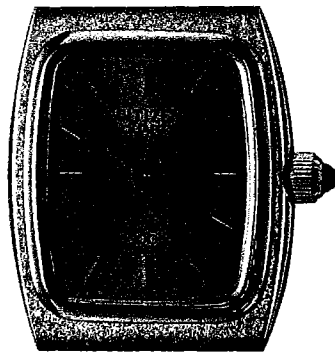


# *TECHNICAL INFORMATION*

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**CITIZEN QUARTZ**

**Cal. No. 442※**



 **CITIZEN**

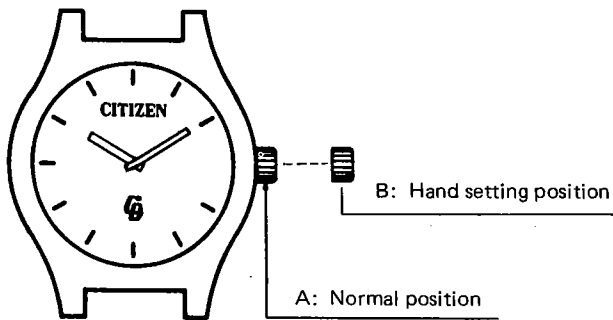
## ■1. OUTLINE

The products are thin, women's analog quartz watches without a second hand, which have been developed as really high-grade models.

## ■2. SPECIFICATIONS

Caliber No.		4420E-07	4421E-7
Type		Analog quartz watch (Without a second hand)	←
Module size (mm)		φ14.0 x 9.2 x 13.2 Thickness: 1.42 (Including the power cell section)	← Thickness: 1.25 (Including the power cell section)
Accuracy		±15 sec./month at normal temp.	←
Oscillation		32,768 Hz	←
Integrated circuit		C/MOS•LSI (1 unit)	←
Effective temp. range		-10°C ~ +60°C (14°F ~ 140°F)	←
Converter		Bipolar step motor	←
Time rate adjustment		DFC (Without adjustment terminal)	←
Time rate measurement		10 seconds	←
Hand running mode		20-second step running of hands	←
Additional function		Reset switch	←
Power cell	Part No.	280-68	280-69
	Cell code	SR512SW (φ5.8 x 1.2)	SR510SW (φ5.8 x 1.0)
	Voltage	1.55V	←
	Capacity	5.5mAH	4.3mAH
	Lifetime	Approx. 2 years	←
Coil resistance		1.7 ~ 2.1 kΩ	←
Current consumption		Under 0.25 μA	←

### ■3. HANDLING INSTRUCTIONS



- The hands are set with the crown pulled out to the first click position, in the same manner as an ordinary analog watch.
- When the hands have been set to the correct time, be sure to push the crown back to the normal position.

**(Note)**

- This watch contains a resetting switch. When the crown is pulled out to the hand-setting position, the resetting switch functions under the control of the IC to stop the driving pulse and the hour and minute hands immediately stop.

The moment the crown is pushed back, the circuit starts counting and, because the watch has a function for compensating rotor phases, the hands begin to run normally after 20 seconds.

### ■4. DISASSEMBLING AND ASSEMBLING NOTES

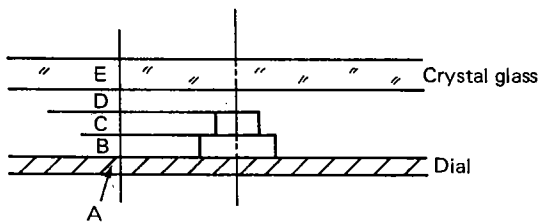
#### 1) Handling the Hour and Minute Hands

- This watch forms a pair with the thin Cal. 39 model for men and has been designed as a very thin watch.

When mounting or removing the hour and minute hands, take care not to deform the hands or the dial.

#### Thickness of each part and gap

(in microns ( $\mu$ ))



	CAL. 4420	CAL. 4421
A	300 t	100 t
B	300	200
C	200	150
D	250	150
E	Over 500	600
Module thickness	1,420	1,250
Hand thickness	100	50

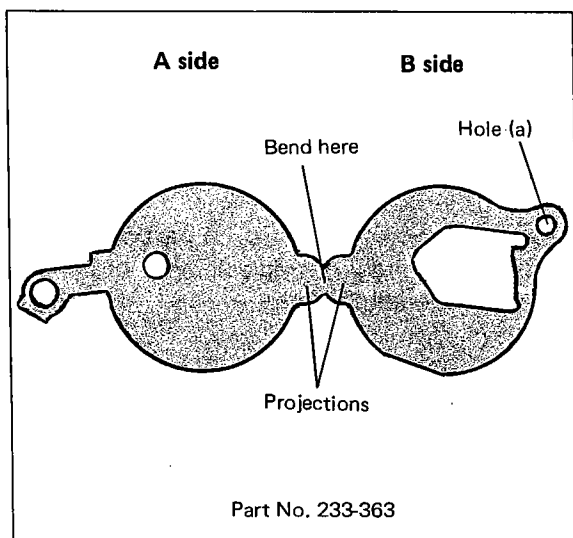
**(Note)** Since the hands of the Cal. 4421 are especially thin,  $50\mu$ , it is possible that they cannot be properly mounted once they are removed; therefore, in such cases it is recommended that they are replaced.

## 2) Mounting and removing the Setting Stem

- Remove or mount the setting stem while it is in the pushed-in condition (in the normal position).

## 3) Power Cell Insulator (Red)

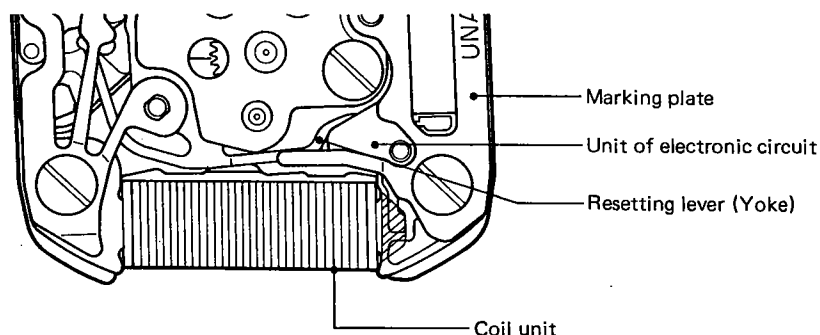
- The power cell insulator is of the bending-type.



- The side 'A' insulates the power cell (-) from the plate complete while the side 'B' insulates the power cell (+) from the power cell connector spring.

When replacing the power cell, make sure that the outer projections are correctly positioned in the retaining parts of the plate complete and hole (a) on side 'B' is properly set in the pin of the plate complete.

## 4) The Position of the Resetting Lever (Yoke: Part No. 071-99)



- The resetting lever is located under the electronic circuit unit, and, when the crown is pulled out, it comes into contact with the circuit pattern (resetting pattern), switching the watch to the resetting mode.
- Make sure that the resetting lever does not strike the circuit and is not deformed.

## 5) Fourth Wheel and Pinion

- The fourth wheel and pinion has a tooth form similar to that of a pinion. (This gear is for polishing the pivot).  
Be careful not to confuse this wheel with other wheels when mounting it.

## 6) Lubrication

- The upper and lower sides of the rotor should be lubricated with low-viscosity F lube.
- Lubricating oil for the center wheel and pinion should be applied to the zonal area at the end of the central axis of the train wheel bridge to prevent the oil from flowing out.

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### 7) Measurement of the Time Rate

- Measurements are made in a 10-second range with a quartz tester.
- This watch produces rate pulses and output pulses alternately at 10-second intervals.
- This watch has no terminal for adjusting the time rate. (Digital frequency control)

### 8) Low Reserve Power Design

- Since this watch is small and thin, it has been designed to consume only a small current and to have only a low level of reserve power.  
Therefore, excessive lubrication, use of incorrect lubricating oil or deformations in components will cause malfunctions and an increase in the value of the current consumed. Therefore, great care should be taken.  
The plate complete, the train wheel bridge and the dial washer ( $6\mu \sim 8\mu$ ) in particular are so thin that they are likely to be deformed if they are pressed strongly during assembly or hand mounting. It is necessary, therefore, to take special care when handling them.

### 9) Shortening the Length of the Setting Stem

- The thickness of the screw part of the setting stem is  $\phi 600$ .  
To prevent problems such as bending, it is recommended that the length-shortening work be carried out with the setting stem held with the fingers instead of using a tool (pin vice) to hold it fast.

### 10) Location of the Coil

- The coil is located in the 6H direction.  
To prevent damage to the coil when opening and closing the case back, confirm the position of the prying-open slit before setting to work.

Ex. JAPAN → 12

If the case back has the above mark, it means that the prying-open slit is located in the 12H direction.

## 5. DISASSEMBLY, ASSEMBLY AND LUBRICATION OF THE MODULE

Disassembling procedure : ① → ②⑤

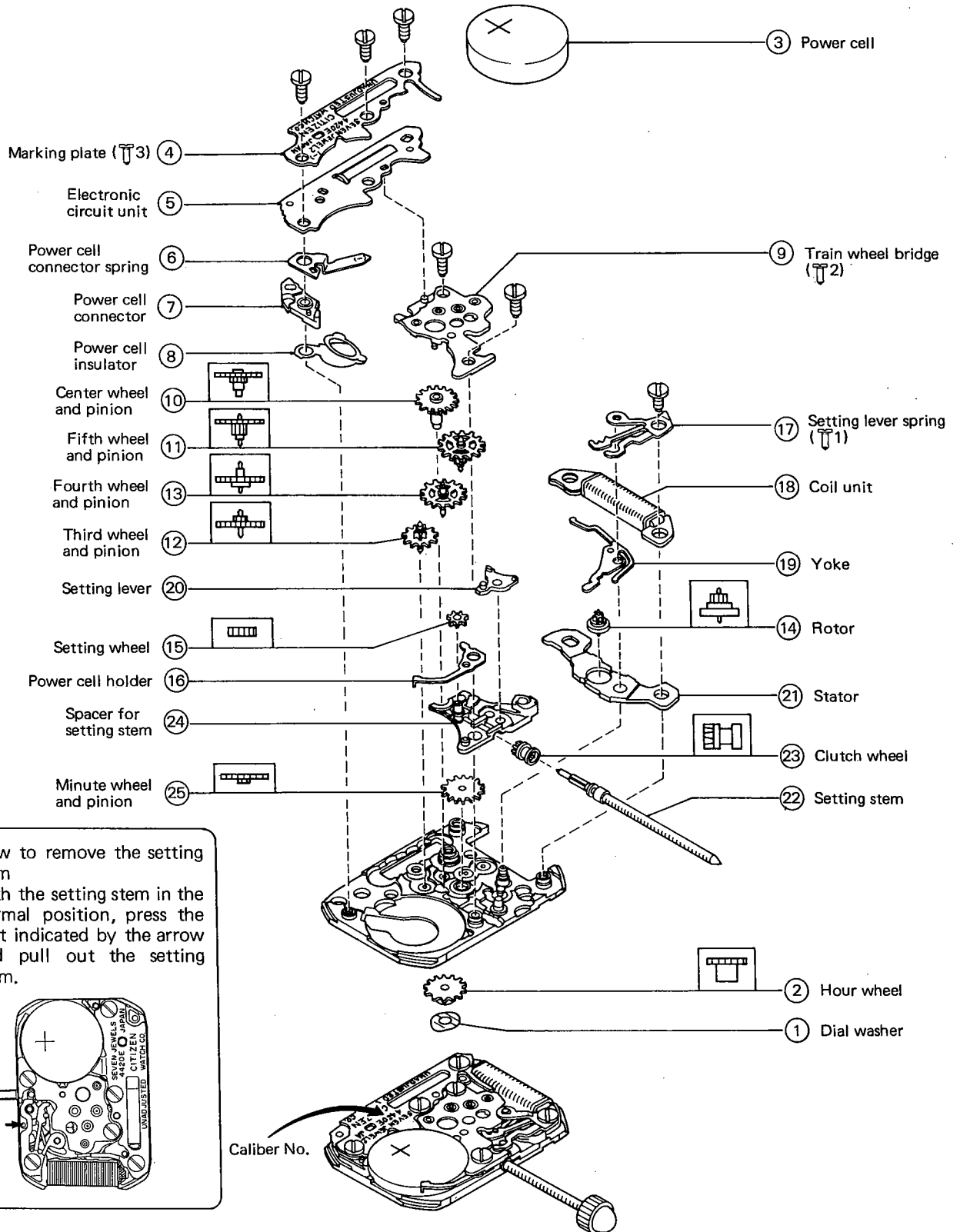
Assembling procedure: : ②⑤ → ①

● Lubrication markings

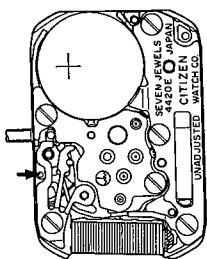
⊙ A lube

⊙ F lube

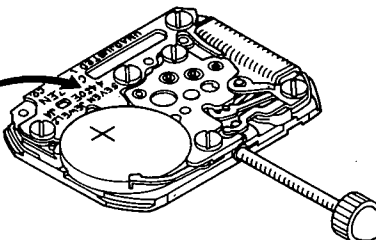
⊙ V lube



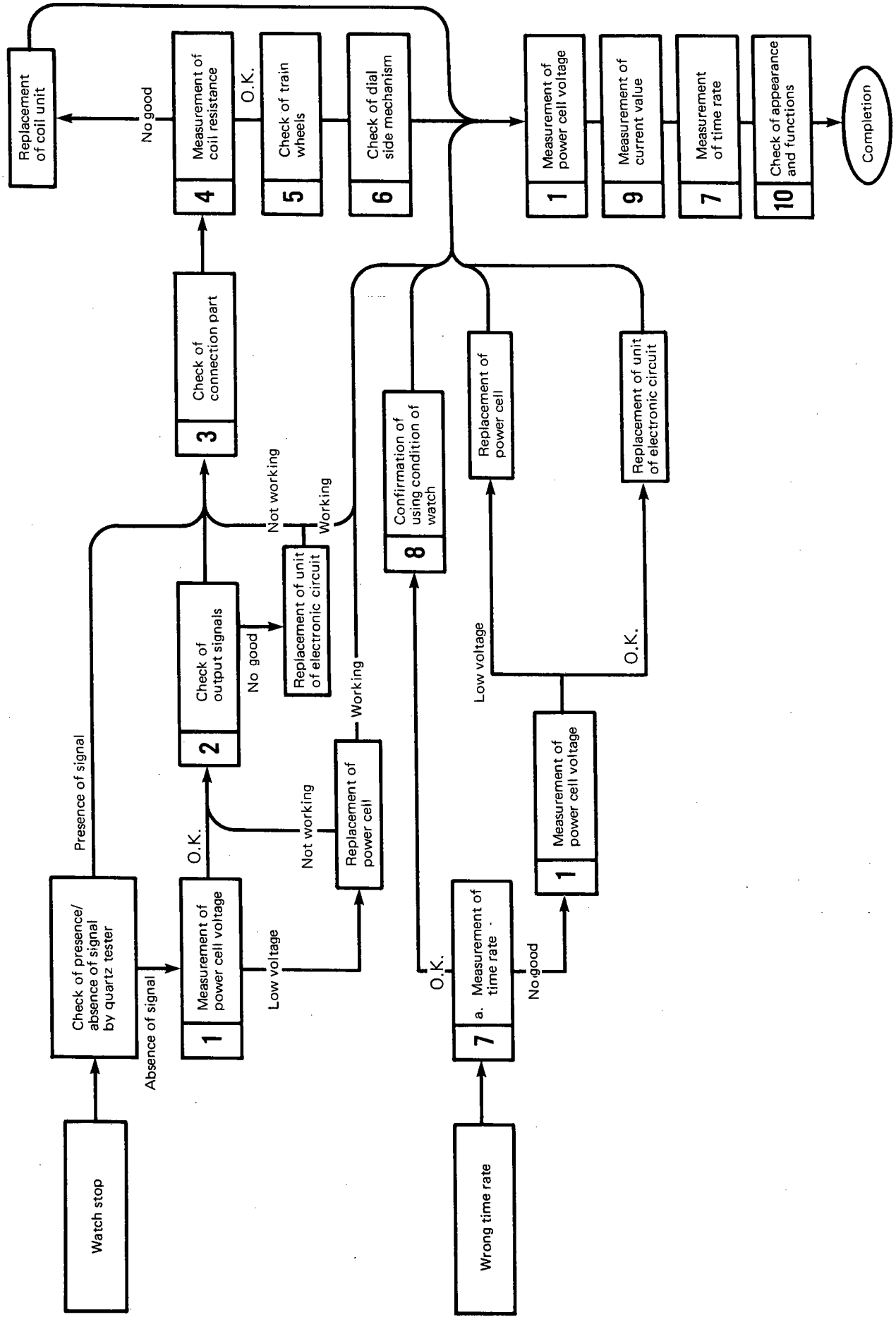
- How to remove the setting stem  
With the setting stem in the normal position, press the part indicated by the arrow and pull out the setting stem.

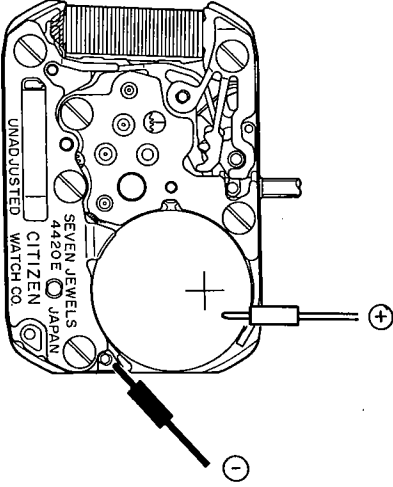
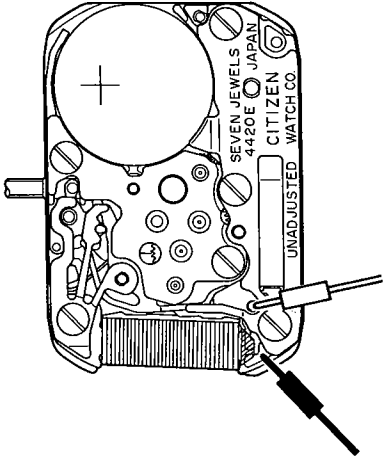


Caliber No.

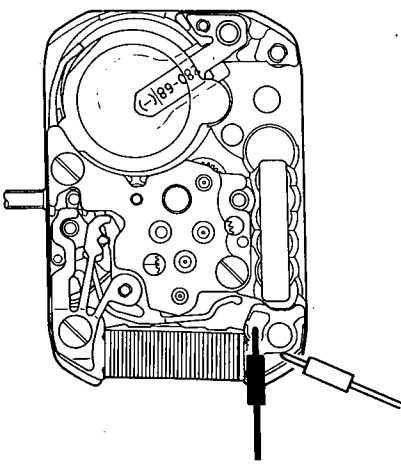


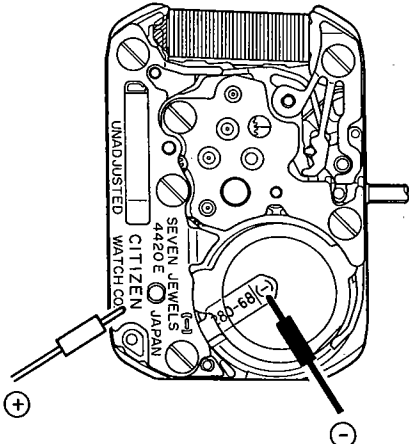
## 6. TROUBLESHOOTING AND ADJUSTMENT



Check points	How to check	Results & treatment
<p>(1) Measurement of power cell voltage</p>	<p>[Refer to Technical Manual, Basic Course II-1-a]</p> <p>(Tester range: DC 3V)</p> 	<p>Over 1.5V → Nondefective</p> <p>Under 1.5V → Replace the power cell with a new one</p>
<p>(2) Confirming the output signal</p>	<p>[Refer to Technical Manual, Basic Course II-1-b]</p> <p>(Tester range: DC 0.3V)</p>  <p>* Because the hands of this watch move in 20 second steps, the tester pointer swings right and left every 20 seconds. (The tester lead pins have no polarity.)</p> <p>*</p>	<p>The tester pointer swings every 20 seconds → Nondefective</p> <p>The tester pointer does not swing → Check the connection parts.</p> <p>The connections are normal but does not swing → Replace the electronic circuit unit</p>
<p>(3) Check connections parts</p>	<p>[Refer to Technical Manual, Basic Course II-2-a.]</p> <p>Confirm that there are no loose screws or dust or stains present.</p> <p>a. If a screw in the electronic circuit unit is loose, the driving signals may not be transmitted.</p> <p>b. Dust or stains on the coil or electronic circuit unit pattern may impair functioning of the circuit.</p>	



Check points	How to check	Results & treatment
(4) Measurement of coil resistance	<p>[Refer to Technical Manual, Basic Course II-1-c]</p> <ul style="list-style-type: none"> <li>Remove the electronic circuit unit when measuring the coil resistance.</li> </ul> <p>(Tester range: R x 10Ω)</p>  <p>(The tester lead pins have no polarity.)</p>	<p>1.7 kΩ – 2.1 kΩ → Nondefective</p> <p>Outside range of 1.7 kΩ – 2.1 kΩ → Replace the coil unit</p>
(5) Check train wheel	<p>[Refer to Technical Manual, Basic Course II-2-b.]</p> <ul style="list-style-type: none"> <li>Check that the transmission is smooth, that each wheel has appropriate clearance and that there is no dust around the rotor.</li> <li>Because the CAL is designed for low loads, do not use the wrong type of lubricating oil or apply too much oil. Also confirm that no oil is leaking from the train wheel mechanism.</li> </ul>	
(6) Check dial side mechanism	<p>[Refer to Technical Manual, Basic Course II-2-c.]</p> <ul style="list-style-type: none"> <li>Confirm that no component parts are deformed and that lubrication has been properly performed.</li> </ul>	
(7) Measurement of the time rate	<p>[Refer to Technical Manual, Basic Course II-2-d.]</p> <ul style="list-style-type: none"> <li>Since this watch uses D.F.C. (digital frequency control) and has no control terminals, the time rate cannot be adjusted. (Measurement is made in a 10 second range.)</li> </ul>	<p>The watch loses or gains substantial time → Replace the electronic circuit unit</p>
(8) Confirmation of usage conditions of the watch	<p>[Refer to Technical Manual, Basic Course II-2-e]</p>	

Check points	How to check	Results & treatment
(9) Measurement of current value	<p>[Refer to Technical Manual, Basic Course II-1-f]</p> <p>(Tester range: DC 12 <math>\mu\text{A}</math>)</p> <p>Mount the power cell in the adapter.</p>  <p>a. This watch has a load-compensating circuit. Since this circuit adjusts the driving output of the rotor, it operates for several seconds when the power cell is mounted, and the value of the consumed current may temporarily rise to approximately 1 <math>\mu\text{A}</math>. In this case, make the measurement after the tester pointer has returned to the normal level.</p> <p>b. When the electronic circuit unit is measured separately, confirm the <math>\oplus</math> and <math>\ominus</math> marks on the circuit pattern and then measure the current in the same manner as the measurement of current consumption in the module.</p>	<ul style="list-style-type: none"> <li>● Current value of the module <ul style="list-style-type: none"> <li>Under 0.25 <math>\mu\text{A}</math> <ul style="list-style-type: none"> <li>→ Nondefective</li> </ul> </li> <li>Over 0.25 <math>\mu\text{A}</math> <ul style="list-style-type: none"> <li>→ Measure the electronic circuit unit separately</li> </ul> </li> </ul> </li> <li>● Measurement of the separate electronic circuit unit <ul style="list-style-type: none"> <li>Under 0.2 <math>\mu\text{A}</math> <ul style="list-style-type: none"> <li>→ Nondefective</li> </ul> </li> <li>Over 0.2 <math>\mu\text{A}</math> <ul style="list-style-type: none"> <li>→ Replace the electronic circuit unit</li> </ul> </li> </ul> </li> </ul> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>When the current value for the module is high but the current value for the separate electronic circuit unit is normal  → The problem is somewhere outside the circuit. Therefore, inspect the watch for stains, lubrication conditions, and deformations of parts, and remove the cause of the high load.</p> </div>
(10) Check appearance conditions and functions	<p>[Refer to Technical Manual, Basic Course II-2-f.]</p> <p>The power cell strap is in contact with the case back to ground the circuit, protecting it from static electricity.</p>	

**CITIZEN WATCH CO., LTD.**  
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