

Service Bulletin

SEIKO ASTRON AS Information

SEIKO Astron is the world's first GPS Solar Watch, which has various advantages in terms of function and technologies. This bulletin contains four subjects which are helpful for your understanding of Astron and after-sales servicing activities:

- 1) Features of Astron and remarks, to remind you of basic functions and remarks for daily use.
- 2) Recharging status and GPS signal reception, which is a key issue to understand for a solar-powered watch to perform GPS reception.
- 3) TAI, UTC and Leap second.
- 4) GPS Reception Checking Chart, which is a work flow chart against the critical issue of GPS reception problems brought up by customers.

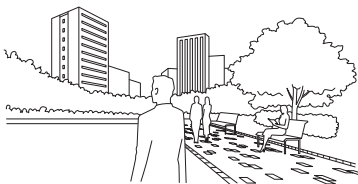
1) Features of Astron and Remarks

1. GPS reception availability

Reception is available anywhere in the world. However, there are places where GPS signals cannot be received. In that case, move outdoors under the open sky with good visibility where GPS signals can be easily received.

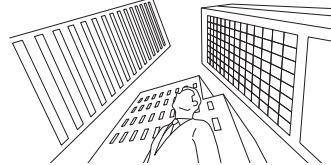
○ Easy to receive

- Outdoors under an open sky with good visibility



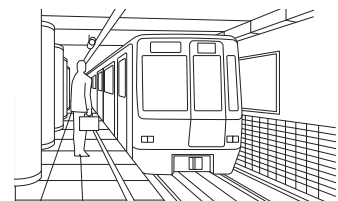
△ Difficult to receive

- The smaller the sky, the more difficult it is to receive GPS signals. In addition, it will also be difficult to receive GPS signals, if there is something that obstructs the GPS signals during reception (in particular, during time zone adjustment).



✕ Cannot receive

- The sky cannot be seen or only part of the sky can be seen.
- There is something hindering the reception.



2. GPS reception and recharging

GPS signal reception requires a lot of energy. When recharging status is "E position (low)," GPS reception is not available. Try to keep the indicator hand pointing to the "level position (middle)" or "F (full)" by recharging the watch regularly.

See 2) more details.

3. Time Zone setting

Astron responds to a total of 39 time zones around the world. When the region or time zone where the watch is used is changed, adjust the time zone to show the precise local time.

4. Automatic leap second reception function

A leap second is automatically added by receiving "leap second data" from GPS signals at the time of leap second addition. Time adjustment as well as Time Zone Setting will not be performed until leap second data is completely received. Be sure to complete the leap second data reception in an environment where GPS signals can be received, such as outdoors.

5. In-flight mode(✈)

Set to the in-flight mode where the reception may influence operation of other electronic devices in an airplane, etc. In the in-flight mode, the GPS signal reception does not work.

The watch is set to "In-flight mode" when shipping from SWC. Re-set the in-flight mode at the NO or at dealers.

6. Daylight Saving Time (DST)

Depending on the area, Daylight Saving Time (DST) is individually set.

Daylight Saving Time means "summer time," which is a system to lengthen daylight time by advancing 1 hour when daylight time is long in summer. Daylight Saving Time has been adopted in about 80 countries, mainly in Europe and North America.

ON/OFF of the DST is not automatically changed over even with operation of time zone adjustment / manual time zone setting. When traveling to a region where DST is not adopted from a region where it is adopted, turn off the DST setting; otherwise, the watch shows one hour ahead of local time.

7. System reset

The watch can be recovered to the initial state by the system reset when trouble occurs. By doing this, all the data of built-in IC are reset to zero. Adjustment of the preliminary position of the date, indicator hand, time adjustment by receiving GPS signals and complete reception of leap second data is essential.

8. Sub dial (Dual time display)

Respective times of two regions can be displayed. Note that the time of the sub dial is not changed by the time zone adjustment. (The time of the sub dial is adjusted by the time adjustment manually.)

2) Recharging Status and GPS Signal Reception

1. Recharging by solar power

Astron is driven by solar power; it does not need periodical battery change.

GPS signal reception requires a lot of energy.

To ensure optimal performance of the watch, make sure that the watch is kept sufficiently charged at all times. Namely, try to keep the indicator hand pointing to the "level position (middle)" or "F (full)" by recharging the watch regularly.


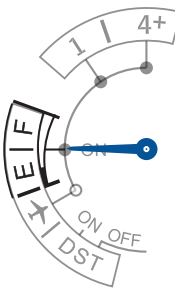
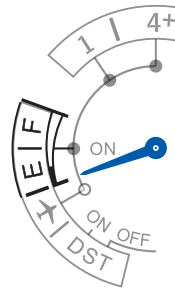
If the energy stored in the watch runs out completely, it takes time to fully charge the watch.

Do not expose the watch to direct sunlight to charge it as the watch temperature becomes extremely high. Make sure to expose the watch to sunlight by a window.

Try to recharge it often, and make sure to expose it to sunlight by a window for 5-6 hours twice a month with the dial facing the sun.

2. Charging status

The indicator hand position shows whether this watch is able or unable to receive GPS signals. In addition, for a low charging state, the movement of the second hand shows the energy depletion state in further detail.

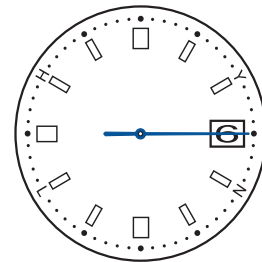
			
Recharging status	F position (full)	Level position (middle)	E position (low)
Second hand movement	1 second interval movement		2 second interval movement 5 second interval movement
Watch operation	Has energy to operate the watch		Does not have energy to operate the watch
GPS signal reception	Available		Not available
Automatic Time Adjustment	Every day / Once every 3 days	Once every 3 days	Not available
Action	Keep in mind to charge the watch regularly.		Charge the watch at least until the indicator hand points to the level position

3. Power Save Function

Stopped at the 15-second position

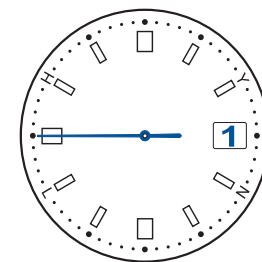
If the watch does not receive a sufficient light source for more than 72 hours, the second hand stops at the 15-second position, and the hour and minute hands also stop.

When the watch is exposed to a sufficient light source for five seconds or longer, it will display the current time again after the second hand is rapidly advanced.



Stopped at the 45-second position

When the watch is in an insufficient charging state for a long time, the second hand stops at the 45-second position, and the hour and minute hands also stop. After sufficiently recharging the watch, set it for the current time if necessary.



3) TAI, UTC and Leap second

TAI: Atomic Time, International (fr)Temps Atomique International

International Atomic Time (TAI, from the French name Temps atomique international) is a worldwide time standard based on International Atomic Time, whose accuracy is maintained by cesium atomic clocks. Atomic clocks deviate only 1 second in about 20 million years.

To achieve the highest possible level of accuracy, the weighted average of the time values from about 300 atomic clocks located in more than 50 national laboratories worldwide is used to determine TAI.

UTC: Universal Time, Coordinated (fr)Temps Universel Coordonné

UTC is the time standard used to determine local times in time zones worldwide. It is primarily based on the TAI.

Leap Second

While TAI is an extraordinarily precise means of time-keeping, it does not take into account the Earth's slowing rotation, which determines the length of a day. This makes for a discrepancy between TAI and mean solar time of around 1 second every 1.5 years.

Leap seconds are added to our clocks (UTC) so that this discrepancy does not get too large over time and the time we use is synchronized as much as possible with the Earth's rotation.

This means that the time difference between TAI and UTC amounts to an integral number of seconds because whole seconds are added. Since June 30, 2012 when the last leap second was added, TAI has been exactly 35 seconds ahead of UTC.

Leap Second Support in Astron

Leap seconds are inserted at the end of the last day in June or December, but they are not inserted every year. UTC decides insertion and transmission of leap second information by GPS signals at least one month in advance.

SEIKO Astron enters the "leap second data" receiving mode after the first GPS signal is received on or after December 1st and June 1st. During "leap second data" receiving mode, GPS signal reception is not available. The Astron automatically obtains leap second information, which is transmitted by GPS satellite every 12.5 minutes and adjusts the time at the end of the month if necessary.

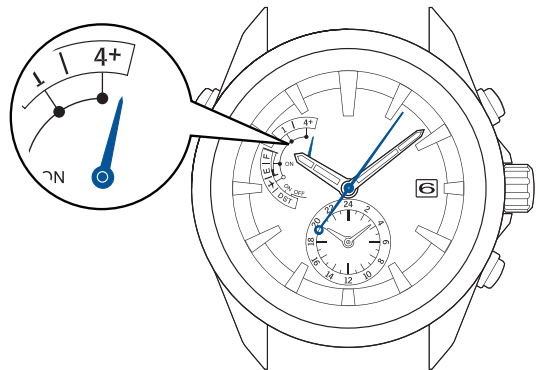
However, if you fail to receive leap second information, "leap second data" receiving mode is kept until you succeed in receiving leap second information. Time zone adjustment and time adjustment is not available until the successful receipt of leap second information.

< Leap second data receiving mode >

- The indicator hand points to the right side of the 4+ position.
- The second hand begins moving counter-clockwise, displaying the countdown in minutes until leap second date is received.

< Leap second data reception >

- When the second hand has reached the 12 o'clock position, reception of the leap second data begins.
- When the leap second data reception is completed, the second hand moves to the 1 o'clock position and the watch acquires the data (within approximately one minutes.)
- If the reception is successful, the second hand points to the "Y" position indicating successful data transfer.
- After the reception result is displayed, the watch returns to normal time display.

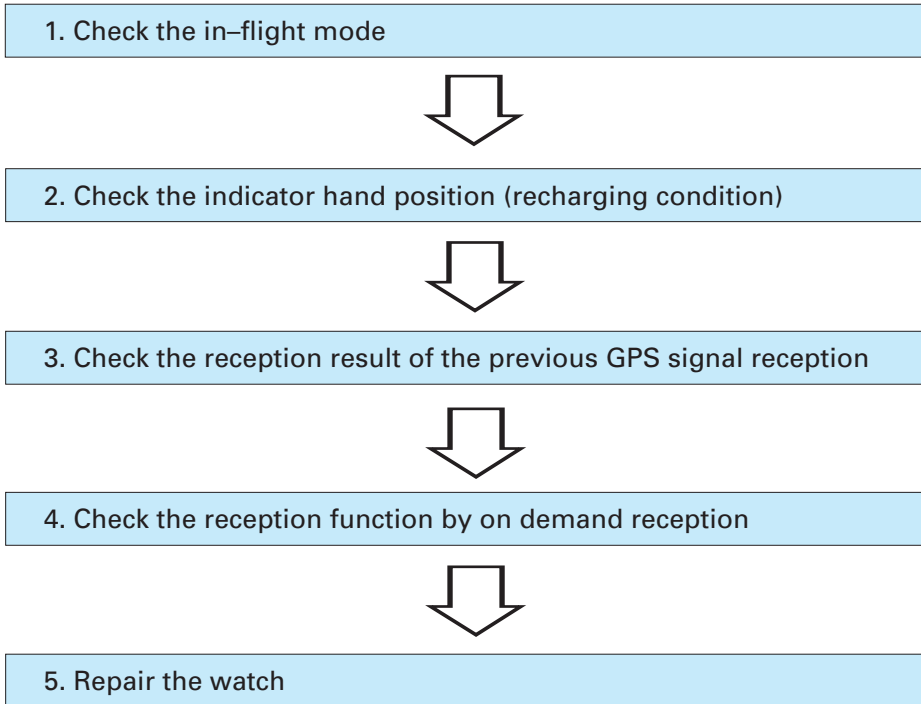


Note:

- Although this automatically movement is different from the normal time display, it is not an indication that the watch is defective.
- The process of receiving the leap second data takes longer than the regular time adjustment.
- Be sure to complete receiving the leap second data in an environment where a GPS signal can be received.

4) GPS Reception Checking Chart

When the watch does not start receiving or is unable to receive GPS signals even with operation of the GPS signal reception, the following can be considered.



Check the in-flight mode

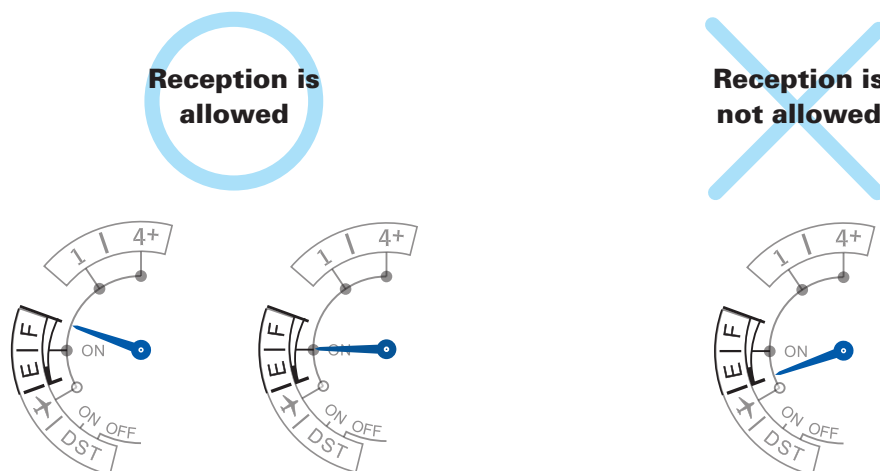
Reception is not allowed when the in-flight mode is ON. Make sure that it is OFF.

➡ See 1)-5 In-flight mode (✈)

1. Check the indicator hand position (recharging condition)

Reception is not allowed when the charging status is at "E" (Empty).

Make sure the charging status is at "F (Full)" or "Level Position (Middle)."



➡ See 2) Recharging Status and GPS Signal Reception

2. Check the reception result of the previous GPS signal reception done by the customer. This is important to check what was intended and the result. From the result, we can estimate the reason for the defect. We suggest you check this before you perform on demand reception checking. The type of reception and reception result (success or failure) of the last GPS signal reception is displayed for 5 seconds: Press button B once and release it. The second hand and indicator hand display the reception result.

Intention	Reception Result	Estimated reason
Time Adjustment	Failed	Environment problem ➡ See 1)-1 GPS reception availability
		Leap-second data reception not completed ➡ See1)-4 Automatic leap second reception function
	Successful, but not displaying the correct time	Time zone is set incorrectly ➡ See 1)-3 Time Zone setting
		DST mode is set incorrectly ➡ See 1)-6 Daylight Saving Time (DST)
Time Zone Adjustment	Failed	Button was not pushed for 6 sec.
		Environment problem ➡ See 1)-1 GPS reception availability
		Leap-second data reception not completed ➡ See1)-4 Automatic leap second reception function
	Successful, but not displaying the correct time	DST mode is set incorrectly ➡ See 1)-6 Daylight Saving Time (DST)

3. Check the reception function by on demand reception
Perform both on demand Time Adjustment and Time Zone Adjustment.

4. Repair the watch
If the GPS reception function does not work properly, conduct repair service.