

# ***TECHNICAL INFORMATION***

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**CITIZEN QUARTZ**

**Cal. No. A71※**

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## §1. OUTLINE

This watch is a thin, solar-powered watch equipped with a solar cell incorporated in its face that converts any light energy into electrical energy to drive the watch. In addition to this watch being highly accurate, realizing an accuracy of approximately  $\pm 10$  seconds per year, it is also provided with a calendar (date) function and time difference correction function.

## §2. SPECIFICATIONS

Caliber No.		<b>A71※A</b>
Type		Thin-type solar powered watch
Module size		$\phi 30.5 \times 3.0t$
Accuracy (At normal temperature)		Within $\pm 10$ seconds per year (moving at 1 sec. intervals) (when kept at normal temperatures of 5~35°C (41~95°F))
Oscillation		32768Hz
IC		1 unit of C/MOS-LSI
Operation temperature		-10°C ~ +60°C (14°F ~ 140°F)
Converter		Bipolar step motor
Time adjustment		D.F.C (No adjustment terminal for use in market)
Measurement gate		10 sec
Additional functions	Time difference correction feature	Installed
	Quick start feature	Installed
	Insufficient recharging warning feature	Installed
	Time setting warning feature	Installed
	Overcharging prevention feature	Installed
Secondary battery used	Part No.	295-40
	Continuous operating time	Approx. 5 months (from full recharge to stop) Approx. 2 days (from two second interval movement to stop)

### §3. BEFORE USING

#### Place in light before use to sufficiently recharge

A secondary battery is used in this watch to store electrical energy.

This secondary battery is a clean energy battery that does not contain mercury or other toxic substances. Once fully charged, the watch will continue to run for about 5 months without additional charging.

#### <How to Use this Solar Watch Properly>

To use this watch comfortably, make sure to recharge the watch before it stops running completely. Since there is no risk of overcharging (Overcharging Prevention Feature), it is recommended that the watch be recharged everyday.

#### <Notes no recharging>

- Avoid recharging at high temperatures (over about 60°C/140°F), otherwise the watch will be damaged.

(e.g.) 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.

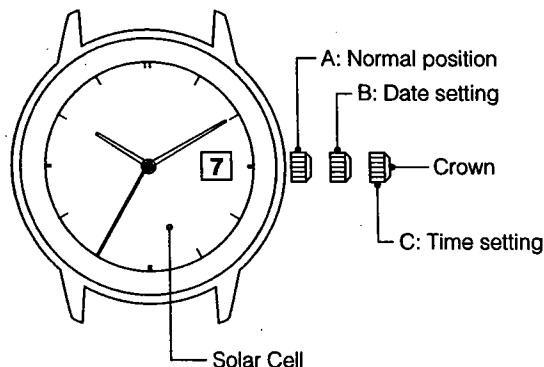
When you charge the watch by an incandescent lamp, select a distance about 50 cm (20 in.) from the light source to prevent extremely high temperature.

#### <Replacing the secondary battery>

**Unlike ordinary batteries, the secondary battery used in this watch doesn't have to be periodically replaced due to repeated charging and discharging.**

### §4. SETTING THE TIME AND CALENDAR

In the case of a screw lock-type crown, release the crown screw lock first.



#### <Setting the Time>

1. Pull the crown out to position ③ so that the second hand stops at the 0 second position.
2. Turn the crown to set the time.
3. Make sure to return the crown to its normal position ① simultaneously with a time signal.

#### <Setting the date>

1. Pull the crown out to position ②.
2. Turn the crown to set the date by moving the hour hand in the clockwise direction.

- The calendar changes at 12:00 midnight. Pay attention to morning and afternoon when setting the calendar.
  - The calendar will also move backwards (enabling corrections to be made in the counterclockwise direction for 1 previous day) when the hour hand is turned in the counterclockwise direction. When turning the hour hand in the counterclockwise direction, the calendar will change at around 9:30 PM.
  - When the crown is in position ②, only the hour hand moves when the crown is turned.
3. Set the hour hand to the current time and return the crown to position ①.

## §5. TIME DIFFERENCE CORRECTION FEATURE

Time differences can be corrected in 1 hour units.

1. Pull the crown out to position **(B)**.
2. Turn the crown to correct the time difference.
  - Since the calendar is linked with the hour hand, the calendar may also change with movement of the hour hand depending on the time at which the time difference is corrected.
  - When correcting the time difference, pay attention to whether it is morning or afternoon as well as to the calendar when setting the time.
3. Return the crown to position **(A)**.

- Do not use the time difference correction feature when the second hand is moving in two second intervals indicating that the watch is insufficiently charged. First charge the watch by placing in the light and then use the time difference correction feature after the second hand has returned to one second interval movement.

**<Universal Time Coordinated (UTC) has become the standard for time difference of major cities throughout the world (as of 1997).>**

City	Time difference	Summer-time	City	Time difference	Summer-time	City	Time difference	Summer-time
London	±0	O	Bangkok	+7	X	Anchorage	-9	O
Paris	+1	O	Hong Kong	+8	X	Los Angeles	-8	O
Cairo	+2	O	Tokyo	+9	X	Denver	-7	O
Moscow	+3	O	Sydney	+10	O	Chicago	-6	O
Dubai	+4	X	Noumea	+11	X	New York	-5	O
Karachi	+5	X	Auckland	+12	O	Caracas	-4	X
Dacca	+6	X	Honolulu	-10	X	Rio De Janeiro	-3	O

★ Cities (areas) using summertime are indicated with a O, cities (areas) not using summertime are indicated with an X.

★ The time difference and summertime for each country may change at that, country's discretion.

## §6. ACCURACY

### <Watch accuracy>

The accuracy of this watch is within ±10 seconds per year. The accuracy of your watch will be maintained when it is used at normal temperatures (5~35°C/41~95°F) and worn approximately 12 hours per day.

When used under conditions other than those indicated above, the accuracy of the watch may decrease slightly.

### <Monthly Error>

The monthly error of your watch cannot simply be calculated by dividing the annual error of ±10 seconds by 12. The monthly error may be ±2 seconds (annual error: ±10 seconds) depending on the conditions of use (seasonal temperature changes, amount of time the watch is worn and other factors).

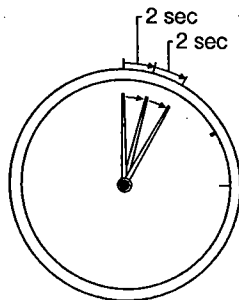
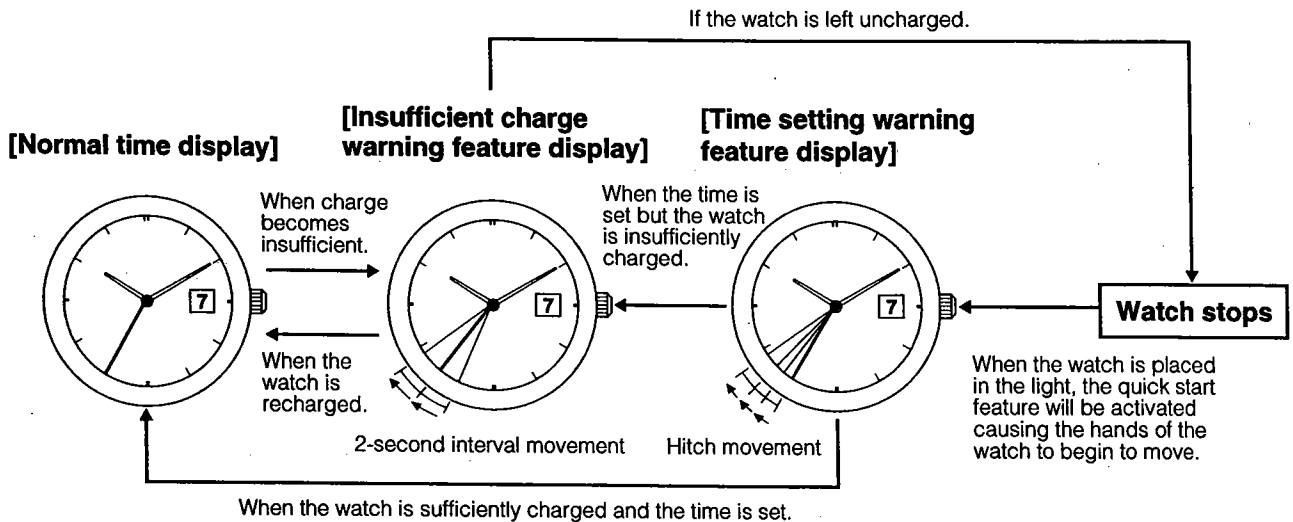
### <Check of time rate>

Measure the time rate and check it with the following rough standard to see if it is abnormal.

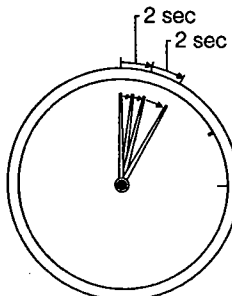
- Yearly error:  $\pm 10$  seconds .....  $\pm 0.028$  seconds/day maximum ( $24^{\circ}\text{C} \pm 0.5^{\circ}\text{C}$ ).
- \* The time rate test has its own accuracy and the measured values are dispersed as the difference of the temperature at measurement from  $24^{\circ}\text{C}$  is increased.
- \* Use a time rate tester which can measure to 1/1000 seconds.

## §7. SPECIAL FUNCTIONS OF SOLAR-POWERED WATCHES

This watch is provided with a feature that causes a warning function to be activated when the watch is insufficiently charged which then alters the display to inform the wearer of an insufficient charge.



Two-second interval movement



Hitch movement

### Insufficient Charge Warning Feature

The second hand changes to two-second interval movement to inform the wearer of an insufficient charge. Although the watch will keep the correct time when this happens, the watch will stop if two-second interval movement continues for about 2 days. Place the watch in light to recharge. The watch will return to one-second interval movement.

### Time Setting Warning Feature

Although the watch hands will begin to move when the quick start feature is activated, after the watch has stopped, the second hand moves with a hitch movement to indicate that the displayed time is incorrect. When this happens, fully recharge the watch and reset the time. The second hand will continue to move with a hitch movement until the time is reset.

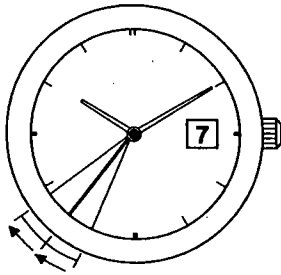
### Quick Start Feature

The watch will stop when it is completely discharged. When placed in light, the hands will begin to move after about 10 seconds. (The time until the hands begin to move varies according to the model and brightness of the light.) Please note that if the light is blocked, the watch may stop again as a result of being insufficiently charged.

### Overcharging Prevention Feature

When the secondary battery is fully charged, the overcharging prevention feature is activated to prevent further charging. This enables the wearer to recharge without risk of damage to the watch.

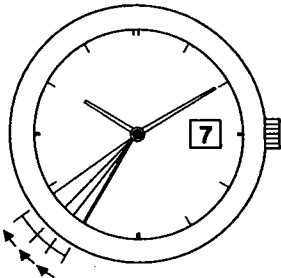
## §8. HELPFUL HINTS



2-second interval movement

### <The second hand is moving in two-second interval movement>

This indicates that the insufficient charge warning feature has been activated. When this happens, recharge the watch promptly so that it returns to one-second interval movement.



Hitch movement

### <The second hand is moving with a hitch movement>

This indicates that the time setting warning feature has been activated. Recharge the watch sufficiently and reset it to the correct time.

## §9. CHARGING TIMES

The time required for charging varies according to the model of watch (color of the watch face, etc.). The following table provides a general reference for determining charging times.

Illuminance (lux)	Environment	Charging Time		
		For one day's use	After stopping until one-second movement	For full charge
500	Interior lamp	1 hour 10 min.	25 hours	215 hours
1,000	60~70cm (24~28 in.) away from fluorescent desk lamp (30W)	35 min.	12 hours	105 hours
3,000	20 cm (8 in.) away from fluorescent desk lamp (30W)	15 min.	4 hours	34 hours
10,000	Outside, cloudy conditions	4 min.	1 hour 10 min.	11 hours
100,000	Outside, sunny conditions	2 min.	25 min.	3 hours

- \* Time required for full charge: Time from the state in which the watch has stopped until fully charged.
- \* Time required for one day's use: Time required for the watch to run at one-second intervals for one day.

### <Notes on recharging>

- Avoid recharging at high temperatures (over about 60°C/140°F), otherwise the watch will be damaged.  
(e.g.) 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.

## §10. REPLACING THE SECONDARY BATTERY

**Unlike ordinary batteries, the secondary battery used in this watch doesn't have to be periodically replaced due to repeated charging and discharging.**

### Caution

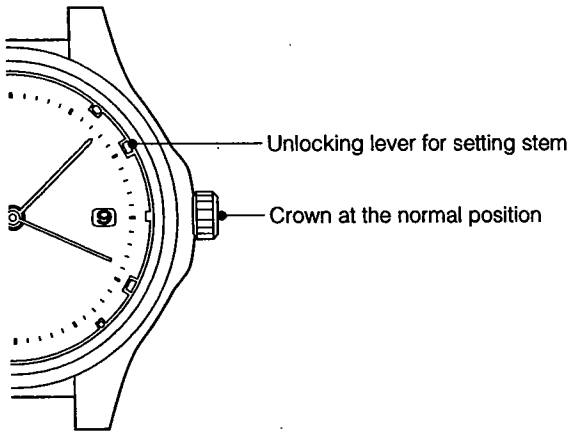
- Never use another battery different from the secondary battery used in this watch.
- The watch structure is so designed that a different kind of battery other than that specified cannot be used to operate it. In case a different kind of battery such as a silver oxide battery is used, there is a danger that it will be overcharged and burst, causing damage to the watch and even to the wearer and other people.
- When you replace the secondary battery, be sure to use a designated secondary battery. (Titanium lithium ion battery/component number 295-40)



## §11. HOW TO PULL OUT SETTING STEM FROM ONE-PIECE CASE (CAL. A715)

### 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.

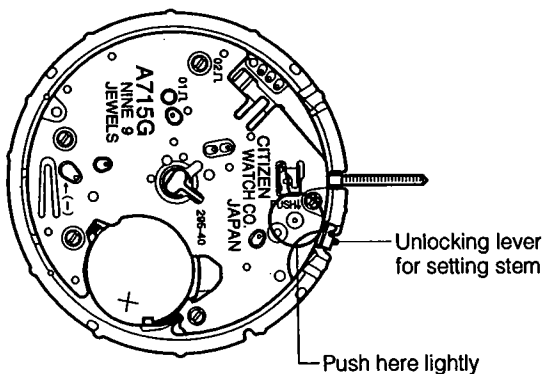
### 2. When removing the setting stem from the movement

- 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.

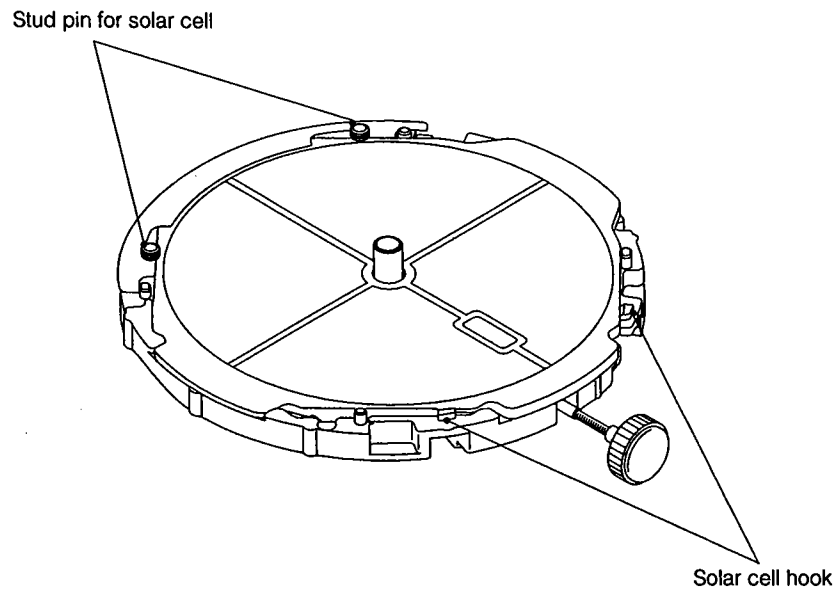
If the movement is installed to the case with any part deformed, the setting stem may not be pulled out even if the unlocking lever for setting stem is pressed.



#### <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.

## §12. HOW TO REMOVE AND INSTALL SOLAR CELL



### <How to remove solar cell>

1. Remove the "stud pins for solar cell" with the hands remover (2 places).
  - Do not touch the top of the "solar cell".
2. Remove the "solar cell" from the solar cell hooks.

### <How to install solar cell>

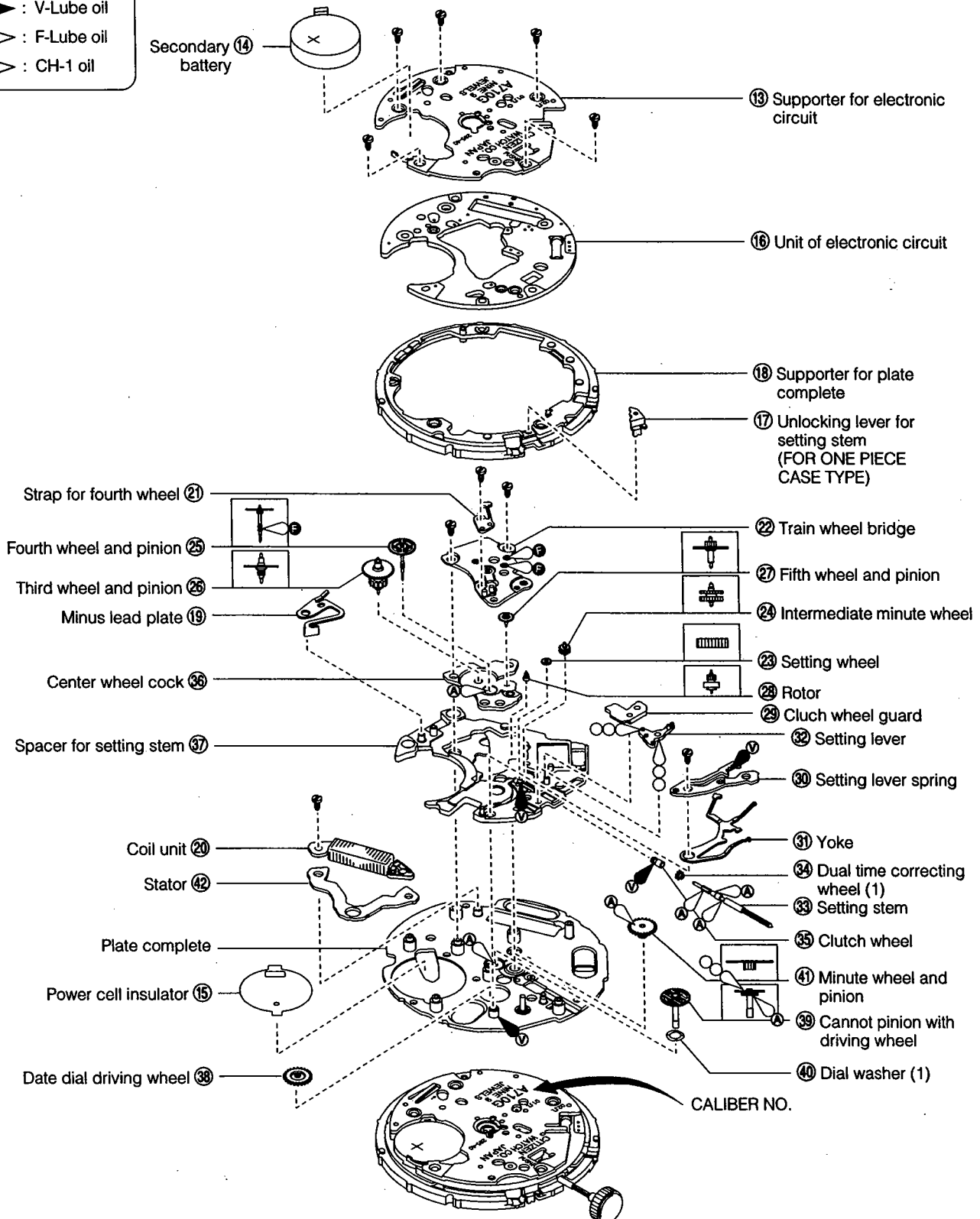
1. Hook the "solar cell" on the solar cell hook.
2. Fit the "stud pin for solar cell".
  - Press the pin in with a flat thing such as the back of tweezers, etc.
3. Conform that the "stud pin for solar cell" is securing the top of the solar cell.

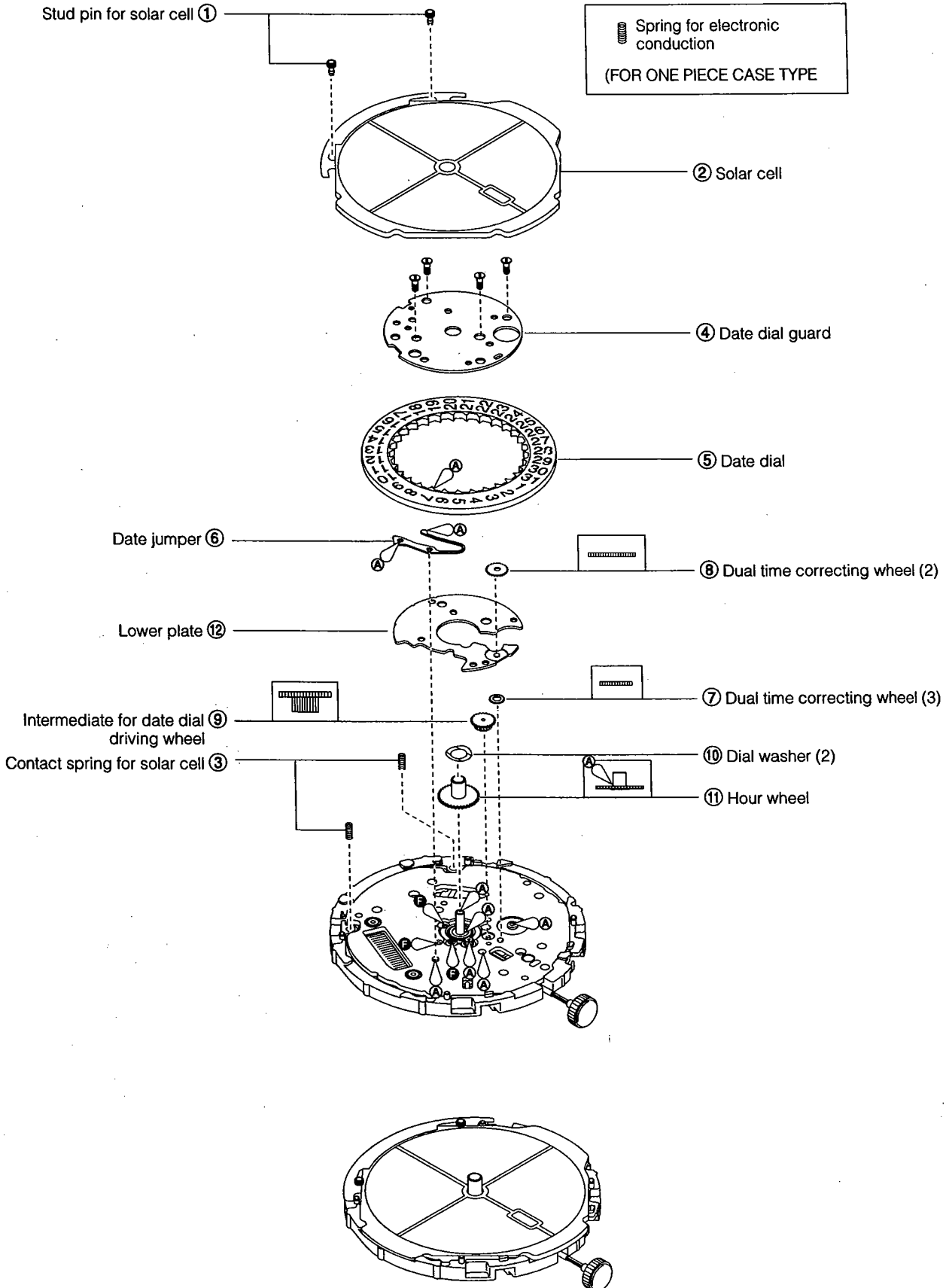
# §13. DISASSEMBLY AND ASSEMBLY OF MODULE

Disassembly procedure: ① → ④②  
 Assembly procedure: ④② → ①

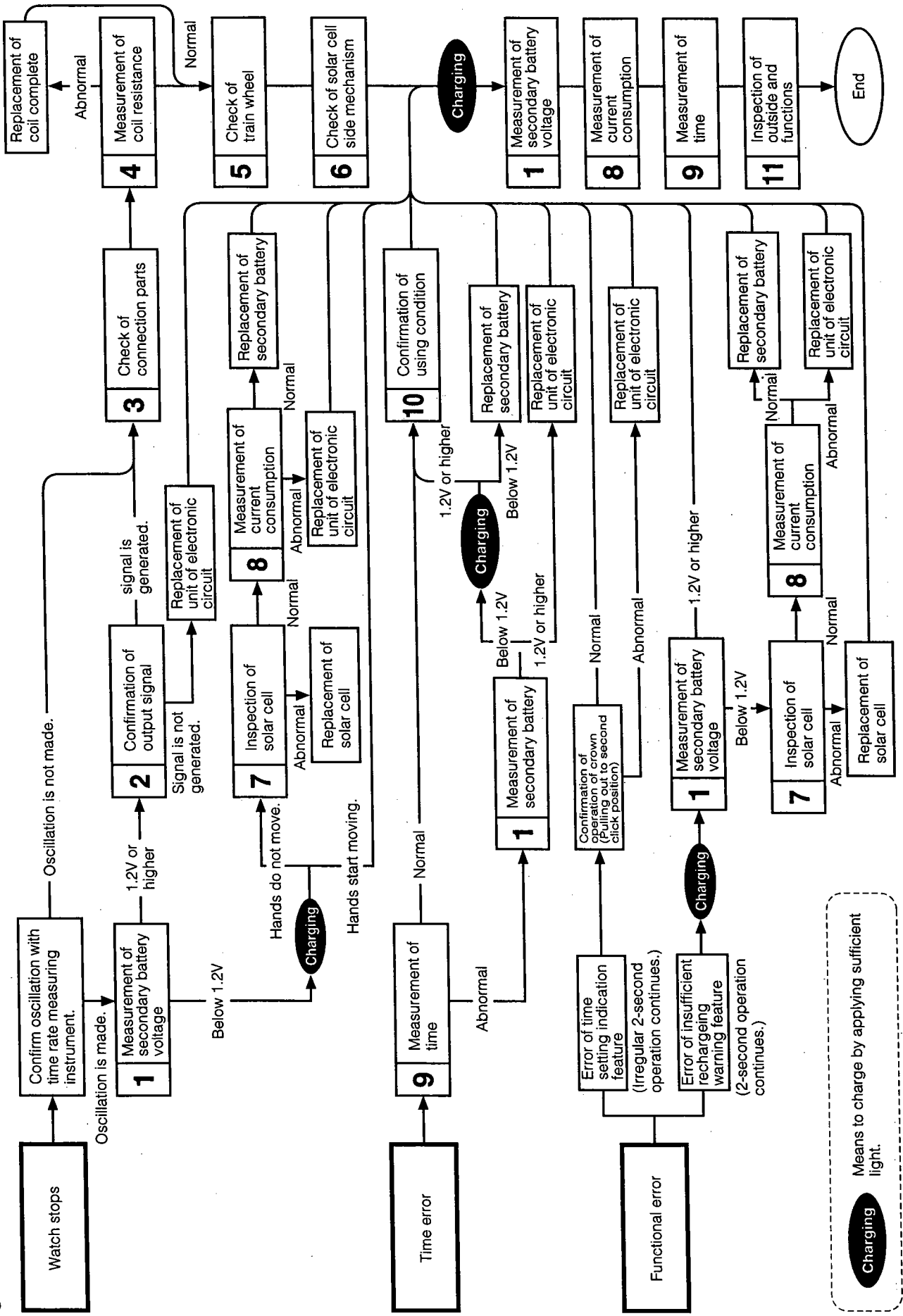
● Lubrication mark

- Ⓐ : A-Lube oil
- ∇ : V-Lube oil
- Ⓣ : F-Lube oil
- ⊖ : CH-1 oil

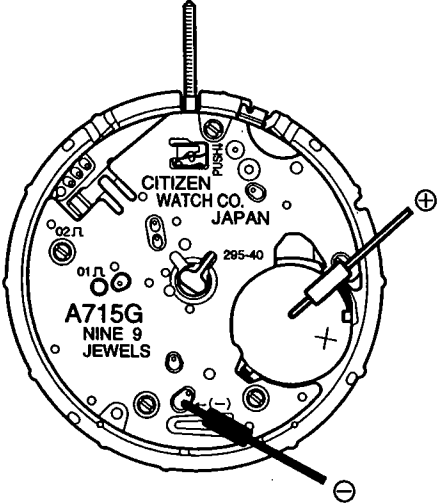


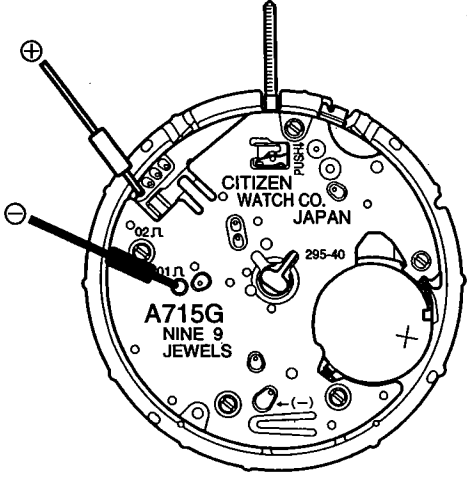


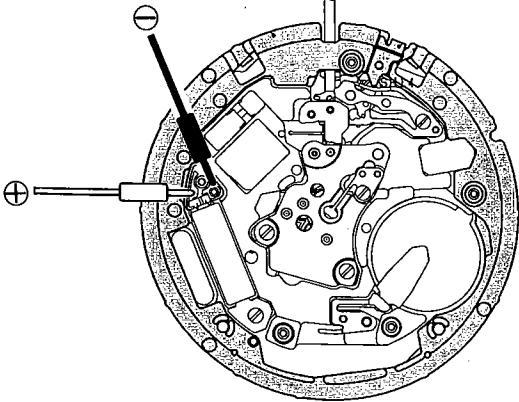
# §14. TROUBLESHOOTING AND ADJUSTMENT METHOD



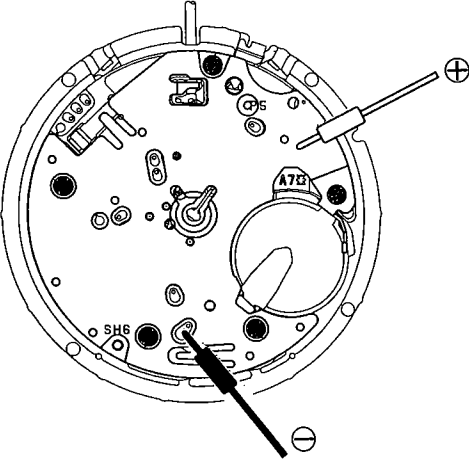
**Charging** Means to charge by applying sufficient light.

Check Items	How to Check	Result and Treatment
<p>① 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>● 0.9V~1.2V: Two-second step running mode</li> <li>1.2V~2.6V: One-second step running mode</li> <li>● Irregular two-second step running 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.</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 capacitor. 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>Caution:</b> When measuring the voltage, be careful not to place the ⊖ tester pin on the supporter for electronic circuit (a short circuit will occur).</p> </div>	

Check Items	How to Check	Result and Treatment
<p>② Confirmation of output signal</p>	<p>* Refer to Technical Manual, Basic Course: II-1-b. &lt;Tester range: DCV. 0.3V&gt;</p>  <ul style="list-style-type: none"> <li>● In the 1-second operation mode, the tester pointer should moves to the right left every 1 second.</li> <li>● In the 2-second operation or irregular 2-second operation mode, the test pointer moves in only one direction every 2 seconds.</li> </ul>	<p>Tester pointer does not move → Check connection parts.</p> <p style="text-align: center;">↓</p> <p>Connection parts are normal → Replace of electronic circuit unit.</p>
<p>③ Check of connection parts</p>	<p>* Refer to Technical Manual, Basic Course: II-2-a.</p> <ul style="list-style-type: none"> <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>

Check Items	How to Check	Result and Treatment
<p>④ Measurement of coil resistance</p>	<p>* For the setting method of the tester, see Basic Course: II-1-c.</p> <ul style="list-style-type: none"> <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 style="text-align: center;">&lt;The tester lead pins have no polarity&gt;</p>	<p>2.5 ~ 2.9kΩ → Normal</p> <p>Out of range of 2.5 ~ 2.9kΩ → Replace coil unit.</p>
<p>⑤ Check of train wheel</p>	<p>* Refer to Basic Course: II-2-b.</p>	
<p>⑥ Check of solar cell side mechanism</p>	<p>* Refer to Basic Course: II-2-c.</p>	
<p>⑦ Check of solar cell</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>	<p>Breakage of solar cell → Replace solar cell.</p> <p>Stain → Remove stain.</p> <p>Flaking of electrode → Replace solar cell.</p>



Check Items	How to Check	Result and Treatment
<p>⑧ Measurement of current consumption</p>	<p>* Refer to Basic Course: II-1-f.</p> <p>This watch uses a secondary battery instead of a battery. Accordingly, prepare a silver battery (1.50V or higher), then measure the current consumption according to the following procedure.</p> <ol style="list-style-type: none"> <li>(1) Remove the secondary battery.</li> <li>(2) Pull out the crown to the second click.</li> <li>(3) Referring to Technical Manual, Basic Course, set the silver battery (1.55V) to the tester adapter.</li> <li>(4) Set the tester. (Apply the test pins ⊕ and ⊖ to the patterns of the electronic circuit unit.)</li> <li>(5) Return the crown to its normal position. (The tester indicates a high value at first. Wait until the tester pointer is stabilized, then start measurement.)</li> </ol> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <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> <p style="text-align: right;">&lt;Tester range: DC 10μA&gt;</p> 	<p>Current consumption by module</p> <p><b>Below 1.4μA</b> → Good</p> <p><b>1.4μA or higher</b> → Measure unit of electronic circuit.</p> <p>Measurement of unit of electronic circuit.</p> <p><b>Below 0.3μA</b> → Good</p> <p><b>0.3μA or higher</b> → Replace unit of electronic circuit.</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>Current consumption by module is high but that by electronic circuit unit is low → A part other than circuit seems to have a trouble. Check for stain, bad lubrication, deformation of parts, and remove causes of load.</p> </div>

Check Items	How to Check	Result and Treatment
<p>⑨ Measurement of time</p>	<p>* Refer to Basic Course: II-2-d.</p> <ul style="list-style-type: none"> <li>● Since DF measurement is applied, measure in the 10-second range. The time rate cannot be adjusted, however. The time rate may not be measured accurately in the 2-second operation or irregular 2-second operation. In this case, apply light to the watch until the second hand moves in the 1-second operation mode, then measure the time rate.</li> </ul>	
<p>⑩ Confirmation of using condition</p>	<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) 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> </ul> <p>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.</p>	
<p>⑪ Inspection of outside and functions</p>	<p>* Refer to Basic Course: II-2-f.</p>	