

## From the Japanese instruction manual for ASTRODEA (Northern Hemisphere)

**-This is NOT the official instruction manual-**

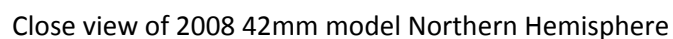
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AstrodeA series: 1<sup>st</sup> generation, 2nd generation and 2008 large 42mm model.

The Constellation Watch ASTRODEA is a precisely designed analog quartz watch that displays not only the current time but also the correct positions of the constellations as they move across the celestial sphere. The ASTRODEA Constellation Watch gives the azimuth and altitude of the major fixed stars, nebulae, galaxies and star clusters, displays local sidereal time, stellar spectral type (2008 model), pale star (2008 model) and an  $\alpha$  Octans hour angle, the hours for astronomical twilight and other functions useful for astronomical observations. The ASTRODEA Constellation Watch also has features that provide such convenient information as the number of hours before sunrise, the remaining hours of daylight and the position of the sun.



## **1-2. Constellation Display of Southern Sky at 35 ° North Latitude**

Because distortion is minimal in the southern hemisphere, approximately 90.4% of the celestial sphere visible at 35° N north latitude is displayed. (The range shown on the constellation dial is from — 77.06° to + 55.57° declination.)

N.B.: The design varies from one model to another.

## **1-3. Constellation Display of Entire Sky at 35° South Latitude**

Because distortion is minimal in the southern hemisphere, approximately 98.6% of the celestial sphere visible at 35° S south latitude is displayed. (The range shown on the constellation dial is from — 77.06° to +55.57° declination.)

N.B.: The design varies from one model to another.

## **1-4. Features**

The Constellation display includes the positions of 1109 fixed stars with a brightness of the 4.8th magnitude or brighter; 171 major nebulae, galaxies and star clusters, delimitation of constellations, and the ecliptic and the celestial equator based on their positions for the year 2000.0. (Maximum magnitude values are indicated for variable stars (2008 model). Fixed stars are represented by a four color spectrum at 0.1 magnitude intervals.)

The constellation dial not only automatically displays the present positions of constellations but can also be used as a planisphere dial in which the constellations dial is independently rotated.

- The solar position display shows 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). Times for sunrise and sunset as well as the number of daylight hours are determined by looking on the horizon line on the transparent dial.

- The altazimuth display lets you determine the altitude and azimuth of the sun as well as the major fixed stars, nebulae, galaxies and star clusters on the celestial sphere. (The equidistant almucantar lines at intervals of 15° on the transparent dial are corrected for atmospheric aberration.)

- The local sidereal time display lets you easily determine the location of the constellations. (Local sidereal time can be designated by reading the right ascension graduations on the constellation dial that intersect with the meridian on the transparent dial.)

- The twilight indicator lets you identify the hours of increasing darkness, especially convenient for astronomical observations. (Astronomical twilight line: use the -18° horizontal on the transparent dial to determine the beginning and ending times for the hours of astronomical twilight.)

- The pole star and  $\sigma$  Octane hour angle display lets you align an astronomical telescope to the polar axis. (Right ascension values for the pole star and  $\sigma$  Octane between the years 2000.0~2050.0 are marked on the constellation dial for every ten years.) Hour angle is the angle measured clockwise from the meridian on the transparent dial to the point marking the value for the right ascension the present pole star.

N.B.: Celestial sphere at the center of the rotating constellation dial is not displayed due to the attachment of the watch hands.

## 1-5. Setting the Time and Constellation Dial

### Setting the time

- (1) When the second hand indicates 0 seconds, pull the crown out to the second position.
- (2) Turn the crown and set the hour and minute hands to the correct time.  
Move the minute hand 4 to 5 minutes ahead of the correct position and then return it to the correct position.
- (3) Properly push the crown into its normal position in accordance with a standard time signal or the like.

### Setting the Constellation dial

- (4) Check the time difference in sidereal time between observation point longitude and standard time longitude.  
Local sidereal time depends on longitude, and is advanced four minutes per degree eastward.
- (5) Pull the crown out to the first position.
- (6) Calculate the time obtained by adding the present time (displayed on the 24 hour time scale) to the time difference in local sidereal time. Find the value corresponding to this time on the right ascension scale, and align it with the date scale by turning the crown clockwise (turning the constellation dial counterclockwise).

Time difference in sidereal time (standard time longitude - 135° E)



Example: To align the constellation dial for 16:00 on January 2 at a position 10° east of the standard time longitude, turn the constellation dial counterclockwise until the point on the dial's right ascension scale opposite 16:40 is in line with the point on the date scale corresponding to January 2.

- (7) Push the crown into its normal position.

N.B.: Increments on the date scale are calibrated for 12 noon Universal Time (21h Japanese Standard Time) over the mean year. Wide lines of the date scale are indicated for the 1st, 11th and 21st of each month. Narrow lines of the date scale are indicated for the 6th, 16th and 26th of each month.



## 1-6. Times for Sunrise and Sunset

Example: Sunrise time for June 28 at the standard time longitude.



- (1) Pull the crown out to the first click position.
- (2) Turn the crown and bring the solar position for June 28 on the ecliptic on the constellation dial so that it overlaps the transparent dial's outline of the east horizon.
- (3) Read the constellation dial's right ascension scale opposite the point on the date scale corresponding to June 28 (it's approx 5am, not taking into account the summer light saving time of course).

After checking this function, turn the crown and return the constellation dial counter-clockwise to its present position. Push the crown into its normal position.

## 1-7. Constellation Dial Display (2008 model)

· The fixed stars are generally classified into the following four spectral types according to their spectra.

|                                    |                            |           |
|------------------------------------|----------------------------|-----------|
| Bluish silver or bluish gray       | spectrum O or B type stars | 301 stars |
| Silver or gray                     | spectrum A or F type stars | 356 stars |
| Yellowish silver or yellowish gray | spectrum G or K type stars | 371 stars |
| Reddish silver or reddish gray     | spectrum M type stars      | 81 stars  |

· Stellar magnitudes are displayed near the right ascension graduations of 13h~ 14h on the constellation dial.

· Hard-to-differentiate neighboring stars (including multiple stars) are indicated in terms of synthetic brightness, with the color being that of the spectral class for the main (brightest in appearance) star in the binary stars.

· Variable stars are not distinguished from other fixed stars.

· The major nebulae, galaxies and star clusters are displayed in light green or emerald green on the constellation dial.

· The star clusters of Pleiades and Hyades are shown together in the fixed star group.

## 1-8. Abbreviations of Constellations and their Full Spellings

| Abbreviations | Full spellings   | Abbreviations | Full spellings      |
|---------------|------------------|---------------|---------------------|
| And           | Andromeda        | Cet           | Cetus               |
| Ant           | Antlia           | Cha           | Chamaeleon          |
| Aps           | Apus             | Cir           | Circinus            |
| Aql           | Aquila           | CMa           | Canis Major         |
| Aqr           | Aquarius         | CMi           | Canis Minor         |
| Ara           | Ara              | Cnc           | Cancer              |
| Ari           | Aries            | Col           | Columba             |
| Aur           | Auriga           | Com           | Coma Berenices      |
| Boo           | Bootes           | CrA           | Corona Australia    |
| Cae           | Caelum           | CrB           | Corona Borealis     |
| Cam           | Camelopardalis   | Crt           | Crater              |
| Cap           | Caprice          | Cru           | Crux                |
| Car           | Carina           | Crv           | Corvus              |
| Cas           | Cassiopeia       | CVn           | Canes Venatici      |
| Cen           | Centaurus        | Cyg           | Cygnus              |
| Cep           | Cepheus          | Del           | Delphinus           |
| Dor           | Dorado           | LMi           | Leo Minor           |
| Dra           | Draco            | Lup           | Lupus               |
| Equ           | Equuleus         | Lyn           | Lynx                |
| Eri           | Eridanus         | Lyr           | Lyra                |
| For           | Fornax           | Men           | Mensa               |
| Gem           | Gemini           | Mic           | Microscopium        |
| Gru           | Grus             | Mon           | Monoceros           |
| Her           | Hercules         | Mus           | Musca               |
| Hoy           | Horologium       | Nor           | Norma               |
| Hya           | Hydra            | Oct           | Octans              |
| Hyi           | Hydrus           | Oph           | Ophiuchus           |
| Ind           | Indus            | Ori           | Orion               |
| Lac           | Lacerta          | Pav           | Pavo                |
| Leo           | Leo              | Peg           | Pegasus             |
| Lep           | Lepus            | Per           | Perseus             |
| Lib           | Libra            | Phe           | Phoenix             |
| Pic           | Pictor           | Sge           | Sagitta             |
| PsA           | Piscis Austrinus | Sgr           | Sagittarius         |
| Psc           | Pisces           | Tau           | Taurus              |
| Pup           | Puppis           | Tel           | Telescopium         |
| Pyx           | Pyxis            | Tra           | Triangulum Australe |
| Ret           | Reticulum        | Tri           | Triangulum          |
| Scl           | Sculptor         | Tuc           | Tucana              |
| Sco           | Scorpius         | UMa           | Ursa Major          |
| Sct           | Scutum           | UMi           | Ursa Minor          |
| Ser           | Serpens          | Vel           | Vela                |
| Ser           | Serpens Caput    | Vir           | Virgo               |
| Ser           | Serpens Cauda    | Vol           | Volans              |
| Sex           | Sextans          | Vul           | Vulpecularnus       |

N.B.: Abbreviation is not shown for the constellation UMi since it is included in the entire range of the celestial sphere unable to be viewed from 35° south latitude.

### 1-9. Nebulae, Galaxies and Star Clusters on the Constellation Dial

M31(And) NGC752(And) M72(Aqr) NGC7009(Aqr) M2(Aqr) NGC7293(Aqr)  
 NGC6167(Ara) I.4651(Am) NGC6362(Ara) NGC6397(Ara) M38(Aur) M36(Aur)  
 M37(Aur) M30(Cap) NGC25 16(Car) NGC2808(Car) NGC3114(Car) NGC3372(Car)  
 NGC3532(Car) NGC3766(Cen) NGC3918(Cen) NGC4945(Cen) NGC5128(Cen)  
 NGC5139(Cen) NGC5460(Cen) 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)  
 NGC4349(Cru) NGC4755(Cru) NGC4258(CVn) NGC 4449(CVn) NGC463 1(CVn) M94(CVn)  
 M63(CVn) M51(CVn) M3(CVn) NGC6871(Cyg) I.1318(Cyg) M29(Cyg) NGC6992-5(Cyg)  
 NGC7000(Cyg) M39(Cyg) NGC2070(Dor) NGC 1291(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) M7 9(Lep) NGC5897(Lib) NGC5822(Lup) NCC5986(Lup) M57(Lyr) M56(Lyr)  
 NGC2237-9(Mon) NGC23U1(Mon) M50(Mon) NGC4833(Mus) NGC6087(Nor)  
 NGC6087(Nor) NGC6171(Oph) M12(Oph) M10(Oph) M62(Oph) M19(Oph) M9(Oph)  
 M14(Oph) NGC6633(Oph) M42(Ori) M78(Ori) NGC 174-5(Ori) NGC744(Pav)  
 NGC752(Pav) M15(Peg) M76(Per) M34(Per) NGC1245(Per) NGC1499(Per) NGC  
 1528(Per) M74(Psc) M47(Pup) M46(Pup) M93(Pup) NGC2546(Pup) NGC1313(Ret)  
 NGC55(Sci) NGC253(Sci) NGC300(Sci) M80(Sco) M4(Sco) NGC6124(Sco) H12(Sco)  
 M6(Sco) M7(Sco) M26(Sct) M11(Sct) M5(Ser) M16(Ser) I.4755(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) NGC6025(TrA)  
 M33(Tri) NGC104(Tuc) NGC362(Tuc) 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) NGC694(Vul)

N.B.: Nebulae, galaxies and star clusters are arranged in alphabetical order of the constellations to which they belong, and in the order of right ascension within a particular constellation (moving to the left around the constellation dial).

### 1-10. Diagram of the Constellation Dial (please refer to Japanese manual as the star names are given there in English)

- |  |  |
|--|--|
| (1) Sirius( $\alpha$ CMa)                      | (2) Canopus( $\alpha$ Car)                       |
| (3) Centaurif ( $\alpha$ Cen)                  | (4) Arcturus( $\alpha$ Boo)                      |
| (5) Vega( $\alpha$ Lyr)                        | (6) Capella( $\alpha$ Aur)                       |
| (7) Rigel( $\beta$ Ori)                        | (8) Procyon( $\alpha$ CMi)                       |
| (9) Achernar( $\alpha$ Eri)                    | (9) Betelgeuse( $\alpha$ Ori)                    |
| (11) Hadar( $\beta$ Cen)                       | (12) Altair( $\alpha$ Aql)                       |
| (13) Aldebaran( $\alpha$ Tau)                  | (14) Antares( $\alpha$ Sco)                      |
| (15) Spica( $\alpha$ Vir)                      | (16) Stellar magnitudes                          |
| (17) Milky Way                                 | (18) Solar position (October 21)                 |
| (19) Right ascension of the pole star (2000.0) | (20) Right ascension of $\sigma$ Octans (2000.0) |

### **1-11. Specifications of 2008 model**

1. Caliber No.: 4P82
  2. Frequency of crystal oscillator: 32,768Hz(Hz: frequency per second)
  3. Accuracy: Within  $\pm 20$  seconds per month (when worn at normal temperature of  $+5^{\circ}\text{C} \sim +35^{\circ}\text{C}$ )
  4. Operating temperature:  $-10^{\circ}\text{C} \sim +60^{\circ}\text{C}$
  5. Additional functions: Constellation display function (period of constellation dial rotation: approximately 23 hours 56 minutes and 04 seconds)
    - Planisphere dial function
    - Displaying of solar position
    - Displaying of altitude and azimuth
    - Displaying of local sidereal time
    - Twilight identification function
    - Displaying of pole star and  $\sigma$  Octans hour angle
  6. Battery: Silver oxide battery 1 pce. 280-39(SR626SW)
  7. Battery life: Approximately 3 years(after installing a new battery)
- N.B.: Specifications are subject to change without notice.