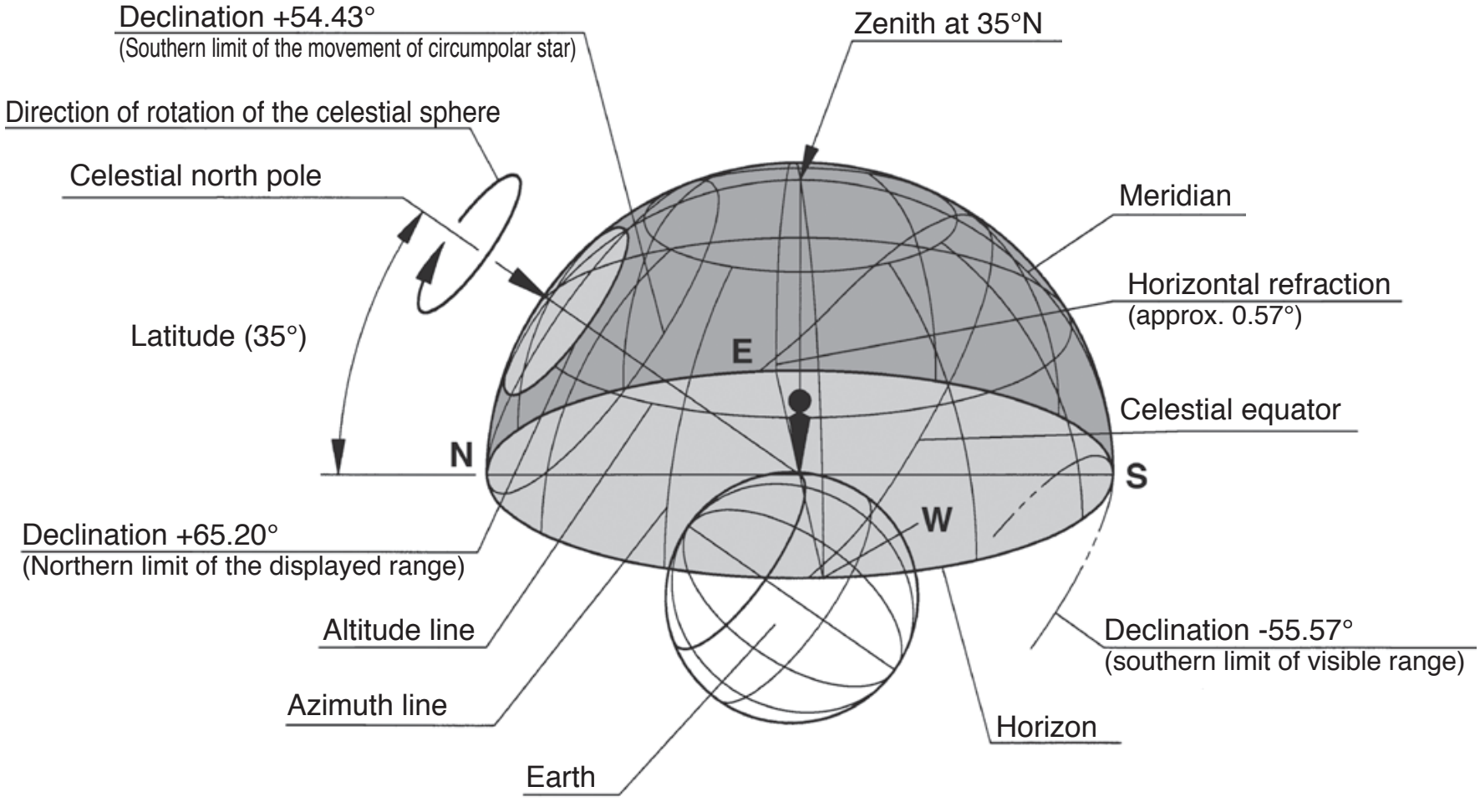
Some models are equipped with a specially designed crown to prevent accidental operation.

Screw down crown

Unlock the crown prior to operate your watch.

	Unlock	Lock
Screw down crown	 Rotate the crown counterclockwise until it releases from the case.	 Push the crown in to the case. With gentle pressure towards the case, rotate the crown clockwise to secure it to the case. Be sure to tighten firmly.

Constellation Display of Entire Sky at 35°N Latitude



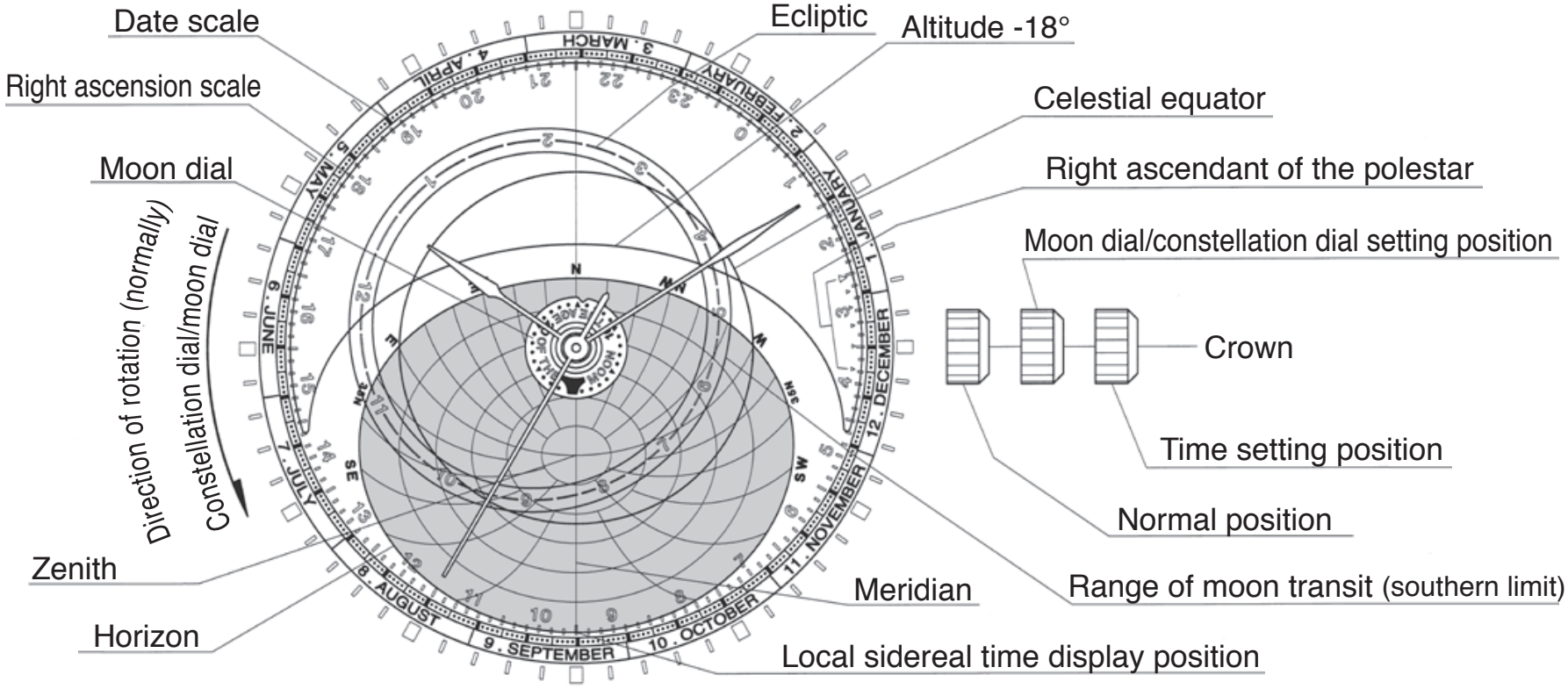
Range of the celestial sphere display on CAMPANOLA Constellation Watch

Contents

1-1. CAMPANOLA Constellation Watch

The CAMPANOLA Constellation Watch is an analog watch that displays the ever-changing array of constellations along with the movements of the moon. The altitudes and azimuths of the major fixed stars, nebulae, star clusters and galaxies are displayed, along with the moon position range, lunar age, the local sidereal time, stellar spectral types, and the polar star hour angle, making it useful for astronomical observation. You can even determine astronomical twilight. The CAMPANOLA Constellation Watch also has features that provide such convenient information as the times of sunrise and sunset and the position of the sun.

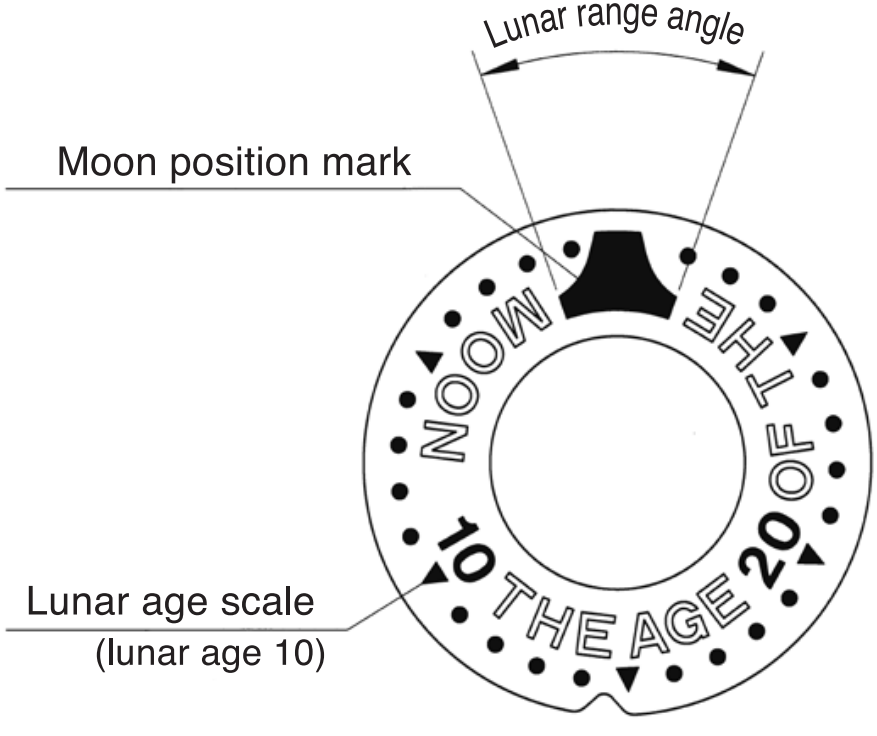
1-2. Constellation Display of Entire Sky at 35°N Latitude



Because distortion is minimal in the northern hemisphere, approximately 94.9% of the celestial sphere visible at 35°N latitude is displayed.
(The range shown on the constellation dial is from -55.57° to +65.20° declination.)

* Designs and features vary from one model to another.

1-3. Diagram of the Moon Dial



*The lunar range angle is displayed as the width of the largest angle encompassing the moon position mark on the moon dial as seen from the center of the watch, including the range of variation due to the inconsistent speed of the moon's movements.

1-4. Features

- The constellation display shows 1,027 fixed stars of visual magnitude 4.8 or brighter (maximum magnitude values for variable stars) in increments of 0.1 and in four colors by spectral type. In addition, 166 major nebulae, star clusters and galaxies, the delimitations of constellations, the ecliptic, and the celestial equator are shown based on their positions as of the year 2000.0.
- The constellation dial not only displays the current positions of constellations but also functions as a planisphere in which the constellation dial is independently rotated.
- The solar position display shows, in the form of spaces along a broken line, the position of the sun along the ecliptic (the sun's apparent path on the celestial sphere during the year) on the 1st, 11th, and 21st of each month (for 12 noon Universal Time over the mean year). You can see the times for sunrise and sunset by looking at the horizon line on the transparent dial.
- The azimuth and altitude display feature shows the azimuths and altitudes of the major fixed stars, nebulae, star clusters and galaxies on the celestial sphere. The altitude line, with intervals of 15° on the transparent dial, compensates for refractions.
- The local sidereal time display is convenient for finding the positions of constellations. Reading the right ascension scale that overlays the meridian on the transparent dial allows you to find the positions of constellations.

- The moon position display allows you to find the range of the moon's position on the celestial sphere, as well as the approximate lunar age. The moon position range is indicated by the intersection of the moon transit range including the ecliptic on the constellation dial and width of the largest angle encompassing the moon position mark on the moon dial. The approximate lunar age is indicated by a straight line drawn toward that day's sun position along the constellation plate ecliptic as seen from the center of the watch and the value of the intersecting lunar age scale.
- The astronomical twilight indicator lets you identify the hours of increasing darkness, a function especially useful for astronomical observations. Using the sun's position on the ecliptic and the -18° altitude line on the transparent dial (with reference to 35°N latitude), you can find the beginning and end of astronomical twilight.
- The polar star hour display lets you align an astronomical telescope to the polar axis. The R.A. of the polar star for every 10 years between the year 2000 and 2050 is displayed with a mark on the constellation dial. The angle that is measured counterclockwise from the meridian direction of the transparent dial to the position equivalent to the current R.A. of the polar star is the polar star hour angle.

*The celestial sphere near the turning center of the constellation dial is not displayed because it is hidden under the moon dial.

1-5. Setting the Time, Constellation Dial, and Moon Dial

*Tip for pulling out the crown: If you find it difficult to pull out the crown, do not try to force it. Push the crown back in and insert the nail of your middle right finger under the crown from the rear cover side. Lightly insert the nail while rotating the crown slightly. It should move easily to the first click position. You can perform fast correction in the first click position for the constellation dial and the moon dial only. To pull out the crown to the second click position, hold it between the nails of your right thumb and middle finger, and in the same way as above, pull it out quite strongly while rotating it slightly. The crown moves to the second click position and the second hand stops. You can set the hour and minute hands in the second click position. The constellation dial and moon dial are linked to the hour and minute hands.

Setting the time

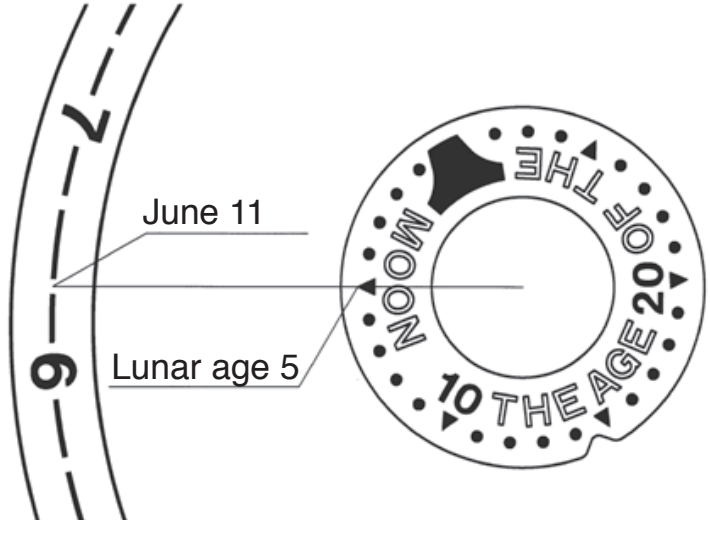
(1) Set the crown to the second click position when the second hand reaches 0 seconds.
(2) Turn the crown to set the hour and minute hands to the current time.
Move the minute hand 4 or 5 minutes forward from the correct time and then return it from the other direction.
(3) Fully return the crown to the normal position at the correct time, using an accurate clock.

Setting the constellation dial and Moon dial

(4) Find the lunar age.
* Look up the next day's lunar age (lunar age at noon) in a newspaper or on the Internet.
The lunar age moves forward by 1 every day. This means that if you deduct the day ratio from the current time until noon the next day from the next day's lunar age, you can determine the current lunar age. For example, if the next day's lunar age is 5.6 (lunar age at noon), the lunar age at 21:00 on that day is the day ratio, which is 15 hours until noon on the next day ($15 \div 24 \fallingdotseq 0.6$), deducted from 5.6, which is 5.

(5) Pull the crown out to the first click position.
(6) Turn the crown until the straight line drawn toward that day's sun position along the constellation plate ecliptic as seen from the center of the watch and the value of the intersecting lunar age scale of the moon dial match the calculated lunar age (to the nearest turning direction).

Example: June 11,
lunar age 5

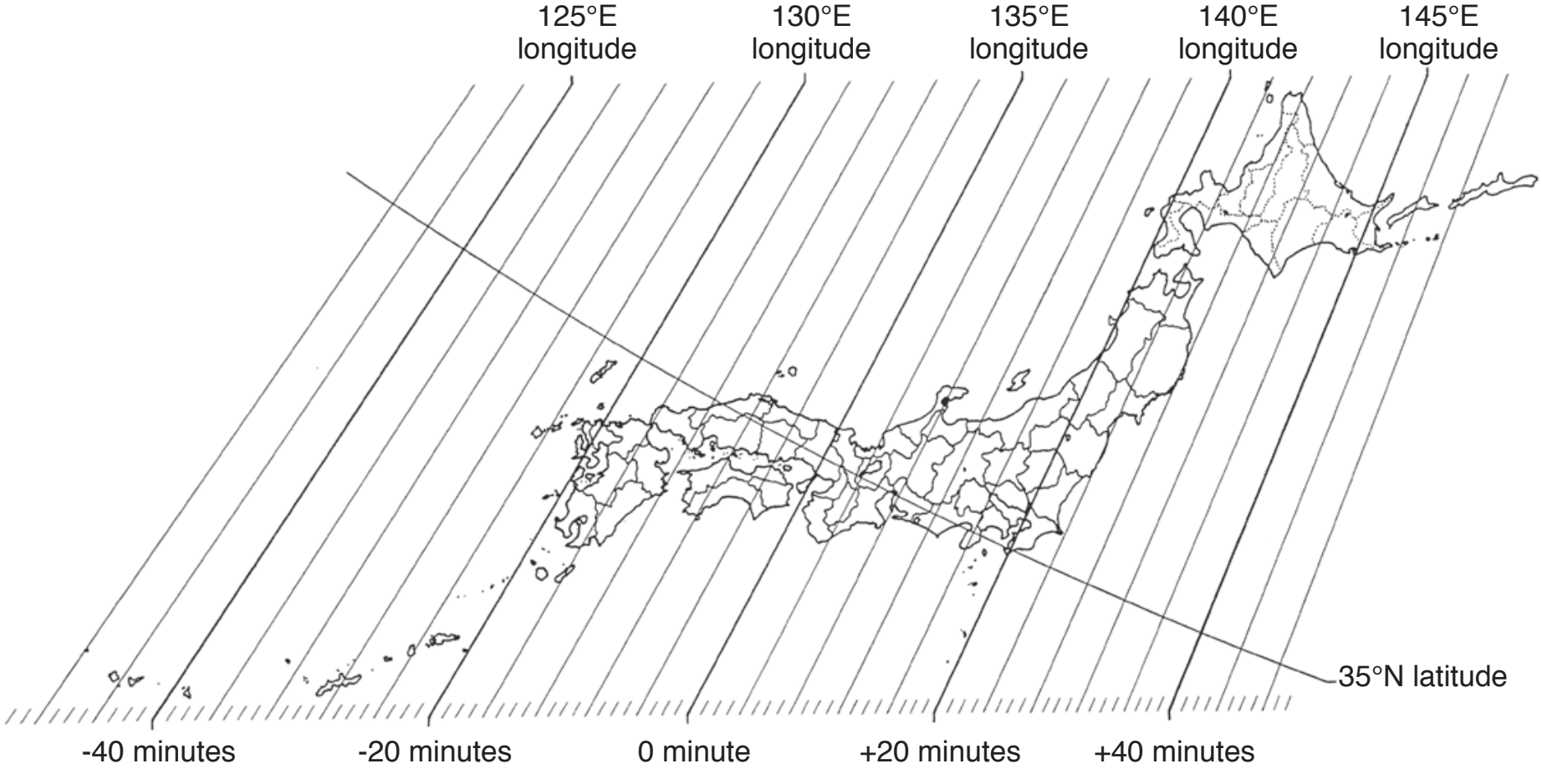


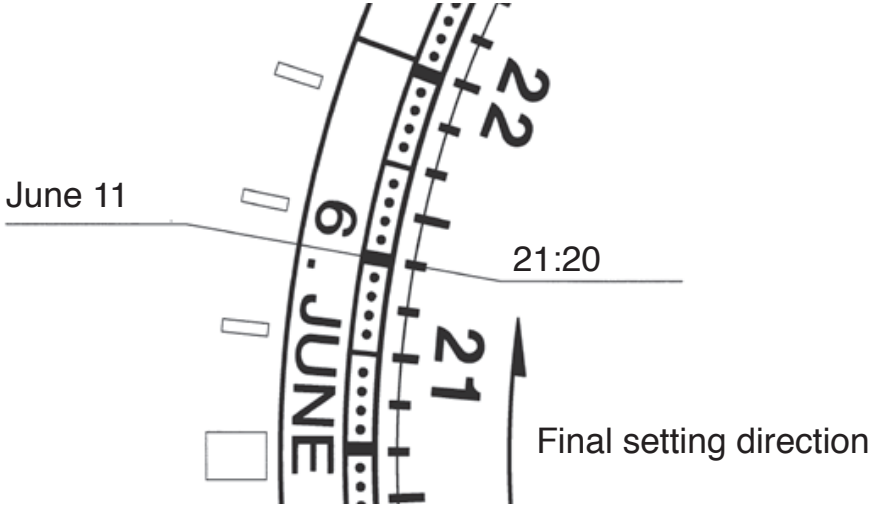
* To check the lunar age while you are correcting it, a useful method is to match that day's sun position on the constellation dial with the meridian or in the hand direction and read the lunar age.
* Turning the crown to the left (to the right for the constellation dial and moon dial) decreases the lunar age, and turning the crown to the right (to the left for the constellation dial and moon dial) increases the lunar age.

(7) Check the time difference in local sidereal time between the observation point longitude and standard time longitude.
The local sidereal time varies according to the longitude, and is advanced four minutes per degree eastward.
(8) Calculate the time obtained by adding the current time (in the 24-hour time system) to the sum of the difference between local sidereal time and the current time. Find the value corresponding to this time on the right ascension scale, and align it with that day's date on the date scale on the watch bezel by turning the crown counterclockwise (clockwise for the constellation dial).
(9) Push the crown into the normal position.

* The lunar age display of this watch continuously operates in a cycle of approximately 29.57 days, which is roughly equal to the synodic month (**p. 36**). The synodic month is the average phase cycle of the moon.
Because an approximate tooth ratio is used, when a long period of time has elapsed, a slight long-term accumulative error will occur for the lunar age that is displayed on the watch (the lunar age slows by approximately 0.5 over one year).
* To minimize this long-term accumulative error, about once a year pull out the crown to the click position and turn the constellation dial 27 times in the opposite direction (clockwise) to its normal turning direction. Then, set it to the current constellation positions and push the crown into the normal position. This correction method can also be used when the lunar age displayed by the watch is reduced by about 0.5 after turning the constellation dial for the initial setting in the step (8). If the lunar age is increased by about 0.5, turn the constellation dial 27 times in the normal direction (counterclockwise). Then, set it to the current constellation positions from the direction opposite to normal turning, and push the crown into the normal position. In this way, you can set the lunar age to a value close to the target value.

Time difference in local sidereal time between longitude and standard time longitude (135°E longitude)





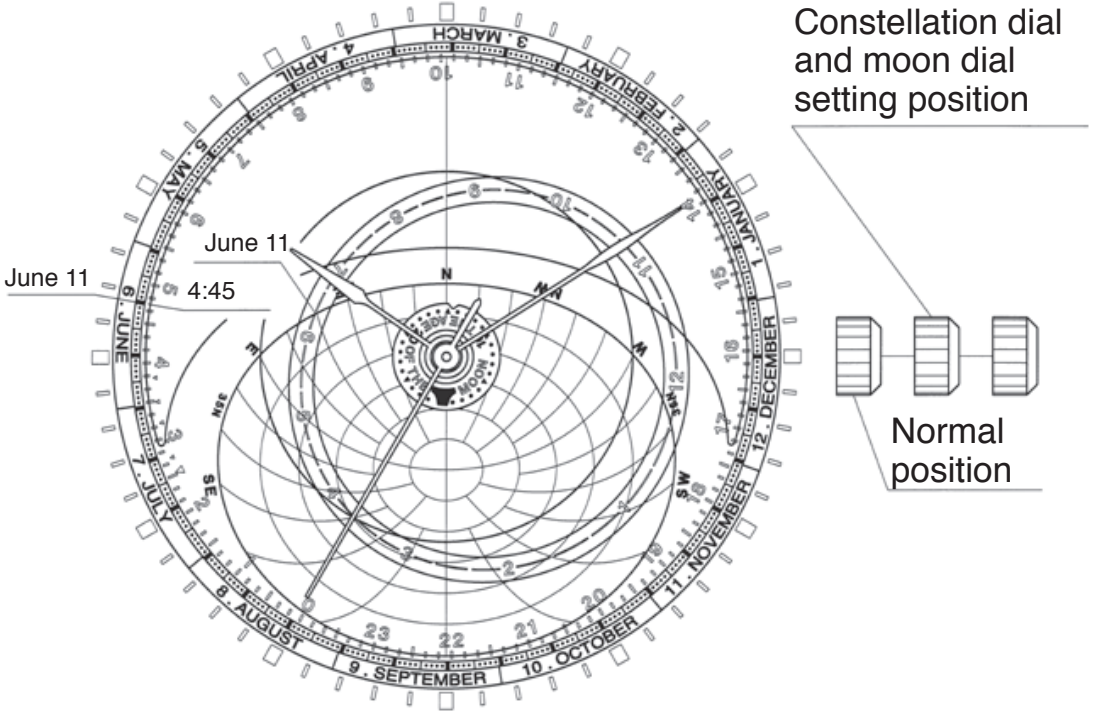
To align the constellation dial for 21:00 on June 11 at a position 5° east (140°E longitude) of the standard time longitude (135°E longitude), first set the right ascension scale position that corresponds to 00 minutes + 20 minutes = 21:20 in the nearest turning direction to match the June 11 date scale of the watch bezel. Then, slightly turn the crown clockwise, and set by turning the crown counterclockwise (clockwise for the constellation dial). After performing the setting, be sure to push the crown into the normal position.

* The date scale of the watch bezel is inscribed with the noon of universal time of each day over the mean year (21:00 Japan Standard Time) set as the center position for each scale line width. The 1st, 11th and 21st of each month are indicated with a thick line, and the 6th, 16th and 26th are indicated with a thin line.

* To set a more accurate value, add the local sidereal time correction value (**p. 37**).

1-6. Time of Sunrise and Sunset

Example: Sunrise time on June 11 at standard time longitude

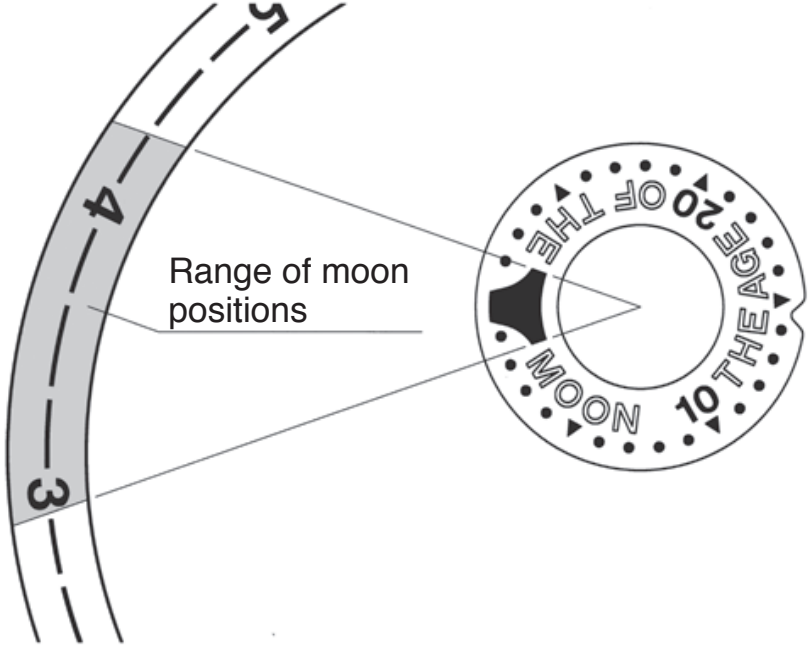


(1) Pull the crown out to the first click position.
(2) Turn the crown so that the sun position along the constellation plate ecliptic on June 11 overlays the east horizon exterior contour on the transparent dial.
(3) Read the right ascension scale of the constellation dial that faces the date scale for June 11.

* After using this function, return the constellation dial and moon dial to the current condition (turn the crown counterclockwise and then turn the constellation dial clockwise), and then be sure to push the crown into the normal position.

1-7. The Range of Moon Positions

The moon transit range that includes the ecliptic on the constellation dial and the range of the maximum angle of the moon position mark that intersects the moon dial as seen from the center of the watch are the moon position ranges that include the variable speed characteristics of the moon's movement.



* This range does not include the long-term accumulative error caused by the approximate tooth ratio (the long-term accumulative error for the constellation dial of the moon dial is an advance of approximately 5.6° per year in the normal turning direction).

1-8. Functions of the Lunar Age Display

You can tell the current approximate lunar age. The approximate lunar age is indicated by a straight line drawn toward that day's sun position along the constellation plate ecliptic as seen from the center of the watch and the value of the intersecting lunar age scale.

- You can tell the size of the tides from the lunar age. In general, spring tides occur during a new moon (lunar age: 0) and full moon (lunar age: approximately 15), when the tidal range is at its maximum; neap tides occur during the first quarter (lunar age: approximately 7) and last quarter (lunar age: approximately 22), when the tidal range is at its minimum.
- You can read the approximate tidal state from the moon dial. A cycle of 1 moon dial rotation is equivalent to about twice the average tidal cycle. The direction of the moon position mark of the moon dial at the time of low tide on a new moon or full moon day is roughly determined by point. If you remember the 2 directions of the moon position mark on the moon dial at the time of low tide on a new moon or full moon day of the point that you want to know, you can use it as a guideline for high tide. However, note that during and close to a neap tide, there is quite a large difference between the low tide and high tide times.

* The lunar age that is displayed by this watch may vary slightly from the actual lunar age due to factors such as the variable speed characteristics of the moon's movement and the long-term accumulative error caused by the approximate tooth ratio.

1-9. The Constellation Dial Display

- As a rule, the fixed stars are displayed by color in the categories below, based on the spectral types.

O type stars and B type stars:	Bluish silver	269 stars
A type stars and F type stars:	Silver	343 stars
G type stars and K type stars:	Yellowish silver	343 stars
M type stars:	Reddish silver	72 stars

- The fixed star magnitude is displayed near the right ascension scale of 0h on the constellation dial.
- Nearby stars (including multiple stars) that are difficult to separate on the constellation dial are displayed with a combined magnitude. The color and position are displayed according to the spectral type and position of the main star (the star that appears brightest).
- Variable stars are displayed on the constellation dial at their maximum magnitude. Note that variable stars are not separately identified on the constellation dial.
- The main nebulae, star clusters and galaxies are displayed in light green or turquoise.
- The star clusters of Pleiades and Hyades are shown together in the fixed star group.

1-10. Abbreviations of Constellations and their Full Spellings

Abbreviations	Full spellings	Abbreviations	Full spellings
And	Andromeda	Cam	Camelopardalis
Ant	Antlia	Cap	Capricornus
Aps	Apus	Car	Carina
Aql	Aquila	Cas	Cassiopeia
Aqr	Aquarius	Cen	Centaurus
Ara	Ara	Cep	Cepheus
Ari	Aries	Cet	Cetus
Aur	Auriga	Cha	Chamaeleon
Boo	Bootes	Cir	Circinus
Cae	Caelum	CMa	Canis Major

Abbreviations	Full spellings	Abbreviations	Full spellings
CMi	Canis Minor	Dra	Draco
Cnc	Cancer	Equ	Equuleus
Col	Columba	Eri	Eridanus
Com	Coma Berenices	For	Fornax
CrA	Corona Australis	Gem	Gemini
CrB	Corona Borealis	Gru	Grus
Crt	Crater	Her	Hercules
Cru	Crux	Hor	Horologium
Crv	Corvus	Hya	Hydra
CVn	Canes Venatici	Hyi	Hydrus
Cyg	Cygnus	Ind	Indus
Del	Delphinus	Lac	Lacerta
Dor	Dorado	Leo	Leo

Abbreviations	Full spellings	Abbreviations	Full spellings
Lep	Lepus	Ori	Orion
Lib	Libra	Pav	Pavo
LMi	Leo Minor	Peg	Pegasus
Lup	Lupus	Per	Perseus
Lyn	Lynx	Phe	Phoenix
Lyr	Lyra	Pic	Pictor
Men	Mensa	PsA	Piscis Austrinus
Mic	Microscopium	Psc	Pisces
Mon	Monoceros	Pup	Puppis
Mus	Musca	Pyx	Pyxis
Nor	Norma	Ret	Reticulum
Oct	Octans	Scl	Sculptor
Oph	Ophiuchus	Sco	Scorpius

Abbreviations	Full spellings	Abbreviations	Full spellings
Sct	Scutum	TrA	Triangulum Australe
Ser	Serpens	Tri	Triangulum
Ser	Serpens Caput	Tuc	Tucana
Ser	Serpens Cauda	UMa	Ursa Major
Sex	Sextans	UMi	Ursa Minor
Sge	Sagitta	Vel	Vela
Sgr	Sagittarius	Vir	Virgo
Tau	Taurus	Vol	Volans
Tel	Telescopium	Vul	Vulpecula

* Abbreviations are not shown for the Aps, Cha, Cir, Cru, Hyi, Men, Mus, Oct, Pav, TrA, Tuc, UMi and Vol constellations because they are in a range that is hidden by the moon dial or are completely or almost completely in a celestial sphere range that cannot be seen from 35°N latitude.

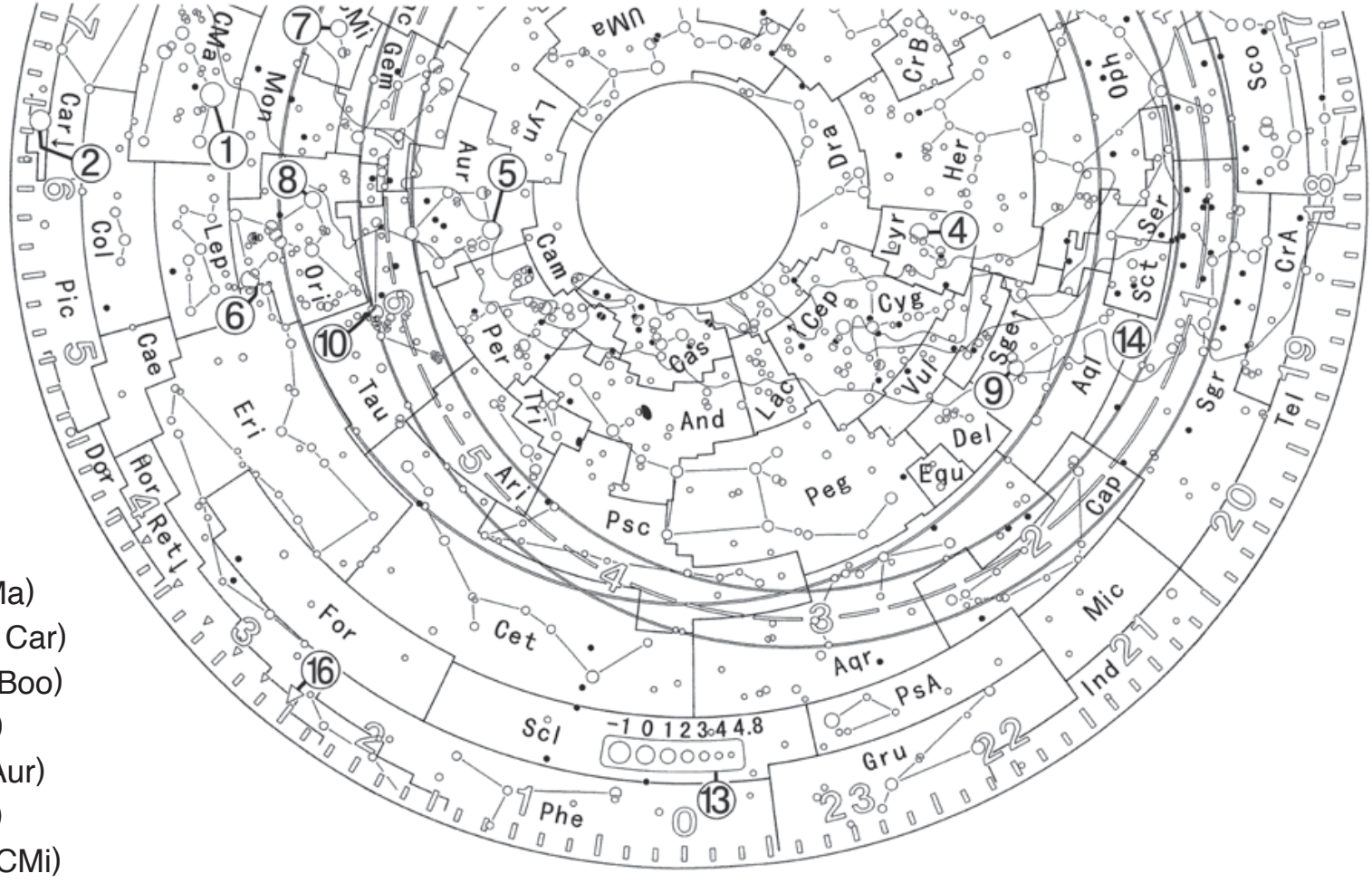
1-11. Nebulae, Star Clusters and Galaxies on the Constellation Dial

M31(And) NGC752(And) M72(Aqr) NGC7009(Aqr) M2(Aqr) NGC7293(Aqr) NGC6167(Ara) I.4651(Ara) NGC6397(Ara) M38(Aur) M36(Aur) M37(Aur) M30(Cap) NGC281(Cas) NGC457(Cas) NGC559(Cas) M103(Cas) I.1805(Cas) I.1848(Cas) NGC7635(Cas) M52(Cas) NGC7789(Cas) NGC4945(Cen) NGC5128(Cen) NGC5139(Cen) NGC5460(Cen) NGC6946(Cep) NGC246(Cet) NGC247(Cet) M77(Cet) M41(CMa) M44(Cnc) M67(Cnc) NGC1851(Col) M98(Com) M99(Com) M100(Com) M85(Com) M88(Com) NGC4548(Com) NGC4565(Com) M64(Com) M53(Com) NGC6541(CrA) NGC4258(CVn) NGC4449(CVn) NGC4631(CVn) M94(CVn) M63(CVn) M51(CVn) M3(CVn) NGC6871(Cyg) I.1318(Cyg) M29(Cyg) NGC6992-5(Cyg) NGC7000(Cyg) M39(Cyg) NGC5866(Dra) NGC1291(Eri) NGC1316(For) M35(Gem) NGC2392(Gem) M13(Her) M92(Her) M48(Hya) NGC3242(Hya) M68(Hya) M83(Hya) NGC2903(Leo) M95(Leo) M96(Leo) NGC3379(Leo) NGC3521(Leo) M65(Leo) M66(Leo) M79(Lep) NGC5897(Lib) NGC5822(Lup) NGC5986(Lup) M57(Lyr) M56(Lyr) NGC2237-9(Mon) NGC2301(Mon) M50(Mon) NGC6067(Nor) NGC6171(Oph) M12(Oph) M10(Oph) M62(Oph) M19(Oph)

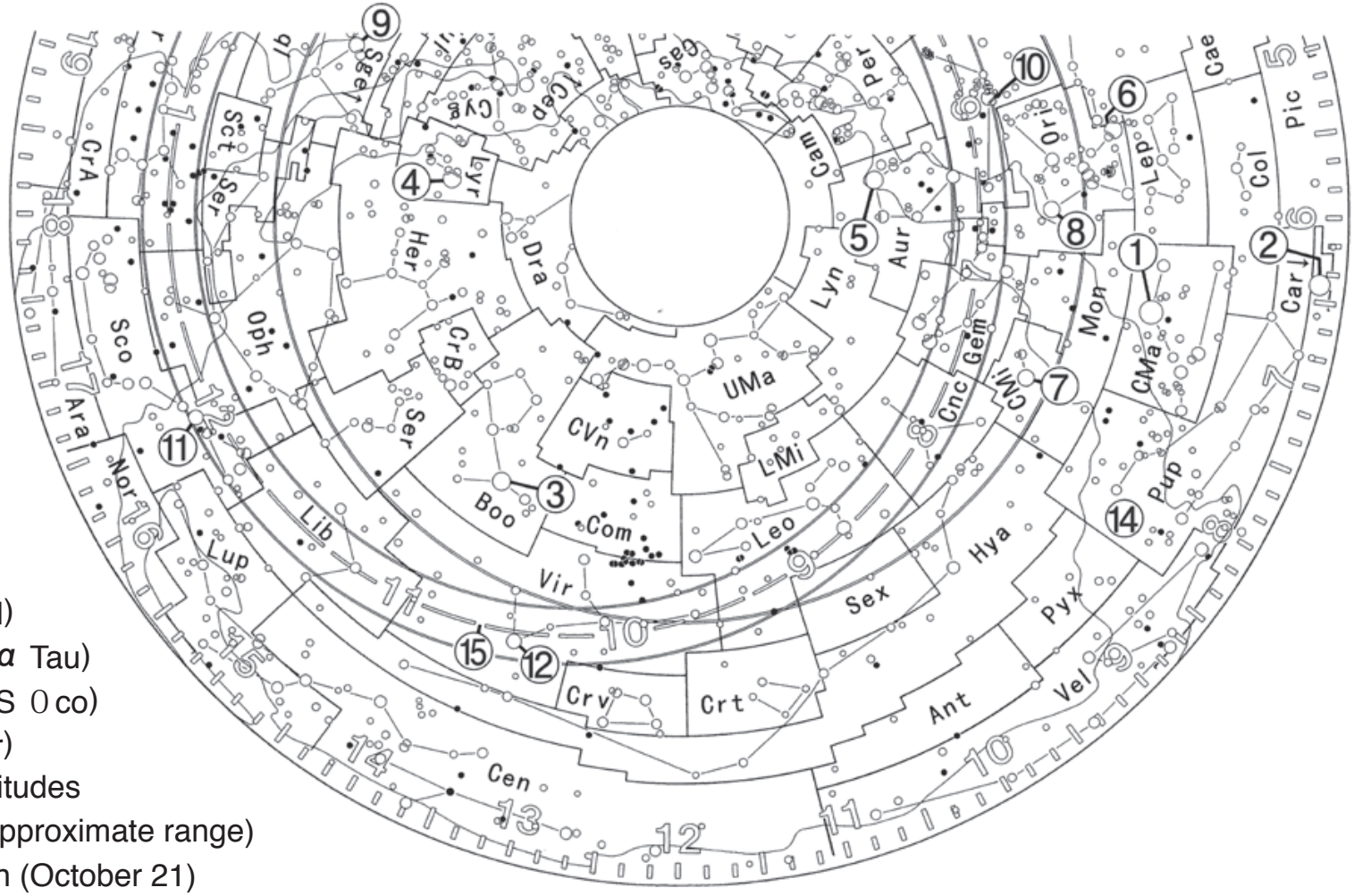
M9(Oph) M14(Oph) NGC6633(Oph) M42(Ori) M78(Ori) NGC2174-5(Ori) M15(Peg) M76(Per) NGC869(Per) NGC884(Per) M34(Per) NGC1245(Per) NGC1499(Per) NGC1528(Per) M74(Psc) M47(Pup) M46(Pup) M93(Pup) NGC2546(Pup) NGC55(Scl) NGC253(Scl) NGC300(Scl) M80(Sco) M4(Sco) NGC6124(Sco) H12(Sco) M6(Sco) M7(Sco) M26(Sct) M11(Sct) M5(Ser) M16(Ser) I.4756(Ser) M71(Sge) M23(Sgr) M20(Sgr) M8(Sgr) M21(Sgr) M24(Sgr) M18(Sgr) M17(Sgr) M28(Sgr) M69(Sgr) M25(Sgr) M22(Sgr) M70(Sgr) M54(Sgr) NGC6723(Sgr) M55(Sgr) NGC6822(Sgr) M75(Sgr) NGC1647(Tau) NGC1746(Tau) M1(Tau) M33(Tri) NGC3556(UMa) M97(UMa) M101(UMa) NGC2547(Vel) I.2395(Vel) H3(Vel) NGC3132(Vel) NGC3201(Vel) M61(Vir) M84(Vir) M86(Vir) M49(Vir) M87(Vir) M89(Vir) M90(Vir) M58(Vir) M104(Vir) M59(Vir) M60(Vir) M27(Vul) NGC6940(Vul)

* The nebulae, star clusters and galaxies are arranged in the alphabetic order of the constellation to which they belong, and those within constellations are ordered according to the right ascension sequence (moving to the right around the constellation dial).

1-12. Diagram of the Constellation Dial



① Sirius (α CMa)
② Canopus (α Car)
③ Arcturus (α Boo)
④ Vega (α Lyr)
⑤ Capella (α Aur)
⑥ Rigel (β Ori)
⑦ Procyon (α CMi)
⑧ Betelgeuse (α Ori)



⑨ Altair (α Aql)
⑩ Aldebaran (α Tau)
⑪ Antares (α S 0 co)
⑫ Spica (α Vir)
⑬ Stellar magnitudes
⑭ Milky Way (approximate range)
⑮ Solar position (October 21)
⑯ Right ascension of the polestar (2000.0)

2. Brief Explanation of Astronomical Terminology

Celestial sphere

This is an imaginary sphere used for displaying the visible positions of celestial objects. The center is the observation point and the radius is infinite. However, note that it is finite when drawn in a diagram, with the diagram drawn as seen from the outside.

Zenith

This is the point where a line drawn vertically above (direction of gravity) the point of observation intersects the celestial sphere. It is the point on the celestial sphere that is directly above the point of observation.

Horizon

This is the intersecting line between the celestial sphere and the plane that is perpendicular to the vertical line (direction of gravity) that includes the point of observation

Celestial north pole

When an imaginary line through the earth's axis is extended, it intersects the celestial sphere at two points. Celestial north pole is the point that can be observed from the northern hemisphere. The other point that can be observed from the southern hemisphere is called the celestial south pole.

Meridian

On the line where the celestial sphere meets the plane that includes the celestial north pole, the zenith and the celestial south pole, this is the area that is higher than the horizon. Within this, the area that can be used to read the hour angle starting point or local sidereal time is the range from the celestial pole that is visible (celestial north pole in the case of the northern hemisphere), through the zenith and toward the opposite celestial pole (celestial south pole in the case of the northern hemisphere) until it reaches the horizon. When it needs to be specifically distinguished from the north-south azimuth line on the earth's surface it is called the “celestial meridian”, but “meridian” alone when used in astronomical observation is usually understood to mean the meridian on the celestial sphere.

Celestial equator

This is the intersecting line between the celestial sphere and the plane that includes the point of observation, perpendicular to the earth's axis.

Ecliptic

The sun's mean path on the celestial sphere. It is inclined by approximately 23.4° relative to the celestial equator. The ecliptic and the sun's position (for 12 noon Universal Time over the mean year) on the ecliptic on the 1st, 11th, and 21st of each month are displayed in the form of spaces along a broken line.

Vernal equinoctial point

Of the two intersections between the ecliptic and the celestial equator, this is the point that the sun passes through as it moves from the south side of the celestial equator to the north side. The other intersection is the autumnal equinoctial point. The vernal equinox and the autumnal equinox occur when the center of the sun passes through these points.

Declination and right ascension

Declination and right ascension determined by using the celestial equator and the vernal equinoctial point as a standard in order to display their position on the celestial sphere. The declination is 0° on the celestial equator, and it is measured as far as +90° north of the celestial equator (celestial north pole) and -90° south (celestial south pole). The right ascension is 0° above the vernal equinoctial point, and it is measured as it turns to the east as far as 359° 59' 59".9… Usually, instead of degrees, minutes and seconds, the value for right ascension is converted to 0h - 23h 59m 59.9…s with 15° = 1 hour. The scale on the outer rim of the constellation plate displays right ascension.

Celestial latitude and celestial longitude

The latitude and longitude that are determined by using the ecliptic and vernal equinoctial point as the standard, in order to display positions on the celestial sphere. The celestial latitude is 0° on the ecliptic, and it is measured as far as +90° north of the celestial equator (ecliptic north pole) and -90° south (ecliptic south

pole). The celestial longitude is 0° above the vernal equinoctial point, and it is measured as it turns to the east as far as 359° 59' 59".9…

The moon's path

The moon's transit as seen from the center of the earth on the celestial sphere. It is inclined by approximately 5.1° relative to the ecliptic. The intersection between the moon's path and the ecliptic moves on the ecliptic relative to the vernal equinoctial point in a cycle of approximately 18.6 years. However, when considering that the inclination angle between the moon's path and the ecliptic is relatively small, the moon's path can be seen as being approximately on the ecliptic. The constellation dial on this watch displays the moon transit range to which has been added the maximum direction difference between the position of the moon as seen from an observation point within the transit range of the moon's path and the position of the moon as seen from the earth's center.

Local sidereal time

This is the angle (vernal equinoctial point hour angle) measured while turning to the west, from the starting point of the meridian of the observation point to the vernal equinoctial point. Instead of degrees, minutes and seconds, it is converted into hours, minutes and seconds (0h - 23h 59m 59.9…s) with 15° = 1 hour. On this watch the right ascension scale of the constellation dial that overlays the meridian on the transparent dial is the local sidereal time.

Hour angle

With the meridian as the starting point, this is the angle measured while turning to the west as far as the target celestial object (or point). Usually, the hour angle is also expressed in hours, minutes and seconds instead of degrees, minutes and seconds, converted with 15° = 1 hour. Also, celestial objects on the east side may be measured by turning east from the meridian and expressed with a negative value (-).

Atmospheric refraction

This is the phenomenon and the value where the refraction caused by the atmosphere of the earth causes the apparent position of the celestial body to appear higher than its actual position. The refraction has been corrected for the altitude line, including the horizon, which is displayed on the transparent dial. The refraction amount of celestial objects (approx. 0.57°) that appear to be on the horizon is called the horizontal refraction.

Astronomical twilight

Twilight is the period after sunset or before sunrise when the sun's afterglow or pre-glow is in the sky and appears as a half-light. In particular, the period when the sun's altitude is -12° to -18° (18° under the horizon) is called the astronomical twilight. If the sky is clear, when the astronomical twilight finishes (or before it starts), stars of magnitude 6 can be seen near the zenith. On this watch, a -18°

altitude line is displayed on the transparent dial with 35°N latitude as the standard, to determine the astronomical twilight.

Delimitations of constellations

The delimitations of constellations are comprised of standard declination and right ascension lines from the year 1875.0. Because of the movement of the celestial north pole and celestial south pole, and the vernal equinoctial point and autumnal equinoctial point, the declination and right ascension lines of the constellation dial (standard: year 2000) do not match the delimitations of constellations.

Polestar hour angle

There is no mark to indicate the celestial north pole, but the polar star is nearby (magnitude 2.0 star, declination of 89° 15' 51", right ascension of 2h 31m 50s… J2000.0 equinox). The angle that separates the celestial north pole from the polestar can be calculated. This means that if you know the hour angle of the polar star, you can use the polar star to calculate the celestial north pole. To enable the calculation of the hour angle of the polar star, the R. A. of the polar star for every 10 years between the year 2000.0 and 2050.0 is displayed with large and small ▼ marks near the 2h to 4h right ascension scale on the outer rim of the constellation dial.

New moon

This is the phenomenon and the time when the celestial longitude of the moon is equal to the celestial longitude of the sun.

First quarter

This is the phenomenon and the time when the celestial longitude of the moon is 90° greater (or 270° smaller) than the celestial longitude of the sun.

Full moon

This is the phenomenon and the time when the celestial longitude of the moon is 180° greater (or 180° smaller) than the celestial longitude of the sun.

Last quarter

This is the phenomenon and the time when the celestial longitude of the moon is 270° greater (or 90° smaller) than the celestial longitude of the sun.

Lunar age

This is the time expressed in days that have passed since the new moon. For example, “lunar age 5” means that 5 days have passed since the moment of the previous new moon. The approximate lunar age is indicated by a straight line drawn toward that day's sun position along the constellation plate ecliptic as seen from the center of the watch and the value of the intersecting lunar age scale.

Synodic month

This is the average phase cycle of the moon, which is approximately 29.530589 days.

Table (p.17)
Correction value for local sidereal time
(the watch scale is the average value from year 1950.0 to 2050.0)

Year/month	~	Year/month	Correction value	Year/month	~	Year/month	Correction value	Year/month	~	Year/month	Correction value
2009.3	~	2010.2	+1 minute	2019.3	~	2020.2	–1 minute	2029.3	~	2030.2	+1 minute
2010.3	~	2011.2	0 minute	2020.3	~	2021.2	+2 minutes	2030.3	~	2031.2	0 minute
2011.3	~	2012.2	–1 minute	2021.3	~	2022.2	+1 minute	2031.3	~	2032.2	–1 minute
2012.3	~	2013.2	+2 minutes	2022.3	~	2023.2	0 minute	2032.3	~	2033.2	+2 minutes
2013.3	~	2014.2	+1 minute	2023.3	~	2024.2	–1 minute	2033.3	~	2034.2	+2 minutes
2014.3	~	2015.2	0 minute	2024.3	~	2025.2	+2 minutes	2034.3	~	2035.2	+1 minute
2015.3	~	2016.2	–1 minute	2025.3	~	2026.2	+1 minute	2035.3	~	2036.2	0 minute
2016.3	~	2017.2	+2 minutes	2026.3	~	2027.2	0 minute	2036.3	~	2037.2	+3 minutes
2017.3	~	2018.2	+1 minute	2027.3	~	2028.2	–1 minute	2037.3	~	2038.2	+2 minutes
2018.3	~	2019.2	0 minute	2028.3	~	2029.2	+2 minutes	2038.3	~	2039.2	+1 minute

3. Precautions

⚠ WARNING Water Resistance

- Refer to the watch dial and the case back for the indication of the water resistance of your watch. The following chart provides examples of use for reference to ensure that your watch is used properly. (The unit "1bar" is roughly equal to 1 atmosphere.)
- WATER RESIST(ANT) ××bar may also be indicated as W.R.××bar.
- Non-water resistant models are not designed to come into contact with any moisture. Take care not to expose a watch with this rating to any type of moisture.
- Water resistance for daily use (to 3 atmospheres) means the watch is water resistant for occasional accidental splashing.

Name	Indication	Specification
	Dial or Case back	
Non-water resistant watch	—	Non-water resistant
Everyday-use water resistant watch	WATER RESIST(ANT)	Water resistant to 3 atmospheres
Upgraded everyday-use water resistant watch	WATER RESIST(ANT) 5 bar	Water resistant to 5 atmospheres
	WATER RESIST(ANT) 10/20 bar	Water resistant to 10 or 20 atmospheres

- Upgraded water resistance for daily use (to 5 atmospheres) means that the watch may be worn while swimming, but is not to worn while skin diving.
- Upgraded water resistance for daily use (to 10/20 atmospheres) means that the watch may be worn while skin diving, but not while scuba or saturated diving using helium gas.

	Water-related use				
	 Minor exposure to water (washing face, rain, etc.)	 Swimming and general washing work	 Skin diving, marine sports	 Scuba diving using an air tank	 Operate the crown or button when the watch is wet
	NO	**NO**	**NO**	**NO**	**NO**
	OK	**NO**	**NO**	**NO**	**NO**
	OK	**OK**	**NO**	**NO**	**NO**
	OK	**OK**	**OK**	**NO**	**NO**

⚠ CAUTION To Avoid Injury

- Be particularly careful when wearing your watch while holding a small child, to avoid injury.
- Be particularly careful when engaged in strenuous exercise or work, to avoid injury to yourself and others.
- Do NOT wear your watch while in a sauna or other location where your watch may become excessively hot, since there is the risk of burns.
- Be careful when putting on and taking off your watch, since there is a risk of damaging your fingernails, depending on the manner in which the band is fastened.
- Take off your watch before going to bed.

⚠ CAUTION Precautions

- Always use the watch with the crown pushed in (normal position). If the crown is of the screw lock-type, make sure it is securely locked.
- Do NOT operate the crown or any push buttons when the watch is wet. Water may enter the watch causing damage to vital components.
- If water enters the watch or the watch fogs up and does not clear up even after a long time, consult your dealer or Authorized Service Center for inspection and/or repair.

- Even if your watch has a high level of water resistance, please be careful of the following.
  - If your watch is immersed in sea water, rinse thoroughly with fresh water and wipe with a dry cloth.
  - Do not pour water from a tap directly onto your watch.
  - Take off your watch before taking a bath.
- If seawater enters the watch, place the watch in a box or plastic bag and immediately take it in for repair. Otherwise, pressure inside the watch will increase, and parts (crystal, crown, push button, etc.) may come off.

⚠ CAUTION When Wearing Your Watch

<Band>

- Leather, genuine skin and rubber (urethane) bands will deteriorate over time due to perspiration, body oils and dirt. Be sure to replace the band periodically.
- The durability of a leather band may be affected when wet (fading, peeling of adhesive), owing to the properties of the material. Moreover, wet leather may cause a rash.
- It is recommended to take off the watch if it gets wet, even if the watch itself is water resistant.
- Do not wear the band too tightly. Try to leave enough space between the band and your skin to allow adequate ventilation.
- The rubber (urethane) band may be stained by dyes or soil present in or on clothing or other accessories. Since these stains may not be removable, caution is required when wearing your watch with items that tend to easily transfer color (articles of clothing, purses, etc.). In addition, the band may be deteriorated by solvents or moisture in the air. Replace with a new one when it has lost elasticity or become cracked.

- Please request adjustment or repair of the band in the following cases:
  - You notice an abnormality with the band due to corrosion.
  - The pin of the band is protruding.
- We recommend seeking the assistance of an experienced watch technician for sizing of your watch. If adjustment is not done correctly, the bracelet may unexpectedly become detached leading to loss of your watch or injury.
  Consult Citizen Owners' Help Desk.

<Temperature>

- The watch may stop or the function of the watch may be impaired in extremely high or low temperature. Do not use the watch in places where the temperature is outside the operating temperature range as stated in the specifications.

<Magnetism>

- Analog quartz watches are powered by a step motor that uses a magnet. Subjecting the watch to strong magnetism from the outside can cause the motor to operate improperly and prevent the watch from keeping time accurately.
  Do not allow the watch to come into close proximity to magnetic health devices (magnetic necklaces, magnetic elastic bands, etc.) or the magnets used in the latches of refrigerator doors, clasps used in handbags, the speaker of a cell phone, electromagnetic cooking devices and so on.

<Strong Shock>

- Avoid dropping the watch or subjecting it to other strong impact. It may cause malfunctions and/or performance deterioration as well as damage to the case and bracelet.

<Static Electricity>

- The integrated circuits (IC) used in quartz watches are sensitive to static electricity. Please note that the watch may operate erratically or not at all if exposed to intense static electricity.

<Chemicals, Corrosive Gasses and Mercury>

- If paint thinner, benzene or other solvents or products containing these solvents (including gasoline, nail-polish remover, cresol, bathroom cleaners and adhesives, water repellent, etc.) are allowed to come into contact with the watch, they may discolor, dissolve or crack the materials. Be careful when handling these chemicals. Contact with mercury such as that used in thermometers may also cause discoloration of the band and case.

<Protective Stickers>

- Be sure to remove any protective stickers that may be on your watch (case back, band, clasp, etc.). Otherwise, perspiration or moisture may enter the gaps between the protective stickers and the parts, which may result in a skin rash and/or corrosion of the metal parts.

⚠ WARNING Handling of the Battery

• If the battery should happen to be removed from the watch, keep it out of the reach of small children.
• In the event a battery is swallowed, immediately consult a physician.

⚠ CAUTION Battery Replacement

• Always be sure to select a battery of the correct specifications when replacing the battery.

⚠ CAUTION Always Keep Your Watch Clean

- Rotate the crown while it is pressed in fully and press the buttons periodically so they do not become stuck due to accumulations of foreign matter.
- The case and band of the watch come into direct contact with the skin in the same manner as undergarments. Corrosion of the metal or unnoticed soiling such as that caused by perspiration and dirt can soil sleeves and other portions of clothing. Keep your watch clean at all times.
- The case and band of the watch come into direct contact with the skin. If you think there is something wrong, discontinue wearing the watch immediately and consult your physician. In the case of accumulation of sweat or dirt on a metal band or case, clean thoroughly using a brush and neutral detergent. In the case of a leather band, wipe clean using a dry cloth.
- Leather bands may become discolored by perspiration or dirt. Always keep your leather band clean by wiping with a dry cloth.

Caring for Your Watch

- Wipe any dirt or moisture such as perspiration from the case and crystal with a soft cloth.
- For a metallic, plastic or rubber (urethane) watchband, wash any dirt off with water.
  Remove the small amounts of dirt trapped between the crevices of the metallic band with a soft brush.
- For a leather band, wipe off dirt using a dry cloth.
- If you will not be using your watch for an extended period of time, carefully wipe off any perspiration, dirt or moisture and store in a proper location, avoiding locations subject to excessively high or low temperatures and high humidity.

<When Luminous Paint is used for your watch>

The paint on the dial and hands helps you with reading the time in a dark place. The luminous paint stores light (daylight or artificial light) and glows in a dark place. It is free from any radioactive substance or any other material harmful to a human body or environment.

- The light emission gradually becomes weaker as time passes.
- The duration of the light (“glow”) will vary depending on the brightness, types of and distance from a light source, exposure time, and the amount of the paint.
- The paint may not glow and/or may dissipate quickly if exposure to light was not sufficient.

4. Specifications

1. Cal. No. : 4398

2. Crystal frequency: 32,768 Hz (Hz: vibrations per second)

3. Time accuracy: Average monthly deviation ±20 seconds when used in of normal temperature between +5°C (41°F) and +35°C (95°F)

4. Operating temperatures: -10°C (14°F) to +60°C (140°F)

5. Additional functions:

- Constellation display feature
  Constellation dial rotary tooth ratio: 2560/2553 rotations/day
  Constellation dial rotation cycle: Approx. 23 hours, 56 minutes, 04 seconds
- Moon position display feature
  Moon dial rotary tooth ratio: 200/207 rotations per day
  Moon dial rotation cycle: 24 hours, 50 minutes, 24 seconds
- Lunar age display feature
  Lunar age display cycle: Approx. 29.57 days
  * Rotation of constellation dial and moon dial: both left (under normal circumstances)
- Planisphere feature
- Solar position display feature
- Azimuth and altitude feature

- Local sidereal time display feature
- Astronomical twilight determination feature
- Polar star hour angle feature

6. Batteries: 1 small silver storage battery 280-39 (SR626SW)

7. Battery lifetime: Approx. 3 years

* Specifications are subject to change without prior notice.