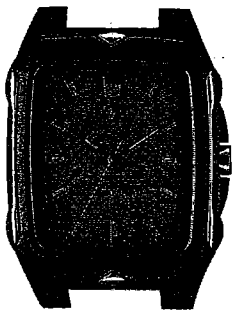
TECHNICAL INFORMATION

CITIZEN QUARTZ

Cal. No. E0※※
Cal. No. E1※※



(Cal. No. E030)

(Cal. No. E110)

CITIZEN

ENGLISH

Contents

§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.		**E030M**	**E010M**	**E000M**	**E110M**	**E100M**
Type		Analog solar power watch				
Movement size (mm)	Major axis x Minor axis	ø18.5 x 18.2 x 17.4			ø23.7 x 22.6	
	Thickness	2.83	3.3	3.5	3.5	3.3
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				
		Time setting warning function				
		Overcharging prevention function				
Continuous Operting time	From full recharge to stop	Approx. 6 months				
	From insufficient charge warning display to stop	Approx. 1 week				
Secondary battery	Part NO.	295-51				
	Remarks	Secondary battery block				

§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>

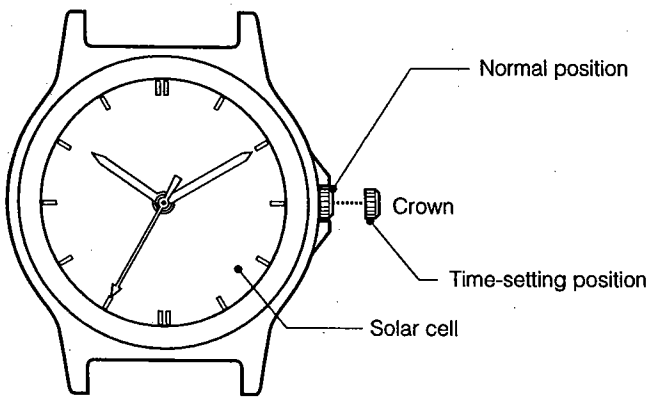
- Since the energy source of this watch is light, expose it to light sufficiently to charge the battery in it.
- The battery of this watch is never overcharged by exposing it to light.
- If the user wears long-sleeved clothes usually, the watch is covered and its battery may not be charged sufficiently.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

§4. HANDLING OF WATCH

A. Setting the Time and Calendar

[1] Three-hand model without calendar display (Cal. E030)

* 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.



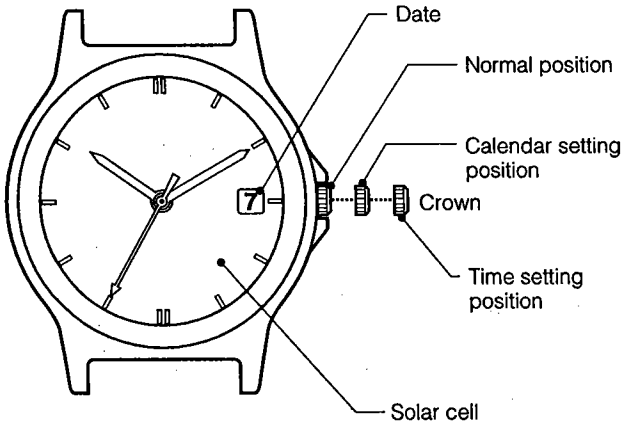
■ Setting the time

1. Stop the second hand by pulling out the crown.
2. Turn the crown to set the time.
3. After setting the time, firmly push the crown back into its normal position.

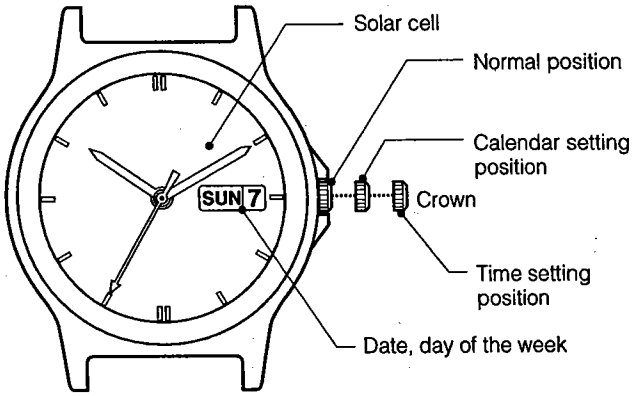
[2] Models with calendar (date and day of the week) display (Cal. E010/E000/E110/E100)

* 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.

[Cal. E010/E110]



[Cal. E000/E100]



■ Setting the time

1. Stop the second hand by pulling the crown out to the 2nd click (time setting position).
2. Turn the crown to set the time.
3. The watch will start after the crown is firmly pushed back into its normal position.

■ 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.

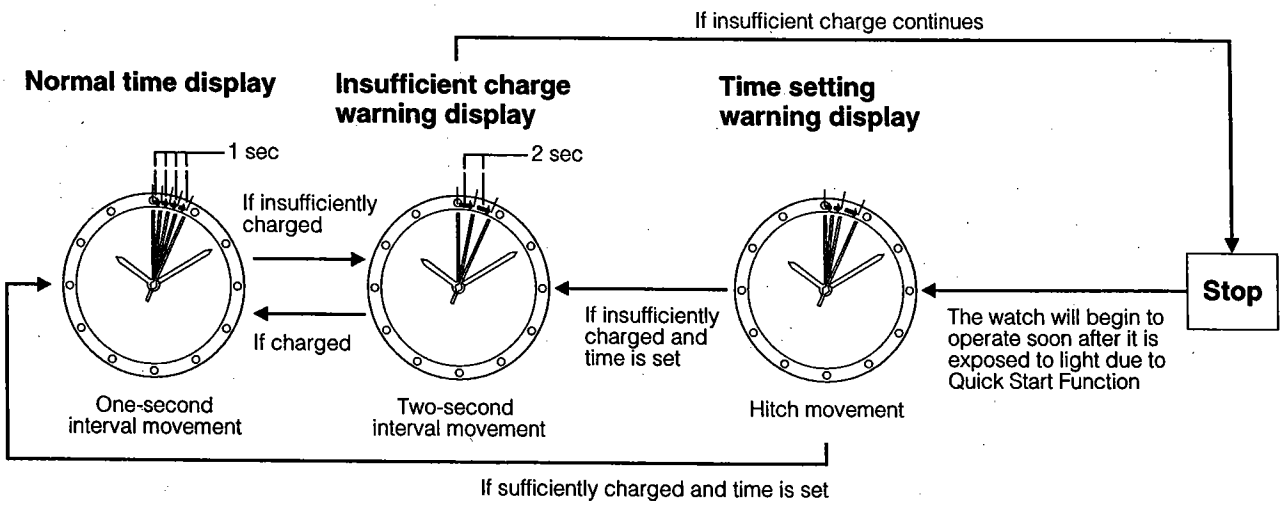
- In the case of date display models, turning the crown clockwise will result in the loose play of the crown.

4. After you have set the calendar, be sure to press the crown back to its normal position.

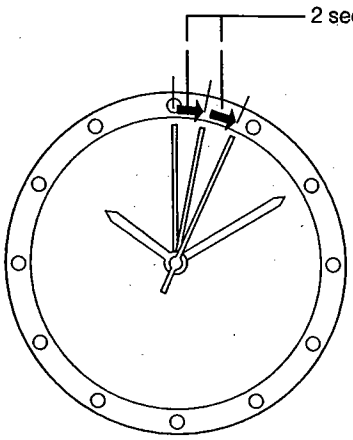
- Do not adjust the calendar when the watch is reading as below. Otherwise the calendar may not change correctly.
  * Date display models ..... between 9:00 pm and 1:00 am
  * Date, day of the week display models .... between 9:00 pm and 4:00 am

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

The second hand changes to two-second interval movement to indicate insufficient recharging.

Even in such a case, the watch keeps correct time, but about 1 week 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.

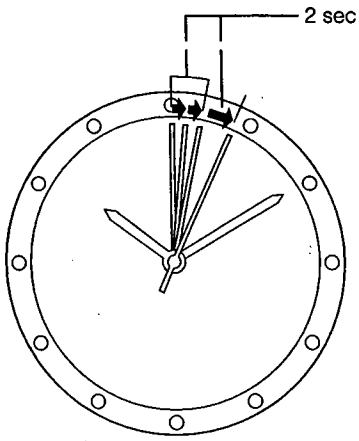
■ Quick Start Function

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.)

■ Time Setting Warning Function



Hitch movement

If the watch stops, subsequent exposure to light allows the 'quick start' function to start again, and **the second hand moves with a hitch to indicate that the time incorrect.**

In this case, quickly recharge the watch and reset the time.

Even if the secondary battery is fully recharged, the hitch movement will continue, unless the time is reset and the crown is returned to the normal position.

■ Overcharging Prevention Function

Once the secondary battery is fully recharged, the overcharging prevention feature comes into operation and prevents overcharging.

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. E030/E010/E000>

Illuminance (lux)	Environment	Time required		
		From the stop state to the one second movement	One day usage	Empty to full
500	Inside an ordinary office	41 hours	2 hours	460 hours
1000	60–70cm (24-28in.) under a fluorescent light (30W)	20 hours	1 hour	220 hours
3000	20cm (8in.) under a fluorescent light (30W)	6 hours 30 minutes	19 minutes	72 hours
10000	Exterior, cloudy	2 hours	6 minutes	22 hours
100000	Exterior, summer, sunny	26 minutes	3 minutes	11 hours

<Cal. E110/E100>

Illuminance (lux)	Environment	Time required		
		From the stop state to the one second movement	One day usage	Empty to full
500	Inside an ordinary office	26 hours	1 hour 20 minutes	290 hours
1000	60–70cm (24-28in.) under a fluorescent light (30W)	13 hours	40 minutes	140 hours
3000	20cm (8in.) under a fluorescent light (30W)	4 hours	15 minutes	46 hours
10000	Exterior, cloudy	1 hour 20 minutes	4 minutes	14 hours
100000	Exterior, summer, sunny	20 minutes	2 minutes	7 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 recharging at high temperatures (over about 60°C/140°F), otherwise the watch will be damaged during recharging.

(eg) Charging the watch near a light source that easily becomes hot, such as an incandescent lamp or a halogen lamp.
Charging in a place that easily becomes hot, such as a dashboard.

When you charge the watch by an incondescent lamp, take a distance about 50cm (20in.) from the light source to prevent extremely 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.

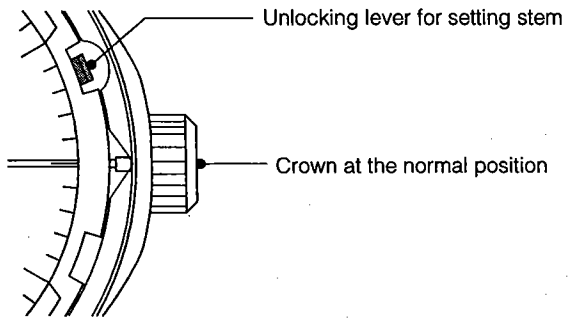
The watch structure is so designed that a different kind of battery other than the specified cannot be used to operate it. In case a different kind of battery such as a silver battery is used by some chance, there is a danger that the watch will be overcharged to burst, causing damage to the watch and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

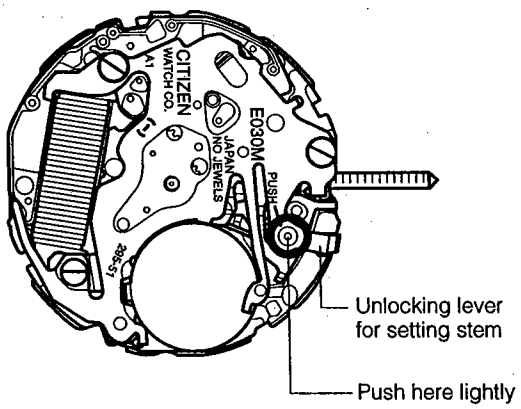
(2) Lightly press the end of the unlocking lever for setting stem with a screwdriver, etc. from above.

(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>

(1) Set the crown at the normal position (Push it in).

(2) Lightly press the base of the unlocking lever for setting stem ("PUSH →" position) with a screwdriver, etc. from above.

(3) With the lever pressed, pull out the setting stem.

B. Precautions for Removal and Setting of Solar Cell

1. Precautions for handling of solar cell

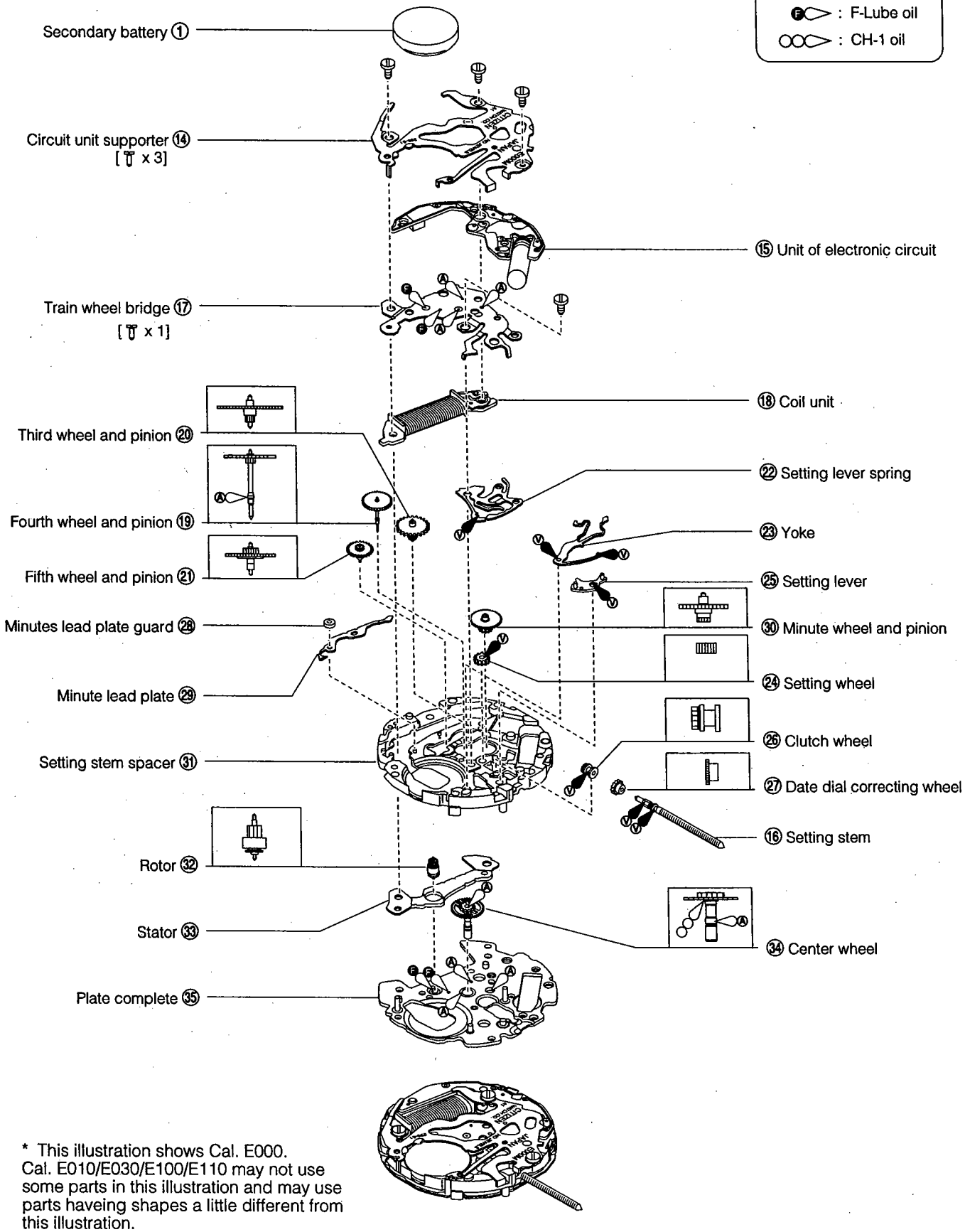
- If the top of the solar cell is damaged, its charging capacity and other functions are lowered. Accordingly, sufficiently take care not to damage the top of the solar cell when removing and setting it.
- If the electrodes are stained or flaked off, a continuity trouble occurs. Since it is difficult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

§6. DISASSEMBLY AND ASSEMBLY OF MOVEMENT

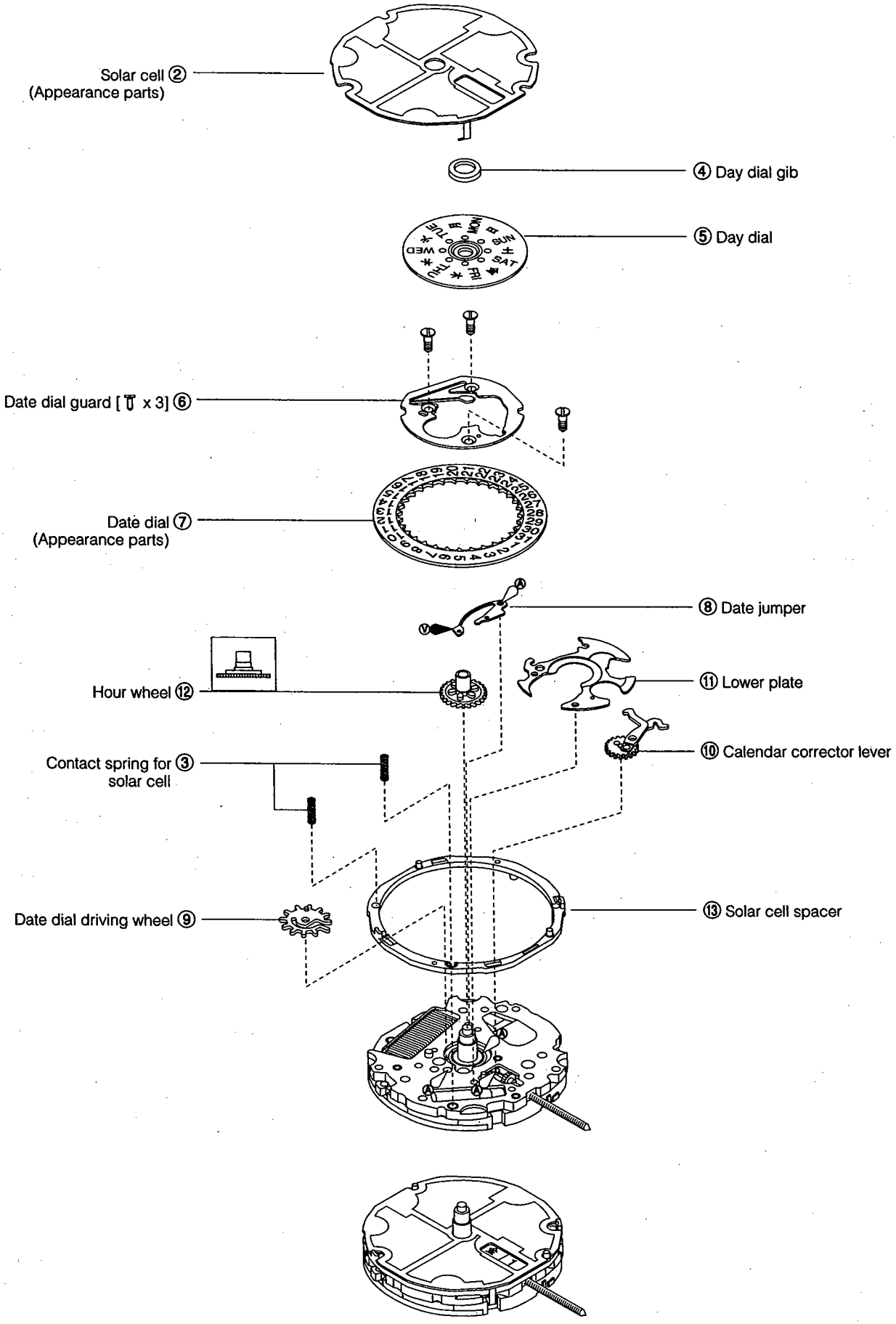
Disassembly procedure: ① → ㉟
Assembly procedure: ㉟ → ①

● Lubrication mark

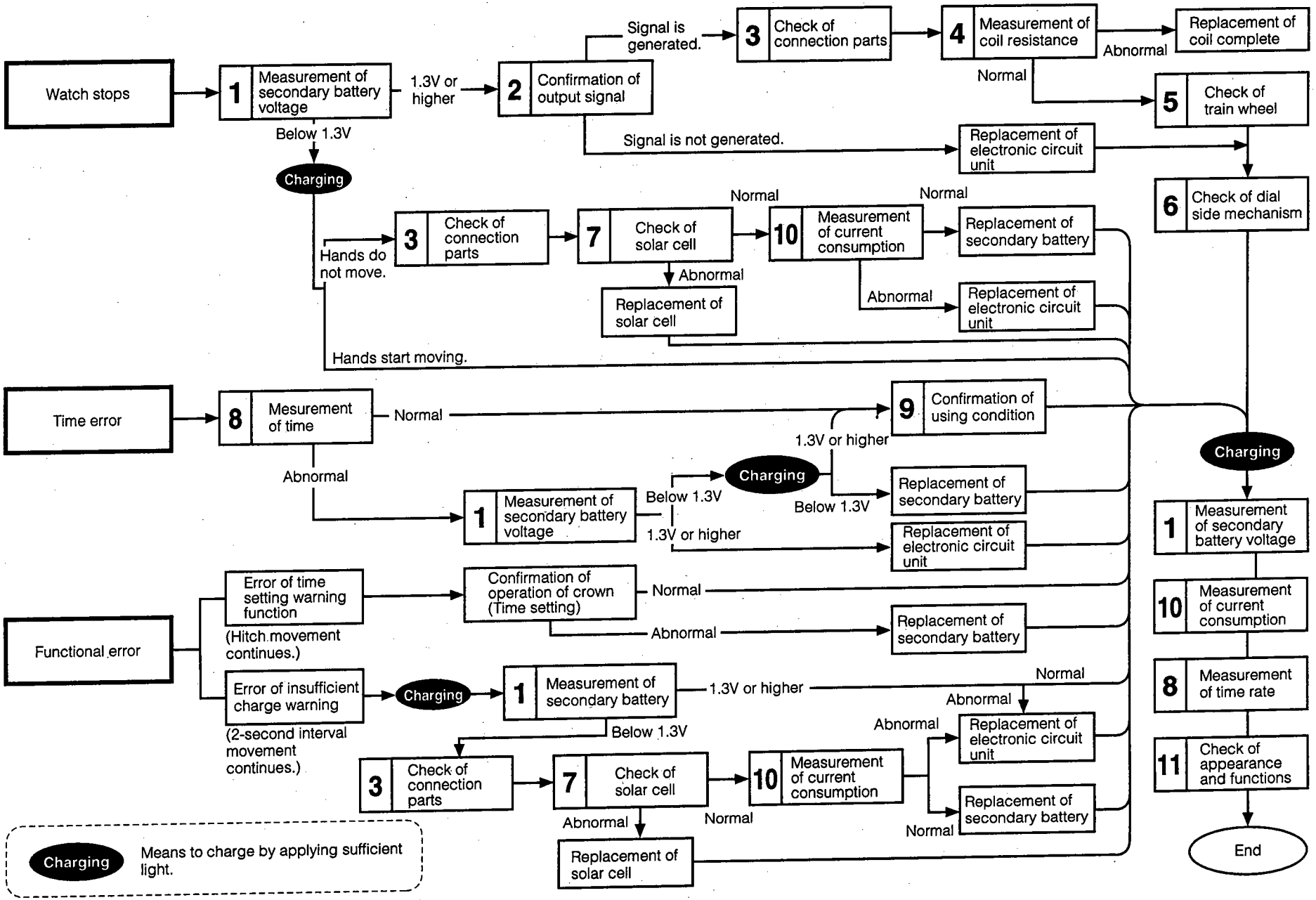
Ⓐ : A-Lube oil
Ⓥ : V-Lube oil
Ⓕ : F-Lube oil
CH-1 oil

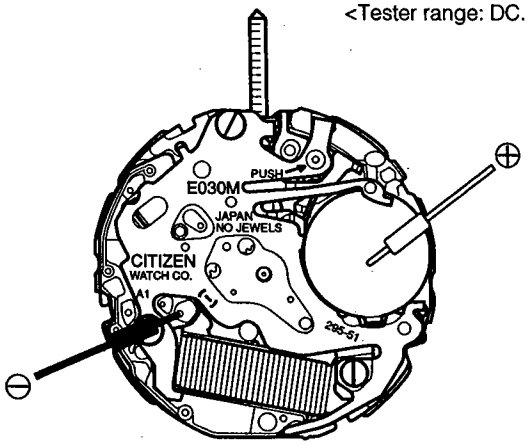
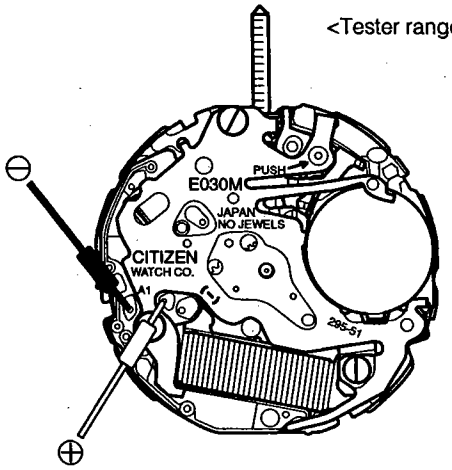


* This illustration shows Cal. E000. Cal. E010/E030/E100/E110 may not use some parts in this illustration and may use parts haveing shapes a little different from this illustration.

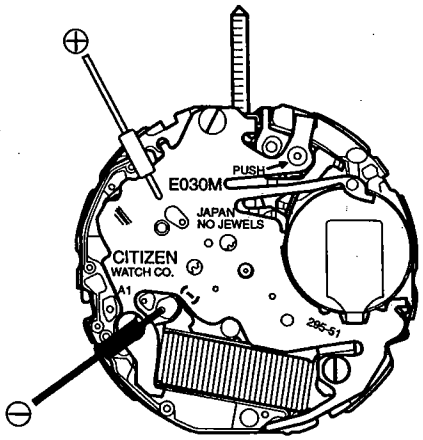

Solar cell ②
(Appearance parts)
④ Day dial gib
⑤ Day dial
Date dial guard [x 3] ⑥
Date dial ⑦
(Appearance parts)
⑧ Date jumper
Hour wheel ⑫
⑪ Lower plate
⑩ Calendar corrector lever
Contact spring for ③
solar cell
Date dial driving wheel ⑨
⑬ Solar cell spacer

§7. TROUBLESHOOTING AND ADJUSTMENT



Check Items	How to Check	Results and Treatments
❶ Measurement of secondary battery voltage	<Tester range: DC. 3V>  Reference: • 0.9V ~ 1.3V: Two-second interval movement mode 1.3V ~ 2.6V: One-second interval movement mode These voltages may vary slightly from watch to watch. • Hitch movement is a function that signals that the watch has stopped and restarted. This mode will continue until the watch is set to the correct time, irrespective of the voltage. • A quick-start is activated by the small-capacity tantalum capacitor which has been incorporated in the circuit, in addition to the primay 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. **Note:** When measuring the voltage, be careful not to place the ⊖ tester pin on the secondary battery strap (a short circuit will occur.)	
❷ Comfirmation of output signal	* Refer to Technical Manual, Basic Course: II-1-b. <Tester range: DC. 0.3V>  <The tester lead pins have no polarity> • In the 1-second interval movement mode, the tester pointer should moves to the right and left every 1 second. • In the 2-second interval movement or hitch movement mode, the test pointer moves in only one direction every 2 seconds.	• Tester pointer swings. → Normal. • Tester pointer does not swing. → Check connections. ⇩ • Connections are normal. → Replace the electronic circuit.

Check Items	How to Check	Results and Treatments
❸ Check of connection parts	* Refer to Technical Manual, Basic Course: II-2-a. • Check for looseness of screws, dust, stain, etc. • 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.	Stain of solar cell pattern and curcuit pattern. → Remove stain. Removal of solar cell pattern, removal of circuit pattern, removal of welded lead plate of secondary battery. → Replace parts.
❹ Measurement of coil resistance	* Refer to Technical Manual, Basic Course: II-1-c. • Remove the unit of electronic circuit and measure the coil resistance <Tester range: R x 10Ω> <The tester lead pins have no polarity>	• **1.9 kΩ - 2.4 kΩ** → Normal • Out of above range → Replace coil unit
❺ Check of train wheel	* Refer to Basic Course: II-2-b.	
❻ Check of dial side mechanism	* Refer to Basic Course: II-2-c.	
❼ Check of solar cell	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). • Check the solar cell for breakage and stain, and check its electrode for stain and flaking.	• Second hand starts moving. → Normal. • Second hand does not move. → Check connecting parts. ⇩ • Connecting parts are normal. → Replace solar cell. • Breakage of solar cell → Replace solar cell. • Stain → Remove stain. • Flaking of electrode → Replace solar cell.
❽ Measurement of time rate	* Refer to Basic Course: II-2-d. <Measurement gate: Analog 10 sec> • The time rate cannot be adjusted. • 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.	• The watch loses or gains substantial time → Replace the unit of electronic circuit

Check Items	How to Check	Results and Treatments
❾ Confirmation of using condition	* Refer to Basic Course: II-2-e. • 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) 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. Example: When the watch is hidden under a long sleeve or the customer works in a dark place, it needs to be exposed to light on purpose. • It is important to check that the secondary battery block is charged normally (the customer knows that this watch is a solar watch) and expain the correct charging method to the customer.	
❿ Measurement of current consumption	* Refer to Technical Manual, Basic Course: II-1-f. • 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. (1) Remove the secondary battery. (2) Referring to Technical Manual, Basic Course, set the silver battery (1.55V) to the adapter of the tester correctly. (3) Pull the crown out. (4) Set the tester.  <Tester range: DC 10μA> (5) Return the crown to the normal position and measure the current consumption of the movement. **Note:** 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.	• Current consumption of the movement **Under 0.8μA** → Normal **Over 0.8μA** → Check train wheel and dial-side mechanism. → Remove dust and dirt. ⇩ • Current consumption measured again **Over 0.8μA** → Replace the unit of electronic circuit.

Check Items	How to Check	Results and Treatments
⓫ Check of appearance and function	* Refer to Basic Course: II-2-f.	