

# ***TECHNICAL INFORMATION***

## ***INFORMACION TECNICA***

### **CITIZEN QUARTZ**

**Cal. No. E001 ※**

**Cal. No. E011 ※**

**Cal. No. E031 ※**

**Cal. No. E101 ※**

**Cal. No. E111 ※**



(Cal. No. E001 ※)



(Cal. No. E101 ※)



CITIZEN IS A REGISTERED TRADEMARK OF CITIZEN WATCH CO., JAPAN.

## ENGLISH

### Contents

<b>§1. OUTLINE</b>	1
<b>§2. SPECIFICATIONS</b>	1
<b>§3. SOLAR POWER WATCH</b>	2
<b>§4. HANDLING OF WATCH</b>	2
A. Setting the Time and Calendar.....	2
B. Functions of the Solar Power Watch.....	4
C. Time Required for Recharge .....	5
D. Notes on Recharge .....	6
E. Replacing the Secondary Battery .....	6
<b>§5. PRECAUTIONS FOR DISASSEMBLY AND ASSEMBLY</b>	6
A. How to Pull Out Setting Stem from One-piece Case.....	6
B. Procedure for assembling solar cell.....	7
<b>§6. DISASSEMBLY AND ASSEMBLY OF MOVEMENT</b>	8
<b>§7. TROUBLESHOOTING AND ADJUSTMENT</b>	10

## ESPAÑOL

### Índice

<b>§1. DESCRIPCIÓN GENERAL</b>	14
<b>§2. ESPECIFICACIONES</b>	14
<b>§3. RELOJ DE ENERGÍA SOLAR</b>	15
<b>§4. MANEJO DEL RELOJ</b>	15
A. Ajuste de la hora y del calendario.....	15
B. Función del reloj de energía solar.....	17
C. Tiempo requerido para la recarga .....	18
D. Notas sobre la recarga.....	19
E. Cambio de la batería secundaria.....	19
<b>§5. PRECAUCIONES PARA EL DESMONTAJE Y MONTAJE</b>	19
A. Forma de extraer el vástago de ajuste de una caja monopieza.....	19
B. Procedimiento de ensamblaje de la célula solar .....	20
<b>§6. DESMONTAJE Y MONTAJE DEL MECANISMO</b>	21
<b>§7. MÉTODO DE INSPECCIÓN Y DE AJUSTE DEL MECANISMO</b>	23

## §1. OUTLINE

This watch is a analog solar power watch which has a solar cell on its dial that converts the light energy into electrical energy to drive its mechanism.

## §2. SPECIFICATIONS

Caliber No.		E031M	E011M	E001M	E111M	E101M
Type		Analog solar power watch				
Movement size (mm)	Major axis x Minor axis	ø18.5 x 18.2 x 17.4			ø23.7 x 22.1 X 22.1	
	Thickness	2.83	3.3	3.5	3.3	3.5
Accuracy (At normal temperature)		±15 sec/month (5°C to 35°C/41°F to 95°F)				
IC		1 unit of C/MOS-LSI				
Operating temperature		-10°C to +60°C (14°F to 140°F)				
Converter		Bipolar step motor				
Time adjustment		No adjustment terminal for use in market				
Measurement gate		10 sec.				
Display functions	Time	Hour, Minute, Second				
	Calendar	—	Date	Date, Day	Date	Date, Day
Additional functions		Quick start function				
		Insufficient charge warning function				
		Overcharging prevention function				
Continuous operating time		<ul style="list-style-type: none"> <li>• Time until watch stops without charging after being fully charged: Approx. 6 months</li> <li>• Time from 2-second interval movement to stopped: Approx. 4 days</li> </ul>				
Battery		Secondary battery 1 pc.				

Specifications are subject to change without notice.

### §3. SOLAR POWER WATCH

This watch is powered not by an ordinary battery, but by converting light energy into electrical energy.

A secondary battery is used in this watch to store electrical energy. **This secondary battery is a clean energy battery which doesn't use any toxic substances such as mercury. Once fully charged, the watch will continue to run for about 6 months without further charging.**

**[Explain the following items to the user for comfortable use of this watch.]**

**<Good use of solar-powered watch>**

- Since the energy source of this watch is light, expose it to light sufficiently to charge the battery in it.
- The battery of this watch is never overcharged by exposing it to light.
- If the user wears long-sleeved clothes usually, the watch is covered and its battery may not be charged sufficiently.
- The watch should be put on a well lit place as long as possible for its normal operation while it is not worn.

**[Replacing the secondary battery]**

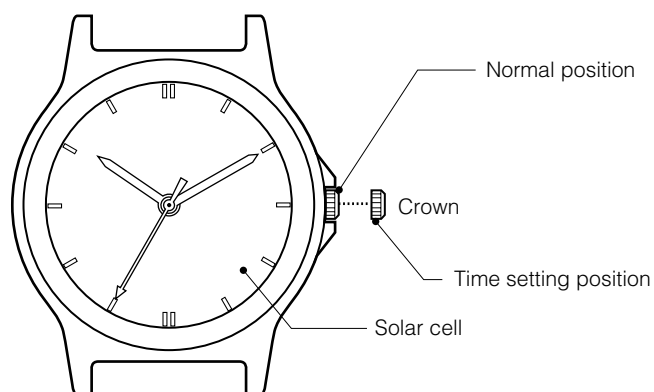
Unlike ordinary silver-based batteries, the secondary battery used in this watch does not have to be periodically replaced since it is able to be charged and discharged repeatedly.

### §4. HANDLING OF WATCH

#### A. Setting the Time and Calendar

**[1] Three-hand model without calendar display**

- \* If your watch has a screw-type crown, lift up the crown to loosen it before operation. Be sure to press the crown down firmly after operation.



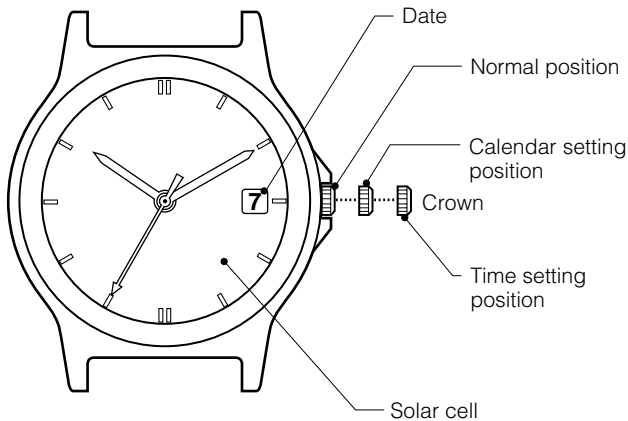
■ **Setting the time**

1. Pull the crown out to time setting position when the second hand reaches the 0 seconds position.
2. Set the time by turning the crown.
3. Securely return the crown to normal position in synchronization with a telephone or other time service.

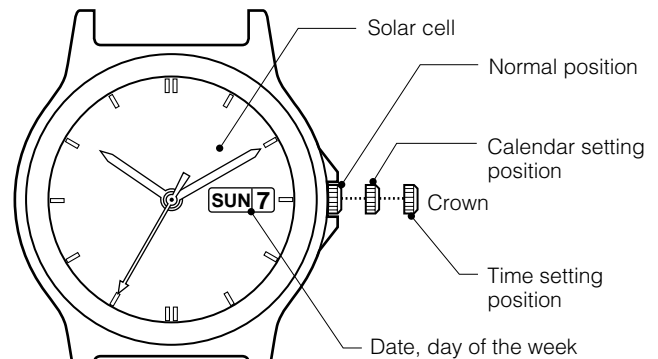
## [2] Models with calendar (date and day of the week) display

\* If your watch has a screw-type crown, lift up the crown to loosen it before operation. Be sure to press the crown down firmly after operation.

### [Date display models]



### [Date, day of the week display model]



## ■ Setting the time

1. Pull the crown out to the time setting position when the second hand reaches the 0 seconds position.
2. Turn the crown to set the time.
  - The date changes at 12:00 AM. Pay attention to AM and PM when setting the time.
3. Securely push in the crown to the normal position in synchronization with a telephone or other time service.

### <Helpful hint for setting the time accurately>

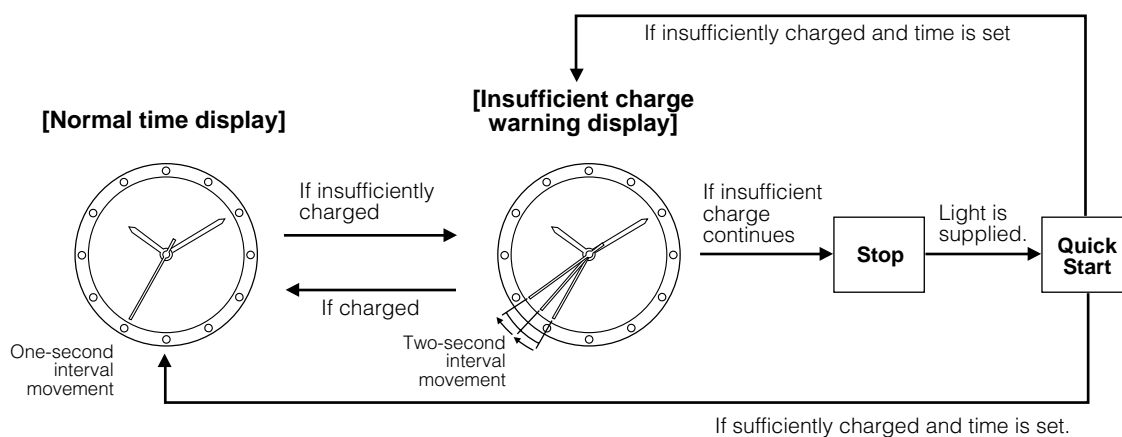
After first stopping the second hand at the 0 seconds position, advance the minute hand 4-5 minutes past the correct time and then turn it back to the correct time. Then push in the crown in synchronization with a telephone or other time service to accurately set the time.

## ■ Setting the calendar

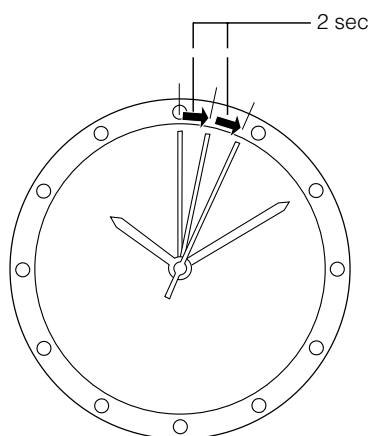
1. Pull the crown out to the 1st click (calendar setting position).
2. Set the desired date by turning the crown counterclockwise.
3. Set the desired day of the week by turning the crown clockwise.
  - In the case of date display models, turning the crown clockwise will result in the loose play of the crown.
4. After you have set the calendar, be sure to press the crown back to its normal position.
  - Do not adjust the calendar when the watch is reading as below. Otherwise the calendar may not change correctly.
    - \* Date display models ..... between 9:00 pm and 1:00 am
    - \* Date, day of the week display models .... between 9:00 pm and 4:00 am

## B. Functions of the Solar Power Watch

If the charge becomes insufficient, a warning function will operate and the display changes, as below.



### ■ Insufficient Charge Warning Function



Two-second interval movement

**This feature indicates that the watch has become insufficiently charged when the second hand changes from 1-second interval movement to 2-second interval movement.**

Even in such a case, the watch keeps correct time, but about 4 days after two-second interval movement begins, the watch will stop.

After exposing the watch to light, recharging takes place and the watch returns to one-second interval movement.

### ■ Quick Start Function

The watch will stop if it is completely discharged.

**It will begin to operate soon after (within 10 second) it is exposed to light.**

(However, the time to start may vary according to the brightness of the light.)

### ■ Overcharging Prevention Function

When the secondary battery becomes fully charged as result of light shining into the watch dial (solar cell), the over charge prevention feature is activated automatically to prevent the secondary battery from being charged further. This prevents the secondary battery as well as time-keeping accuracy, functions and performance of the watch from deteriorating no matter how much the watch is charged.

## C. Time Required for Recharge

Time required for recharge may vary according to the Caliber number, design (color of the dial, etc.) and operating environment. The following table will serve you as rough reference.

“The recharging time is the time when the watch is continuously exposed to radiation.”

### <Cal. E031/E011/E001>

Illuminance (lux)	Environment	Time required		
		One day usage	From the stop state to the one second movement	Empty to full
500	Inside an ordinary office	4 hours	60 hours	——
1000	60–70cm (24–28in.) under a fluorescent light (30W)	2 hours	25 hours	——
3000	20cm (8in.) under a fluorescent light (30W)	40 minutes	8 hours 30 minutes	130 hours
10000	Exterior, cloudy	12 minutes	3 hours	40 hours
100000	Exterior, summer, sunny	2 minutes	18 minutes	11 hours

### <Cal. E111/E101>

Illuminance (lux)	Environment	Time required		
		One day usage	From the stop state to the one second movement	Empty to full
500	Inside an ordinary office	4 hours	50 hours	——
1000	60–70cm (24–28in.) under a fluorescent light (30W)	2 hours	25 hours	——
3000	20cm (8in.) under a fluorescent light (30W)	40 minutes	7 hours	120 hours
10000	Exterior, cloudy	11 minutes	2 hours	35 hours
100000	Exterior, summer, sunny	2 minutes	17 minutes	11 hours

Full recharging time .....The time for fully recharge from stopped.  
(Empty to full)

One day usage .....The time required for the watch to run for one day with one second interval movement.

## D. Notes on Recharge

- Avoid charging the watch at high temperatures (about 60°C / 140°F or higher) since allowing the watch to reach a high temperature during charging can cause deformation or discoloration of external components as well as a malfunction of movement components.

### Examples:

- Charging by placing the watch too close to a light source that may become hot such as an incandescent lamp or halogen lamp.
- Charging by placing the watch on an automobile dashboard that can easily reach a high temperature.
- When charging the watch with an incandescent lamp, halogen lamp or other light source that may reach a high temperature, always make sure to place the watch at least 50 cm (20 in.) away from the light source to prevent the watch from reaching a high temperature.

## E. Replacing the Secondary Battery

**This watch uses the secondary battery, which does not have to be periodically replaced due to repeated charging and discharging, unlike ordinary batteries.**

### Caution

**Never use a battery other than the secondary battery used in this watch.**

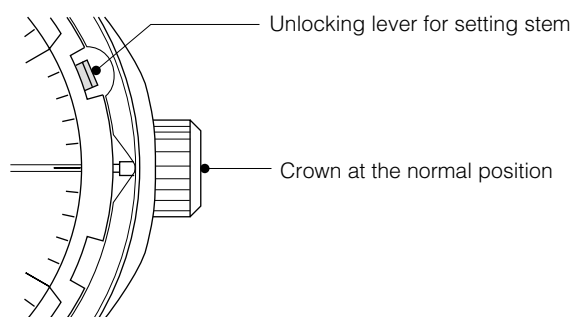
The watch structure is so designed that a different kind of battery other than the specified cannot be used to operate it. In case a different kind of battery such as a silver battery is used by some chance, there is a danger that the watch will be overcharged to burst, causing damage to the watch and even to the human body.

## §5. PRECAUTIONS FOR DISASSEMBLY AND ASSEMBLY

### A. How to Pull Out Setting Stem from One-piece Case

#### 1. When removing the setting stem from the case

- Pressing down the end of the unlocking lever for setting stem from above, pull out the setting stem.



#### <Procedure>

- (1) Set the crown at the normal position (Push it in).
- (2) Lightly press the end of the unlocking lever for setting stem with a screwdriver, etc. from above.
- (3) With the lever pressed, pull out the setting stem.



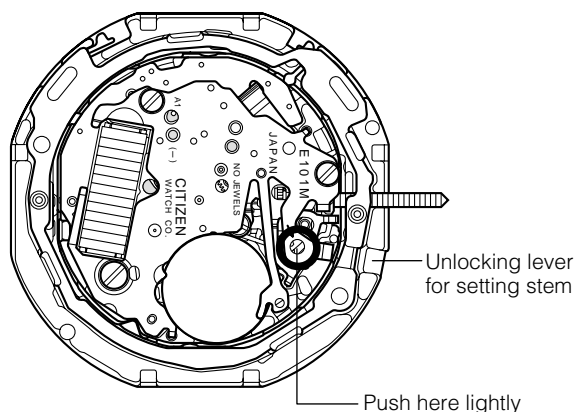
## 2. When removing the setting stem from the movement

- Pressing the base of the unlocking lever for setting stem ("PUSH →" position), pull out the setting stem.

### <Note>

When the movement has been removed from the case, do not press the end of the unlocking lever for setting stem. If it is pressed in this case, it may be pressed too much to deform itself, circuit unit supporter, etc. since there is not a stopper.

If the movement is installed to the case with any part deformed, the setting stem may not be pulled out even if the unlocking lever for setting stem is pressed.



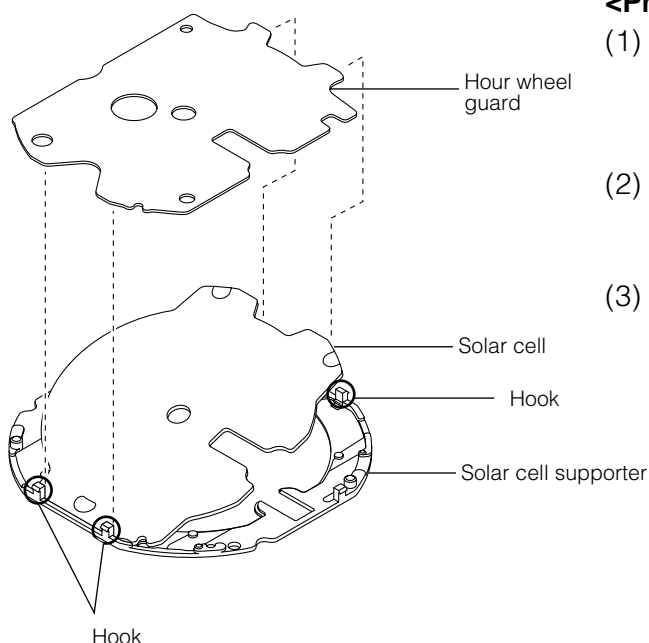
### <Procedure>

- Set the crown at the normal position (Push it in).
- Lightly press the base of the unlocking lever for setting stem ("PUSH →" position) with a screwdriver, etc. from above.
- With the lever pressed, pull out the setting stem.

## B. Procedure for Assembling Solar Cell

### 1. Precautions for handling of solar cell

- If the top of the solar cell is damaged, its charging capacity and other functions are lowered. Accordingly, sufficiently take care not to damage the top of the solar cell when removing and setting it.
- If the electrodes are stained or flaked off, a continuity trouble occurs. Since it is difficult to clean the top of solar cell, do not touch them with a finger, etc.



### <Procedure>

- Insert either side of the solar cell under the hook of the solar cell supporter, and then insert the opposite side under the hook similarly.
- Similarly to the solar cell, insert either side of the hour wheel guard under the hook, and then insert the opposite side under the hook.
- After assembling the solar cell supporter, solar cell, and hour wheel guard, install them to the movement.

## §6. DISASSEMBLY AND ASSEMBLY OF MOVEMENT

Disassembly procedure: ① → ③⑦

Assembly procedure: ③⑦ → ①

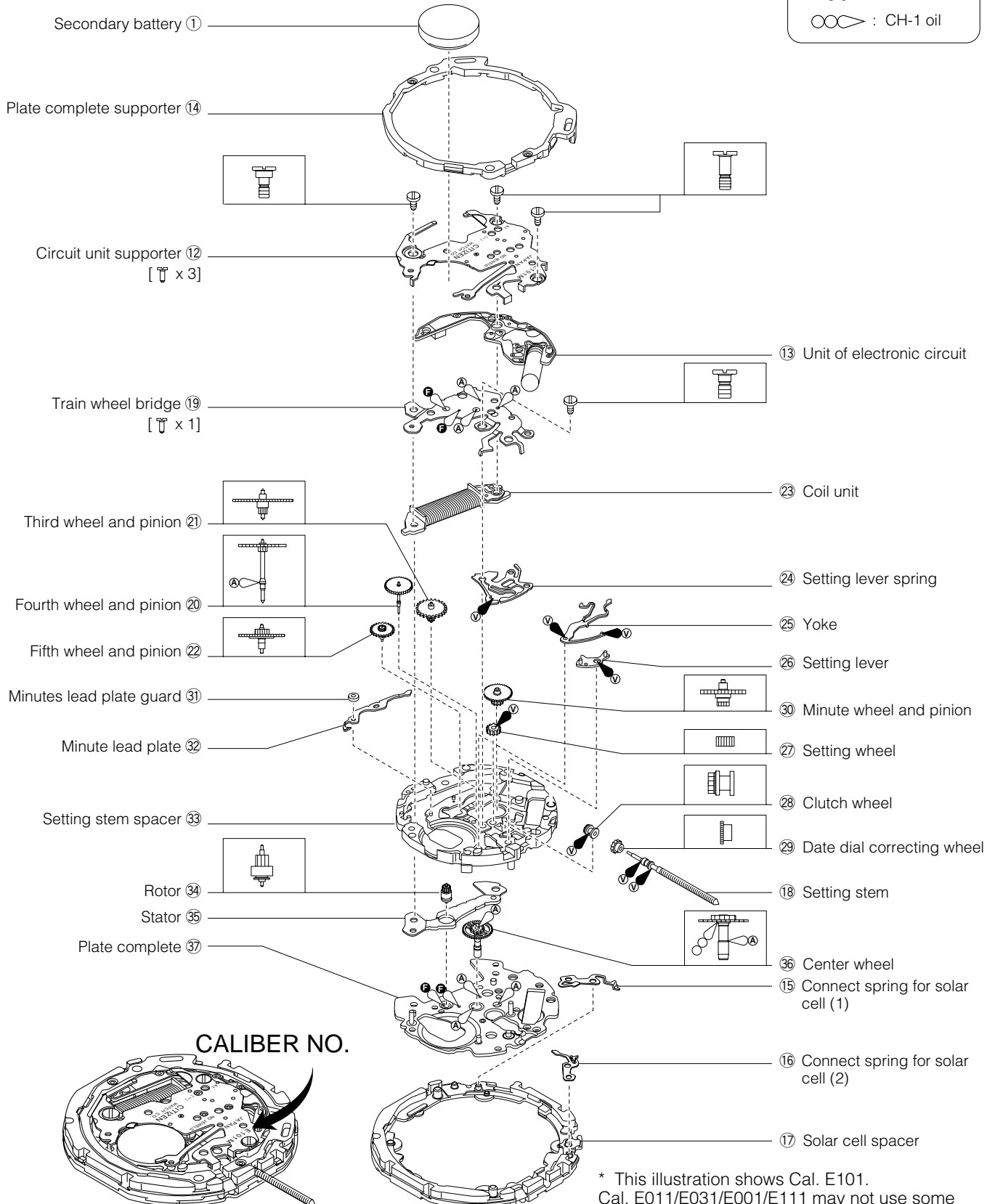
● Lubrication mark

Ⓐ : A-Lube oil

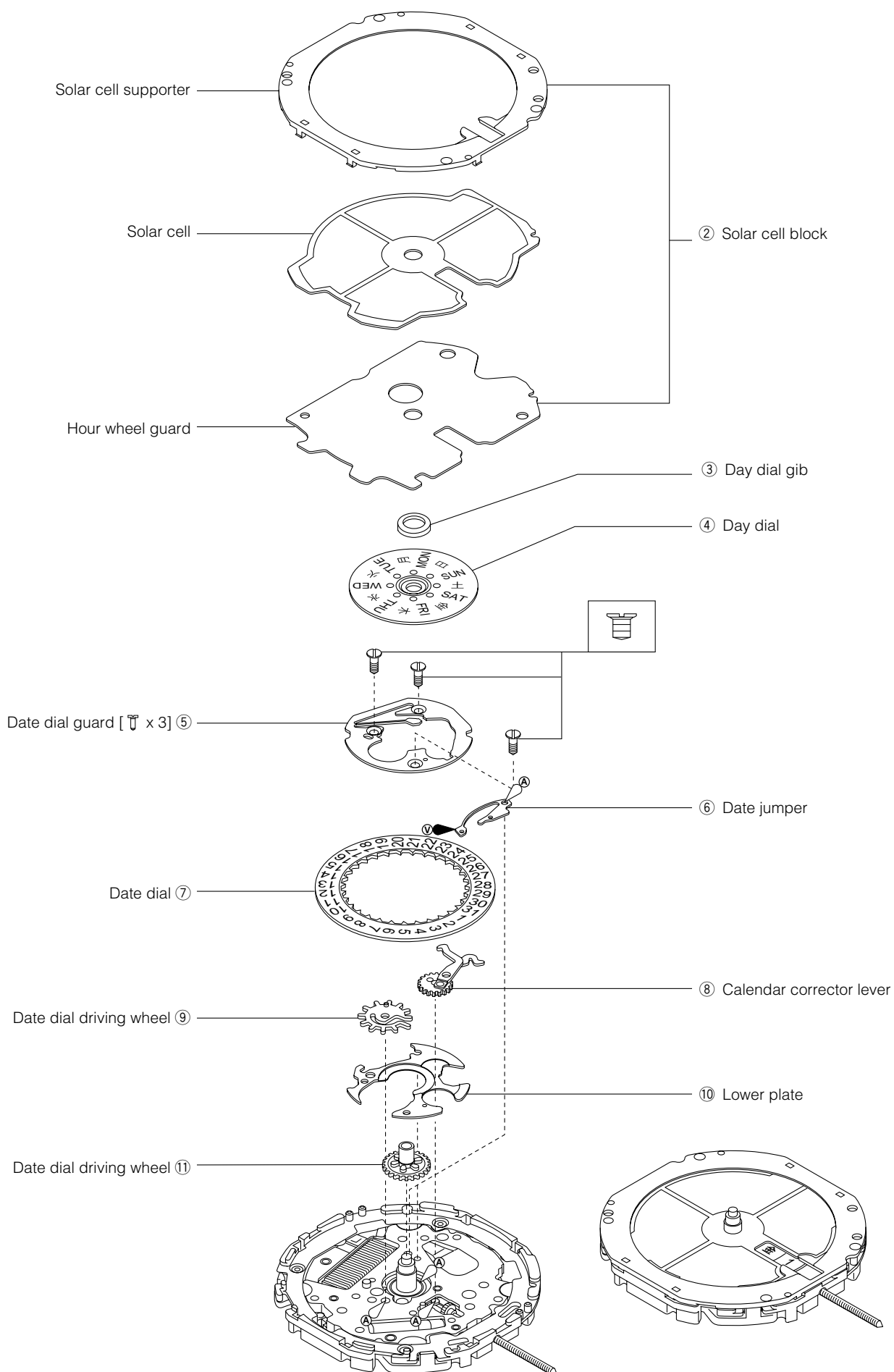
Ⓥ : V-Lube oil

Ⓕ : F-Lube oil

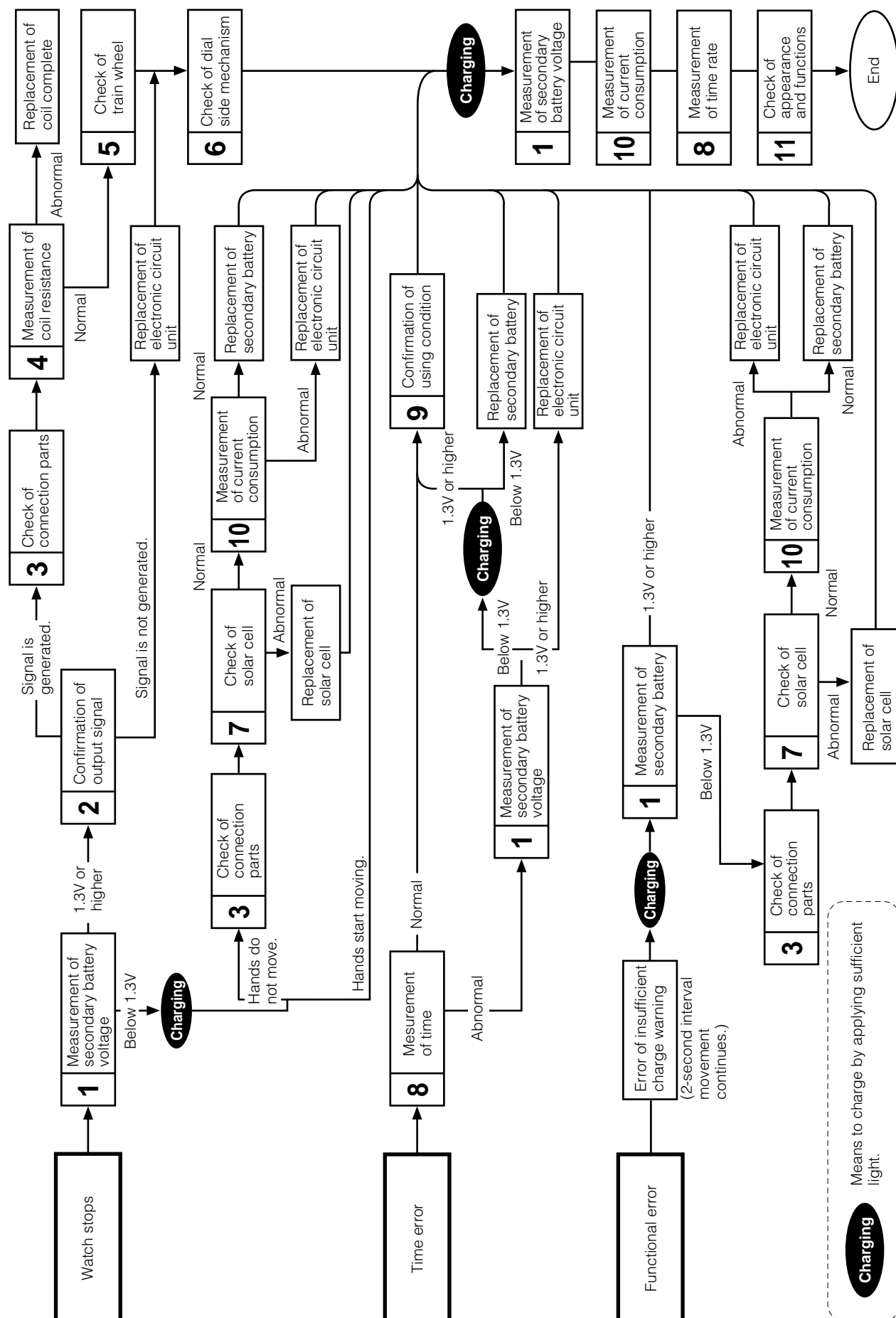
∞ : CH-1 oil

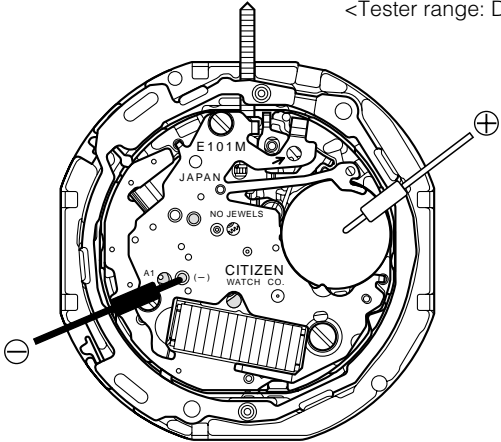
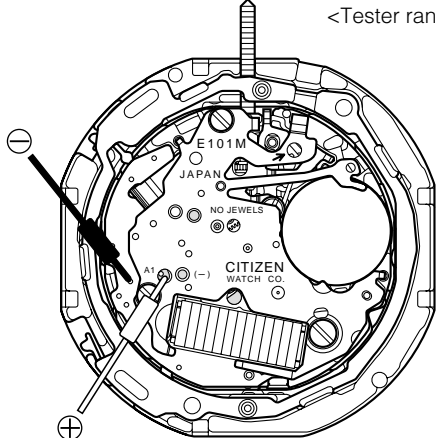


\* This illustration shows Cal. E101.  
Cal. E011/E031/E001/E111 may not use some parts in this illustration and may use parts having shapes a little different from this illustration.



## **§7. TROUBLESHOOTING AND ADJUSTMENT**



Check Items	How to Check	Results and Treatments
<p>❶ Measurement of secondary battery voltage</p>	<p style="text-align: right;">&lt;Tester range: DC. 3V&gt;</p>  <p>Reference:</p> <ul style="list-style-type: none"> <li>• 1.1V ~ 1.3V: Two-second interval movement mode 1.3V ~ 1.8V: One-second interval movement mode These voltages may vary slightly from watch to watch.</li> <li>• A quick-start is activated by the small-capacity tantalum capacitor which has been incorporated in the circuit, in addition to the primary secondary battery. After the watch is illuminated (right after it begins running), the secondary battery voltage will display an extremely low value because the secondary battery has not been fully charged.</li> </ul> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>Note:</b> When measuring the voltage, be careful not to place the ⊖ tester pin on the secondary battery strap (a short circuit will occur.)</p> </div>	
<p>❷ Confirmation of output signal</p>	<p>* Refer to Technical Manual, Basic Course: II-1-b.</p> <p style="text-align: right;">&lt;Tester range: DC. 0.3V&gt;</p>  <p>&lt;The tester lead pins have no polarity&gt;</p> <ul style="list-style-type: none"> <li>• In the 1-second interval movement mode, the tester pointer should move to the right and left every 1 second.</li> <li>• In the 2-second interval movement or hitch movement mode, the test pointer moves in only one direction every 2 seconds.</li> </ul>	<ul style="list-style-type: none"> <li>• Tester pointer swings. → Normal.</li> <li>• Tester pointer does not swing. → Check connections.</li> </ul> <p style="text-align: center;">↓</p> <ul style="list-style-type: none"> <li>• Connections are normal. → Replace the electronic circuit.</li> </ul>

Check Items	How to Check	Results and Treatments
③ Check of connection parts	<ul style="list-style-type: none"> <li>* Refer to Technical Manual, Basic Course: II-2-a.</li> <li>• Check for looseness of screws, dust, stain, etc.</li> <li>• Check for stain and removal of the solar cell pattern (two places), deformation of connection spring, removal of welded lead plate of the secondary battery, stain of the circuit pattern, bad contact of each part.</li> </ul>	<p>Stain of solar cell pattern and circuit pattern. → Remove stain.</p> <p>Removal of solar cell pattern, removal of circuit pattern, removal of welded lead plate of secondary battery. → Replace parts.</p>
④ Measurement of coil resistance	<ul style="list-style-type: none"> <li>* Refer to Technical Manual, Basic Course: II-1-c.</li> <li>• Remove the unit of electronic circuit and measure the coil resistance</li> </ul> <p style="text-align: right;">&lt;Tester range: R x 10Ω&gt;</p> <p>&lt;The tester lead pins have no polarity&gt;</p>	<ul style="list-style-type: none"> <li>• 2.0 kΩ - 2.4 kΩ → Normal</li> <li>• Out of above range → Replace coil unit</li> </ul>
⑤ Check of train wheel	<ul style="list-style-type: none"> <li>* Refer to Basic Course: II-2-b.</li> </ul>	
⑥ Check of dial side mechanism	<ul style="list-style-type: none"> <li>* Refer to Basic Course: II-2-c.</li> </ul>	
⑦ Check of solar cell	<p>Remove only the secondary battery and expose the solar cell to light and see if the second hand starts moving (if the solar cell generates power).</p> <ul style="list-style-type: none"> <li>• Check the solar cell for breakage and stain, and check its electrode for stain and flaking.</li> </ul>	<ul style="list-style-type: none"> <li>• Second hand starts moving. → Normal.</li> <li>• Second hand does not move. → Check connecting parts.</li> </ul> <p style="text-align: center;">↓</p> <ul style="list-style-type: none"> <li>• Connecting parts are normal. → Replace solar cell.</li> <li>• Breakage of solar cell → Replace solar cell.</li> <li>• Stain → Remove stain.</li> <li>• Flaking of electrode → Replace solar cell.</li> </ul>
⑧ Measurement of time rate	<ul style="list-style-type: none"> <li>* Refer to Basic Course: II-2-d.</li> </ul> <p style="text-align: right;">&lt;Measurement gate: Analog 10 sec&gt;</p> <ul style="list-style-type: none"> <li>• The time rate cannot be adjusted.</li> <li>• The time rate may not be measured accurately in the 2-second interval movement or hitch movement. In this case, apply light to the watch until the second hand moves in the 1-second interval movement mode, then measure the time rate.</li> </ul>	<ul style="list-style-type: none"> <li>• The watch loses or gains substantial time → Replace the unit of electronic circuit</li> </ul>

Check Items	How to Check	Results and Treatments
<b>9</b> Confirmation of using condition	<p>* Refer to Basic Course: II-2-e.</p> <ul style="list-style-type: none"> <li>Since this watch is energized by light, it should receive light as much as possible. If the watch is placed near a light source which generates heat (above 60°C / 140°F) such as an incandescent lamp, a halogen lamp, etc., its functions and parts may be deteriorated or deformed by the heat. Accordingly, take care when applying light to it.</li> <li>It is important to check that the secondary battery is charged normally (the customer knows that this watch is a solar watch) and explain the correct charging method to the customer.</li> </ul>	
<b>10</b> Measurement of current consumption	<p>* Refer to Technical Manual, Basic Course: II-1-f.</p> <ul style="list-style-type: none"> <li>This watch uses the secondary battery block, instead of a ordinary battery. Accordingly, prepare a silver battery (1.55V) and measure the current consumption according to the following procedure.</li> </ul> <p>(1) Remove the secondary battery.</p> <p>(2) Referring to Technical Manual, Basic Course, set the silver battery (1.55V) to the adapter of the tester correctly.</p> <p>(3) Pull the crown out.</p> <p>(4) Set the tester.</p> <div> </div> <p style="text-align: center;">&lt;Tester range: DC 10μA&gt;</p> <p>(5) Return the crown to the normal position and measure the current consumption of the movement.</p> <div style="border: 1px solid black; padding: 5px;"> <p><b>Note:</b> When measuring the current consumption, do not apply any light to the solar cell. If any light is applied, the voltage changes and correct current consumption cannot be measured.</p> </div>	<ul style="list-style-type: none"> <li>Current consumption of the movement Under 0.5μA → Normal</li> <li>Over 0.5μA → Check train wheel and dial-side mechanism. → Remove dust and dirt.</li> </ul> <p style="text-align: center;">↓</p> <ul style="list-style-type: none"> <li>Current consumption measured again Over 0.5μA → Replace the unit of electronic circuit.</li> </ul>
<b>11</b> Check of appearance and function	<p>* Refer to Basic Course: II-2-f.</p>	