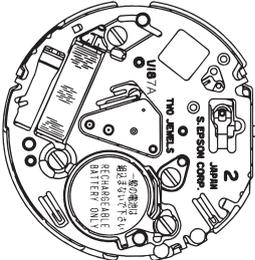
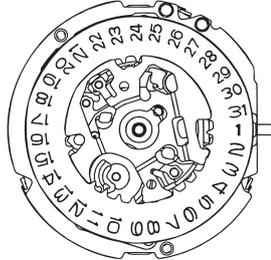


PARTS LIST/TECHNICAL GUIDE

ANALOGUE SOLAR Cal. V187A

[SPECIFICATIONS]

Item		Cal. No.	V187A
 <p>3 hands (hour, minute and second hands)</p>			  <p>Diameter Outside: 20.0mm x 19.0 mm Casing: 19.4mm x 18.7 mm Height: 2.40mm</p>
Intervals of the hand movement		1 second	
Driving system		Stepping motor (Load compensated driving pulse type)	
Additional function		<ul style="list-style-type: none"> • Overcharge prevention function • Energy depletion forewarning function • Instart-start function • Electronic circuit reset function • Train wheel setting devise • Date calendar • Instant setting device for date calendar 	
Crown operation	Normal position	Free	
	1st click position	Date setting	
	2nd click position	Time setting	
Loss/Gain		Monthly rate:less than 15 seconds (worn on the wrist at temperature range between -5 to 35 degrees Centigrade)	
Regulation system		Nil	
Gate time for rate measurement		Use 10-second gate	
Current consumption		Movement: less than 0.80 μ A	
		Circuit block: less than 0.40 μ A	
Coil resistance		4002907: 1.80 - 2.20 K Ω	
Power supply	Power generator	Solar power generation system	
	Rechargeable battery	MT616 Titanium-lithium rechargeable battery	
	Operating voltage range	0.45V - 2.20V	
	Power reserve	From full charge to stoppage: Approximately 2 months	
Number of jewels		2 jewels	

SEIKO WATCH CORPORATION

Cal.V187A is a ladies' 3-hand analogue watch employing a new solar panel (3 cell unit), but the basic movement structure of Cal.V187A is similar to the previous Cal.V18 Series watches, and the knowledge and technique you have gained in handling the previous Cal.V18 Series watches will come in handy when you repair Cal.V187A.

FEATURES

Cal. V187A

This is a ladies' analogue watch powered by light energy.

The battery used in this watch is a rechargeable battery, which is different from ordinary silver oxide batteries. Unlike other disposable batteries such as dry-cell batteries or button cells, this rechargeable battery can be used over and over again by repeating the cycles of discharging and recharging.

The capacity or recharging efficiency of the rechargeable battery may gradually deteriorate for various reasons such as long-term use or usage conditions. Worn or contaminated mechanical parts or degraded oils may also shorten recharging cycles. If the efficiency of the rechargeable battery decreases, it is necessary to have the watch repaired.

● HOW TO CHARGE AND START THE WATCH

When you start the watch or when the energy in the rechargeable battery is reduced to an extremely low level, charge it sufficiently by exposing the watch to light.

● INSTANT START FUNCTION

When the watch is exposed to sunlight or strong artificial light (of more than 1,000 lux), it will start operating immediately with the second hand moving at 2-second intervals.



1. Expose the watch to sunlight or strong artificial light.

* When the watch has stopped operating, the second hand will start moving at 2-second intervals.

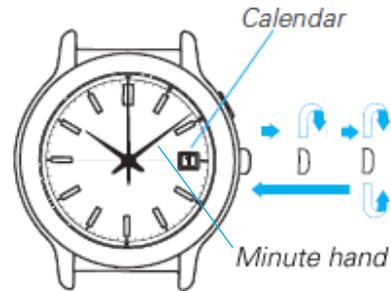
2. Keep the watch exposed to the light until the second hand moves at 1-second intervals.
3. When the watch is charged after it has completely stopped, set the date and time before wearing the watch.

Note

1. When the instant-start function is activated after the watch is exposed to light, the second hand starts moving at 2-second intervals immediately, but the energy stored in the rechargeable battery is not sufficient. If the watch is turned away from the light, it may stop operating.
2. It is not necessary to charge the watch fully. It is important, however, to charge the watch sufficiently, especially in case of initial charge.

● **TIME/CALENDAR SETTING**

1. Pull out the crown to the first click and set the previous day's date.
2. Pull out the crown to the second click when the second hand is at the 12 o'clock position.
3. Turn the crown until the desired date appears.
4. Turn the crown to set the hour and minute hands to the desired time.
5. Push back the crown completely in accordance with a time signal.



● **GUIDELINE OF CHARGING TIME**

Environment/ Light source	Illumination (lux)	Time required for full charge	Time required for steady operation	Time to charge 1 day of power
Office, overhead/ Fluorescent light	700	100 hours	8 hours	95 minutes
30W 20 cm/ Fluorescent light	3,000	25 hours	1.6 hours	23 minutes
30W 3 cm/ Fluorescent light	10,000	7 hours	0.4 hours	6 minutes
Cloudy weather/ Sunlight	10,000	7 hours	0.4 hours	6 minutes
Fine weather/ Sunlight	100,000	3 hours	0.1 hours	3 minute

The above table provides only a general guideline.

It is recommended that the watch be charged for as long as the charging time according to the column "Time required for steady operation" in this table in order to assure the stable movement of the watch.

● **CAUTION FOR CHARGING**

When charging the watch, do not place it too close to a photo flash light, spotlight, incandescent light or other light sources as the watch temperature will become extremely high, causing damage to the parts inside the watch.

When exposing the watch to sunlight to charge it, do not leave it on the dashboard of a car, etc. for a long time, as the watch temperature becomes extremely high.

While charging the watch, make sure the watch temperature does not exceed 60 °C.

● ENERGY DEPLETION FOREWARNING FUNCTION

When the energy stored in the rechargeable battery is reduced to an extremely low level, the second hand starts moving at 2-second intervals instead of the normal 1-second intervals. (Some calibres have no such function.)

The watch remains accurate even while the second hand is moving at 2-second intervals.

In that case, recharge the watch as soon as possible by exposing it to light.

Otherwise, the watch may stop operating in about 3 days. (For recharging the watch, see "HOW TO CHARGE AND START THE WATCH.")

● TO PREVENT ENERGY DEPLETION

- When wearing the watch, make sure that the watch is not covered by clothing.
- When the watch is not in use, leave it in a bright place as long as possible.

PARTS LIST

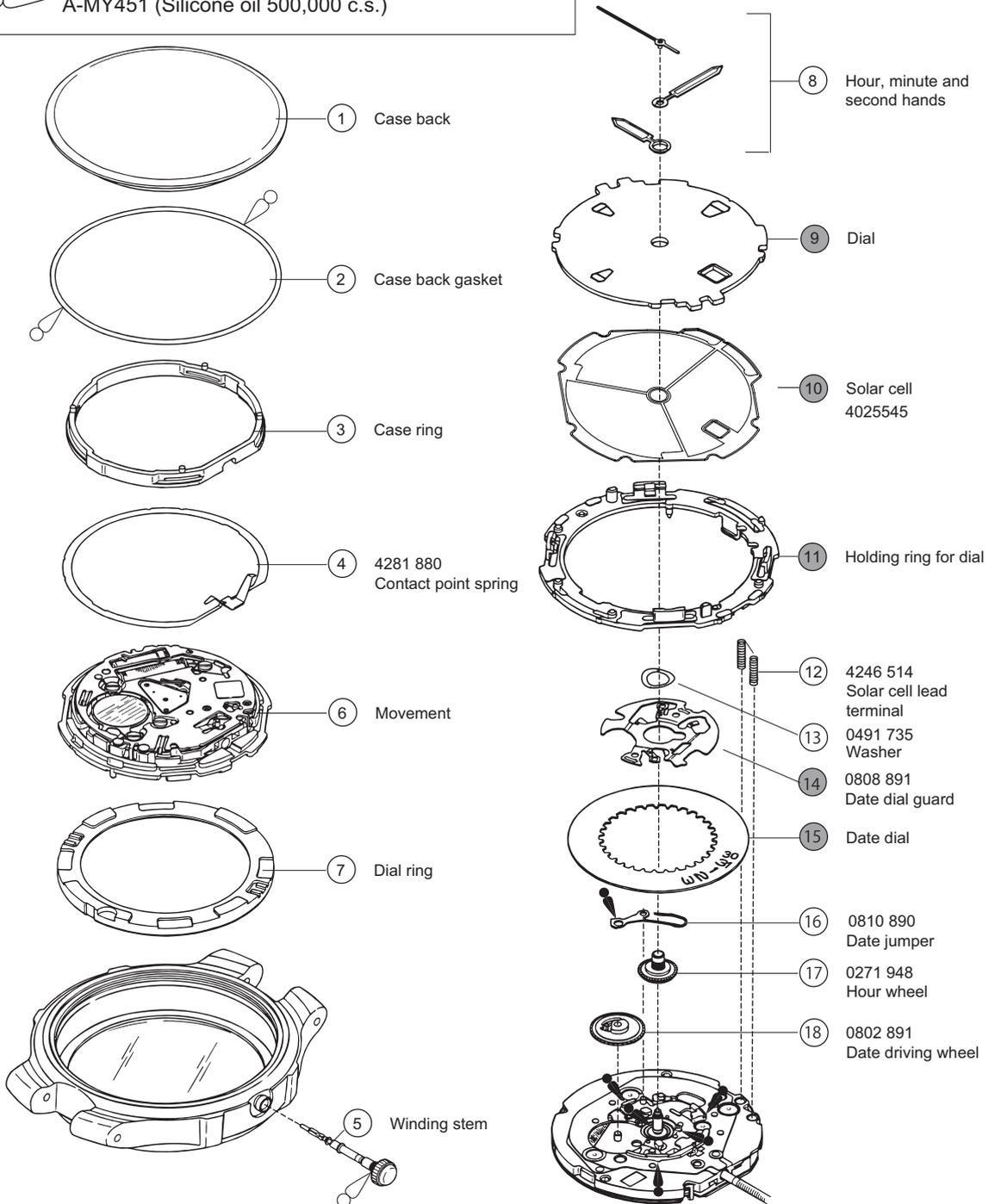
Cal. V187A

Disassembling procedures Figs. : ① → ④①

Reassembling procedures Figs. : ④① → ①

Lubricating: Types of oil Oil quantity

 AO-3  Normal quantity
 A-MY451 (Silicone oil 500,000 c.s.)



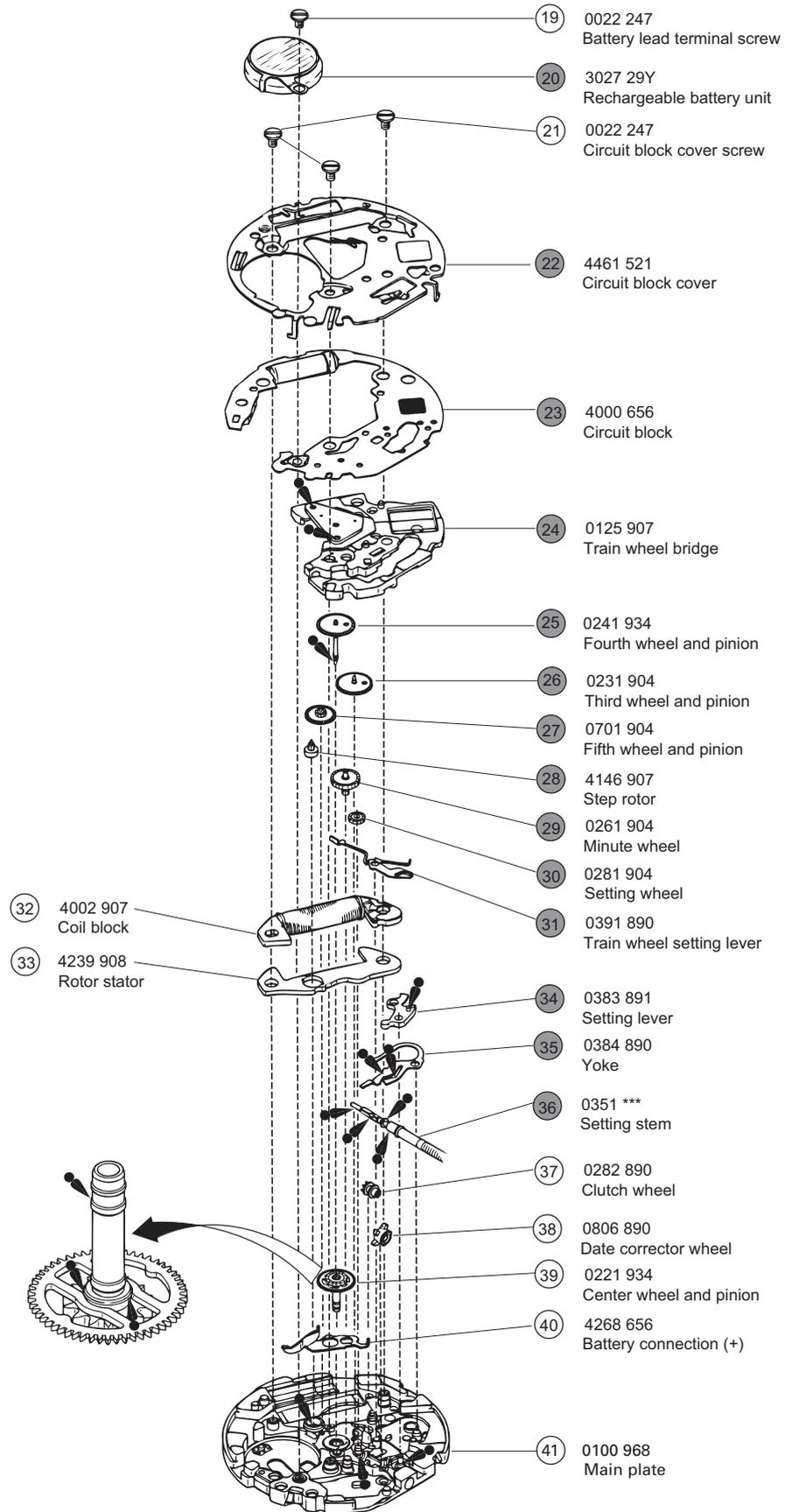
0022 247

- Battery lead terminal screw (1 pc.)
- Circuit block cover screw (3 pcs.)

  Please see the remarks on the following pages.

PARTS LIST

Cal. V187A



● → Please see the remarks on the following pages.

PARTS LIST

Cal. V187A

● How to find the correct parts, if not determined by 4 digit caliber number

Following parts are determined based on the design of watches, such as hands height, dial color, and design of cases. Please refer to the SEIKO WATCH PARTS CATALOGUE in order to choose corresponding parts.

⑩ Solar cell 4025 545

⑪ Holding ring for dial 0866 775

⑮ Date dial

Part number	Position of crown and calendar frame	Color of figure	Color of background
0878882	3 o'clock	Black	White
0878883	3 o'clock	Gold	Black

The type of date dial is determined based on the design of cases. Check the case number and refer to the "Watch Parts Catalogue" to choose a corresponding date dial.

⑳ Setting stem 0351 860

The type of setting stem is determined based on the design of cases. Check the case number and refer to the "Watch Parts Catalogue" to choose a corresponding setting stem.

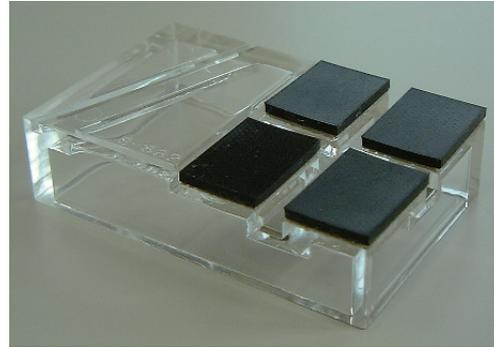
PARTS LIST

Cal. V187A

- **Tools and consumables required for disassembling/reassembling**

- **Movement holder**

UNIVERSAL MOVEMENT HOLDER (S-682)



- **Watch oils**

SEIKO watch oils A-MY451 (500,000 c.s.)



SEIKO watch oil AO-3



REMARKS ON DISASSEMBLING AND REASSEMBLING THE MOVEMENT

● HOW TO REMOVE THE SETTING STEM BEFORE DISMANTLING THE MOVEMENT

Crown position: normal position

Push the SETTING LEVER gently (refer to the Fig. 1) in order to disengage it from the SETTING STEM. Then pull out the crown with the stem completely.

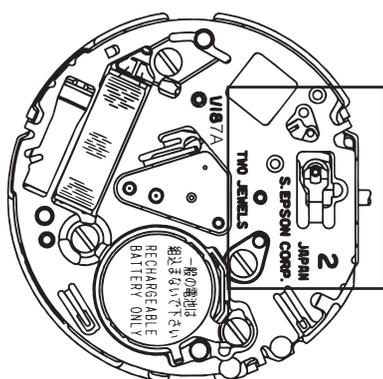
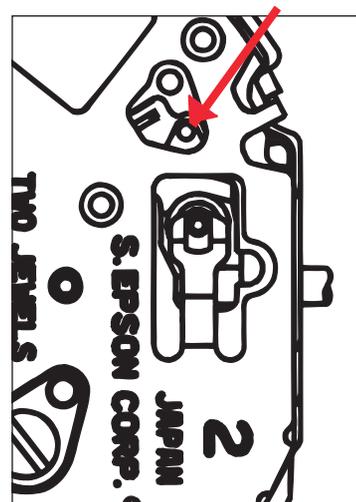


Fig. 1



● SOLAR POWER GENERATION MECHANISM – POSITIONS OF THE HOOKS

⑨ Dial

⑩ Solar cell

<Disassembling>

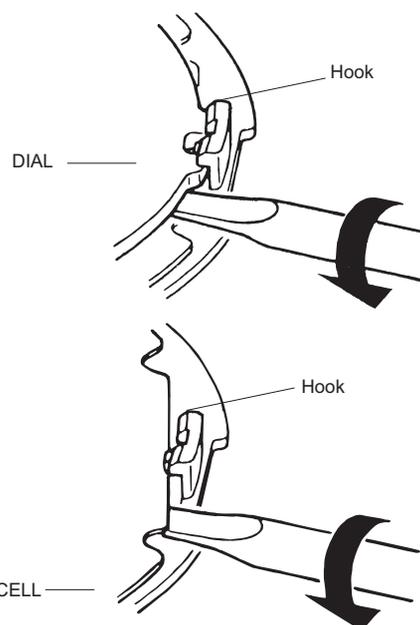
1. The dial is fixed to the CASING RING with four hooks of the CASING RING.

When disassembling the dial, insert the tip of a screwdriver into a gap between the dial and the SOLAR CELL near a hook, then, pry up the dial to release it.

2. Follow the same procedure to release all the four hooks.

Note

Please be careful not to scratch the SOLAR CELL under the dial when disassembling the dial from the CASING RING.

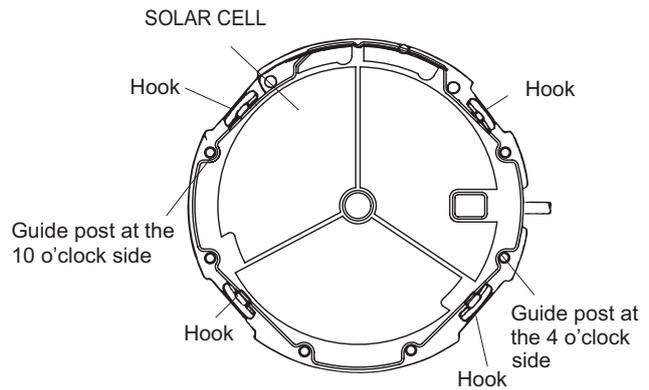


<Assembling>

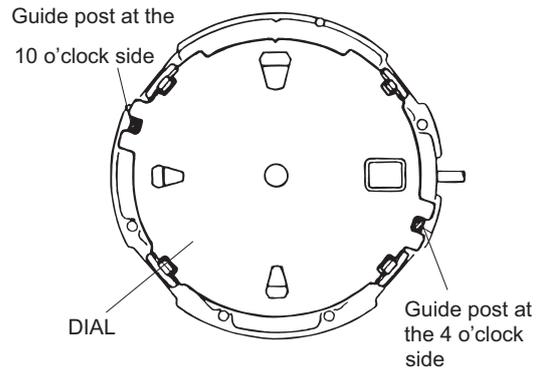
1. Set the notched portions of the SOLAR CELL to the guide posts at the 4 o'clock sides of the HOLDING RING FOR DIAL.

Note:

At this step it is not necessary to hook the SOLAR CELL to the four hooking portions of the holding ring for dial.



2. Set the notched portions of the dial to the guide posts at the 4 o'clock and 10 o'clock sides of the holding ring for dial.

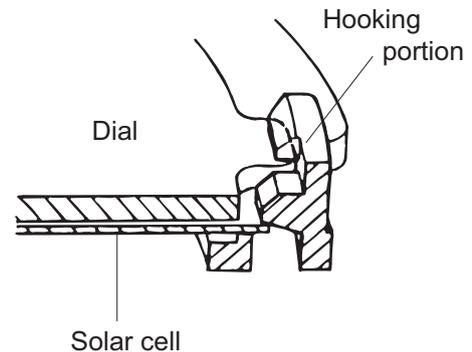


3. Push the circumference of the dial near the hooking portion to set the dial and the SOLAR CELL to the four hooking portions as shown in the illustration at right.

Notes:

* When installing the dial, take care not to damage or deform it.

* After installing the solar cell and dial, check that they are fixed securely to the HOLDING RING FOR DIAL by the four hooking portions.

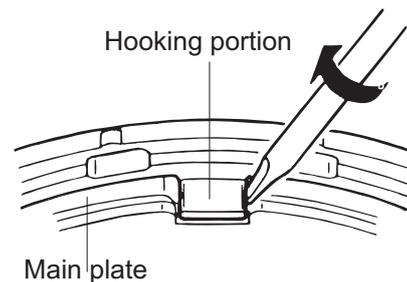


⑪ HOLDING RING FOR DIAL

<Disassembling>

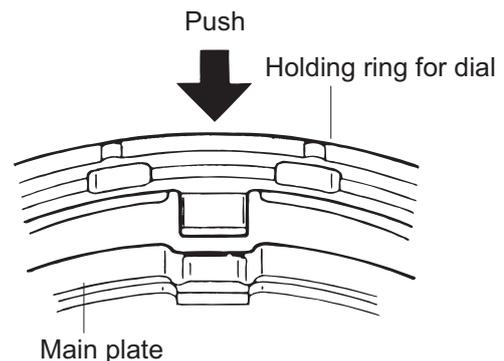
The holding ring for dial is fixed by two hooking portions at the 12 o'clock and 6 o'clock sides.

1. Insert the tip of a screwdriver into a gap between the hooking portion and main plate as shown in the illustration at right, and release the hooking portion from the main plate.



<Assembling>

1. Set the hooking portions at the 12 o'clock and 6 o'clock sides to the main plate.
2. Gently push the holding ring for dial at the hooking portions so that they catch the main plate securely.

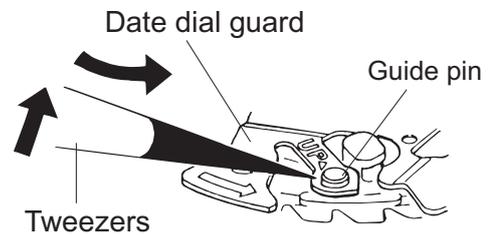
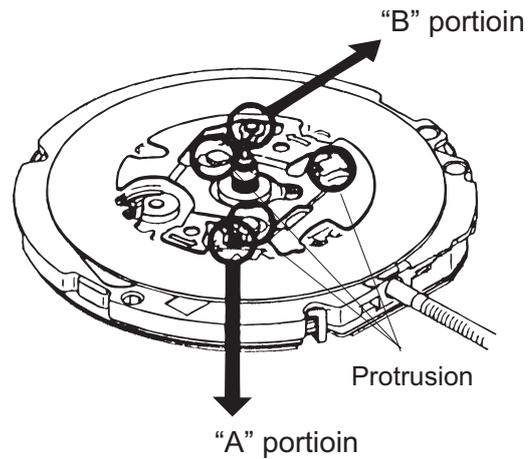


⑭ DATE DIAL GUARD

Unlike conventional movements, the date dial guard is not fixed with screws. It is set to the main plate with three protrusions, which are caught under the main plate by turning the guard. Then, it is fixed by two guide pins.

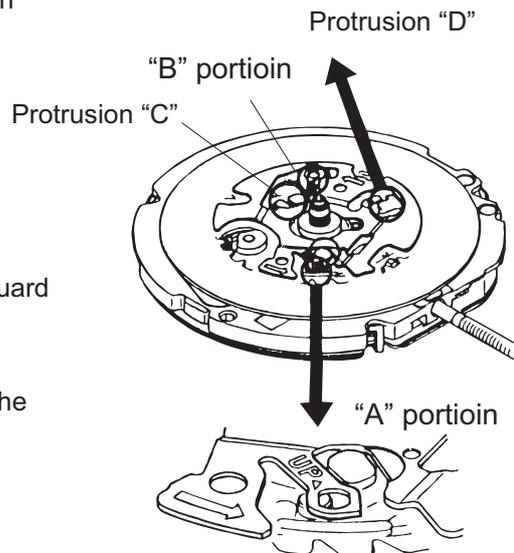
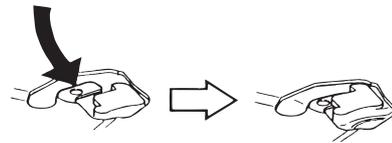
• How to remove

1. Lightly lift the "A" portion of the date dial guard with tweezers to release it from the guide pin, and then move it counterclockwise until it mounts on the guide pin.
2. Release the "B" portion of the date dial guard in the same way as described above, and then move it counterclockwise until it mounts on the guide pin.
3. Check that all the three protrusions of the date dial guard have come off from the main plate, and then remove the date dial guard.



• How to install

1. Put the date dial guard on the main plate so that the "A" and "B" portions are over the guide pins, as shown in the illustrations at right.
2. Move the protrusion "D" of the date dial guard clockwise so that it is caught under the main plate.
3. Slightly move the protrusions "C" and "E" clockwise alternately to set them under the main plate. Then, set the "A" and "B" portions of the date dial guard to the guide pins.
4. Check that the date dial guard is fixed securely to the main plate.



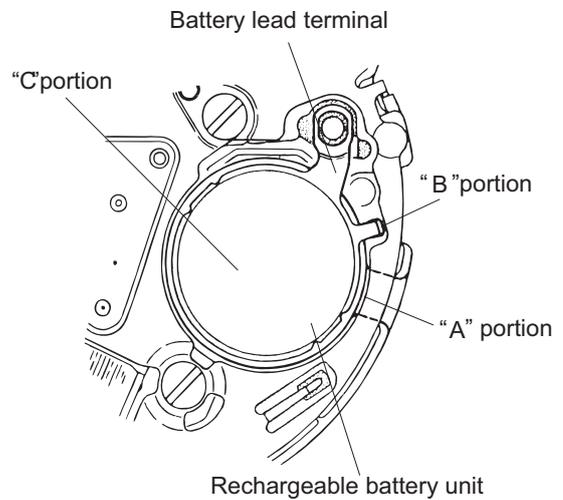
②① Rechargeable battery unit

• How to remove

Remove the battery lead terminal screw, and then pry up the “A” portion in the illustration with tweezers to remove the rechargeable battery unit.

• How to install

Set the “B” portion of the battery lead terminal to the guide hole of the main plate, and then push the center portion of the rechargeable battery unit (the “C” portion in the illustration) to fix it in position.



- Notes:
- Be sure to observe the correct polarity of the rechargeable battery unit. The (–) side has the lead terminal.
 - Handle the rechargeable battery unit with care so as not to short-circuit its (+) and (–) terminals.

②② Circuit block cover

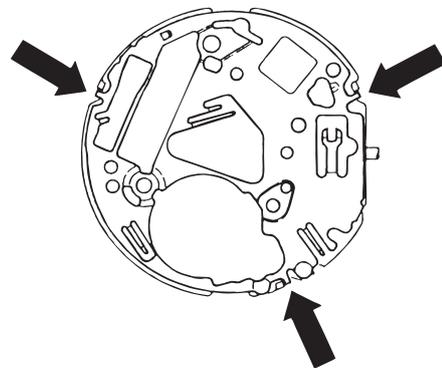
• How to install

Have the three hooking portions of the circuit block cover catch the main plate securely.

②④ Train wheel bridge

• Setting position

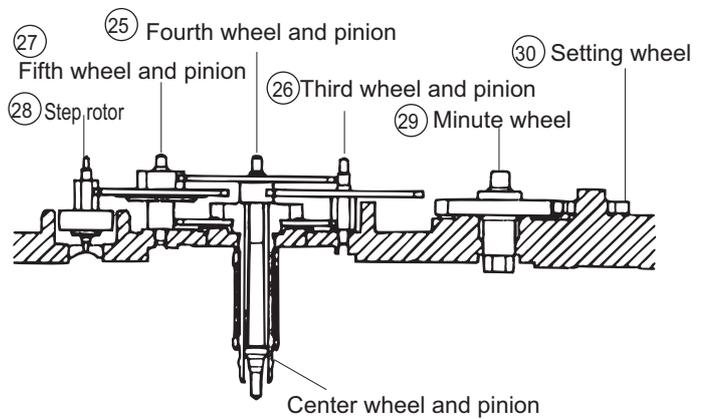
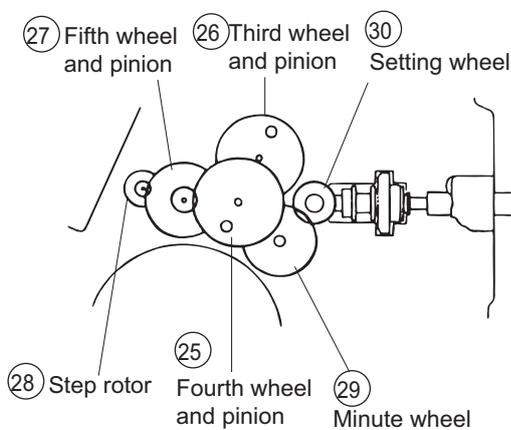
Refer to the illustrations below to check where to install the respective wheels.



- ②⑤ FOURTH WHEEL AND PINION
- ②⑥ THIRD WHEEL AND PINION
- ②⑦ FIFTH WHEEL AND PINION
- ②⑧ STEP ROTOR
- ②⑨ MINUTE WHEEL
- ③⑦ SETTING WHEEL

• Setting position

Refer to the illustrations below to check where to install the respective wheels.

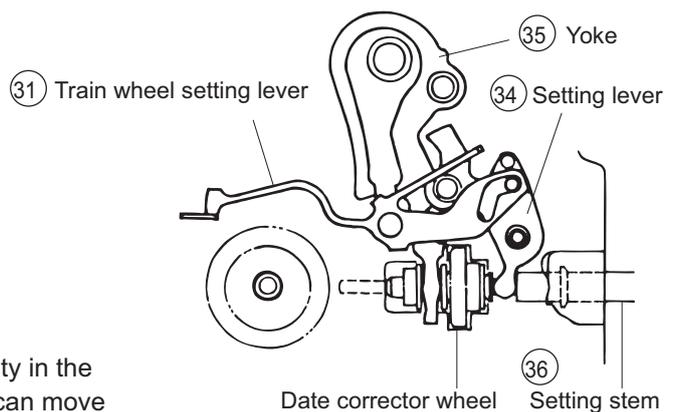


- ③① TRAIN WHEEL SETTING LEVER
- ③④ SETTING LEVER
- ③⑤ YOKE
- ③⑥ SETTING STEM

• Setting position

Refer to the illustration at right.

- The date corrector wheel has some elasticity in the contact with the winding stem so that they can move together.
- Push in the winding stem straight toward the center of the main plate.



REMARKS ON INSPECTION AND MEASUREMENT

- Value checking - coil resistance (coil blocks)

COIL BLOCK 4002 907 1.8 K Ω - 2.2 K Ω

- Current consumption

For the whole movement : Less than 0.8 μ A (with 1.55V supplied)

For the circuit block alone : Less than 0.4 μ A (with 1.55V supplied)

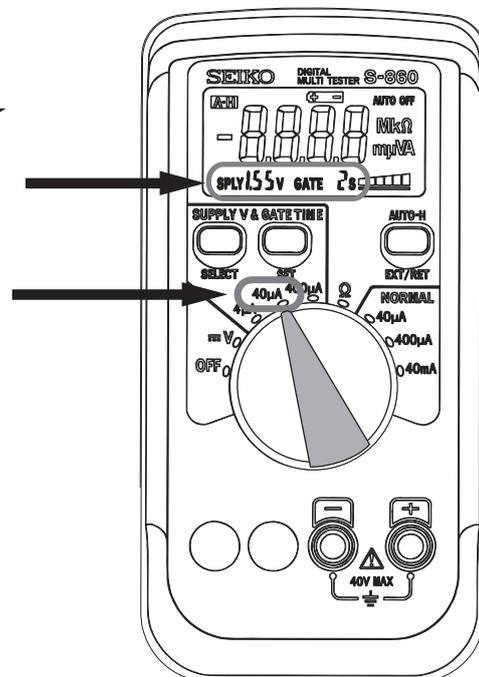
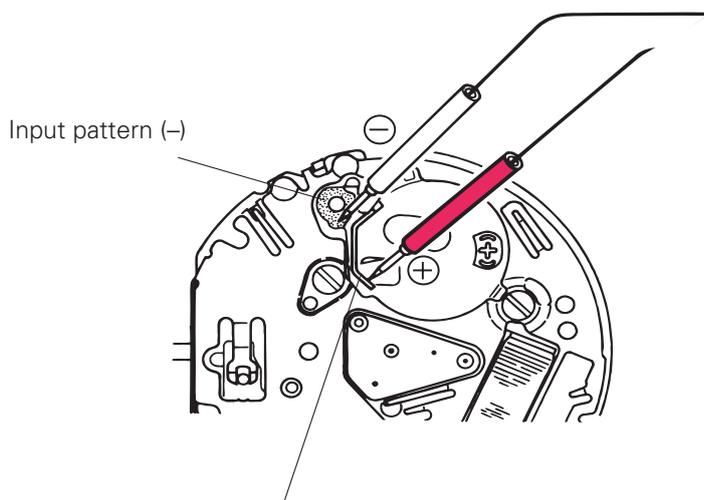
<Measuring the current consumption for the whole movement>

- 1) Remove the solar cell and rechargeable battery.
- 2) Connect the tester as shown in the illustration.

* When measuring the current consumption using the SEIKO digital multi-tester (S-860), use the range of 40 μ A of SUPPLY V (=1.55V) & GATE TIME (2S).

- 3) Wait until a stable measurement becomes available. It usually takes 30 seconds to a few minutes for getting a stable measurement is obtained.

- 4) Make sure that the read value is less than 0.8 μ A.



<Measuring the current consumption for the CIRCUIT BLOCK alone>

1) Connect the tester to the input terminals (+) and (-) of the circuit block. (Please refer to the “Structure of the circuit block” below).

* When measuring the current consumption using the SEIKO digital multi-tester (S-860), use the range of 40 μ A of SUPPLY V (=1.55V) & GATE TIME (2S).

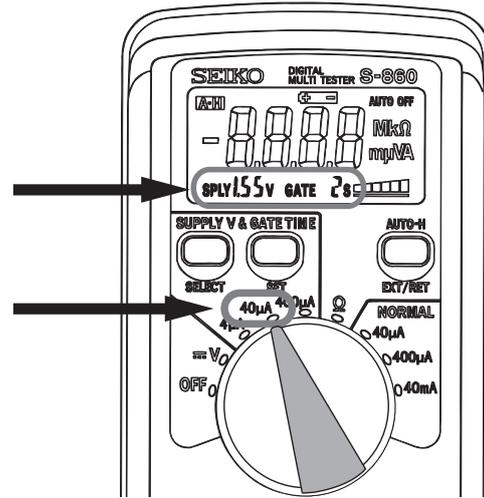
* Avoid exposing the CIRCUIT BLOCK to direct light in order to obtain the correct measurement.

2) Wait until a stable measurement becomes available.
It is usually takes 30 seconds to a few minutes for getting a stable measurement.

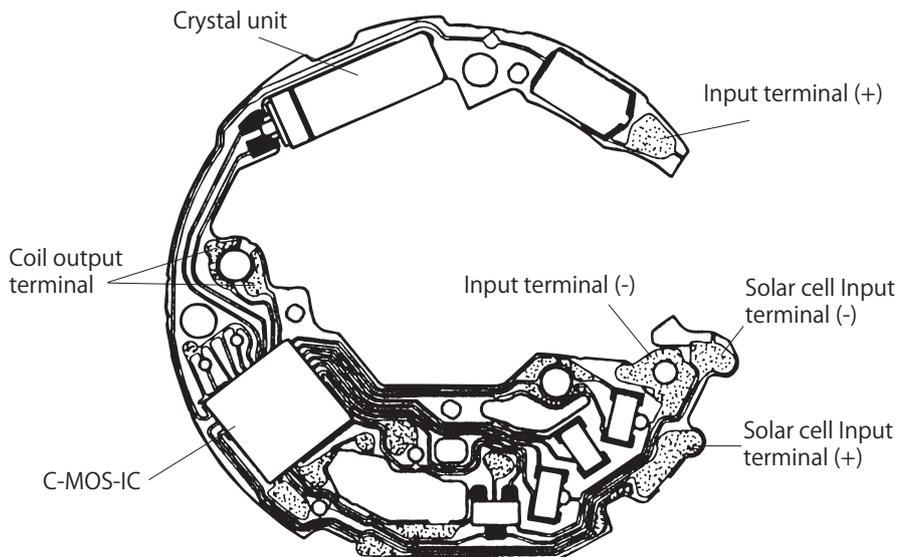
3) Make sure that the read value is less than 0.40 μ A.

Remarks:

When the current consumption exceeds the standard value for the whole movement but is within the standard value range for the circuit block alone, the watch is generating a driving pulse to compensate for the heavy load that may be applied to the gear train, etc. In this case, overhaul and clean the movement parts and then measure current consumption for the whole movement again.



● Structure of the CIRCUIT BLOCK



- Output voltage for the solar cell

Output voltage when the watch is placed at a distance of 5cm under a fluorescent light of 15 to 20 watts: More than 1.8V.

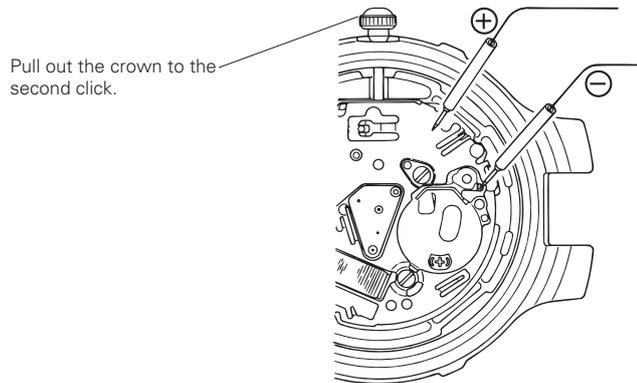
- Use either of the following two methods to measure the output voltage for the solar cell.

1. Measurement of the output voltage for the watch
2. Measurement of the output voltage for the solar cell alone

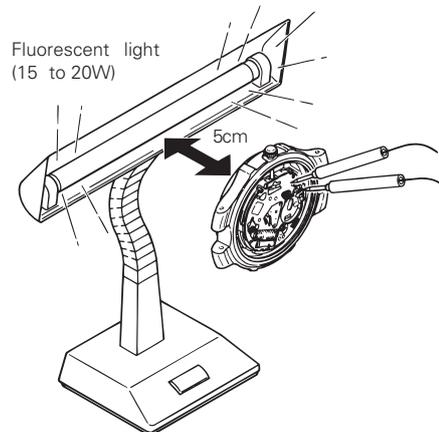
Remarks: If the output voltage for the watch is less than the specified value, measure the output voltage for the solar cell alone.
If the output voltage for the solar cell unit alone exceeds the specified value, check the solar cell lead terminal for conductivity, etc.

<Measuring the output voltage for the watch>

- 1) Set the dial to the solar cell.
- 2) Make sure that the rechargeable battery unit is not installed into the watch.
- 3) Pull out the crown to the second click and reset the circuit.
- 4) Connect the tester as shown in the illustration.

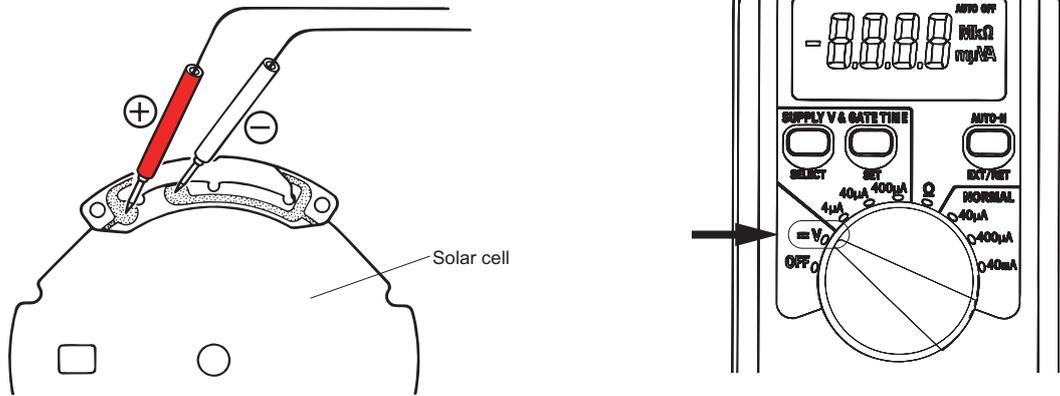


- 5) Place the watch at a distance of 5cm under a fluorescent light of 15 to 20 watts, exposing the dial side to the light, and then measure the output voltage.



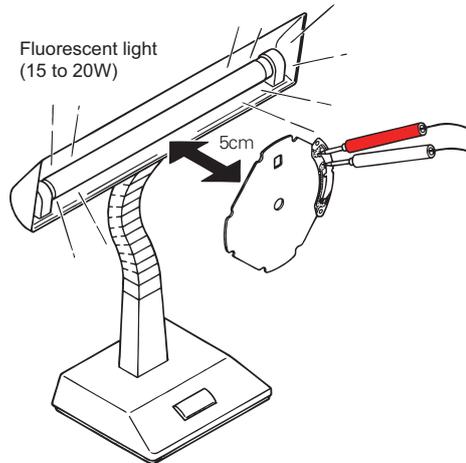
<Measuring the output voltage for the SOLAR CELL alone>

- 1) Connect each probe to the appropriate (-) and (+) output terminal of the SOLAR CELL as shown in the illustration.



* When measuring the output voltage using the SEIKO digital multi-tester (S-860), use the range of V.

- 2) Place the solar cell at a distance of 5 cm under a fluorescent light of 15 to 20 watts, exposing the solar cell side to the light, and then measure the output voltage.

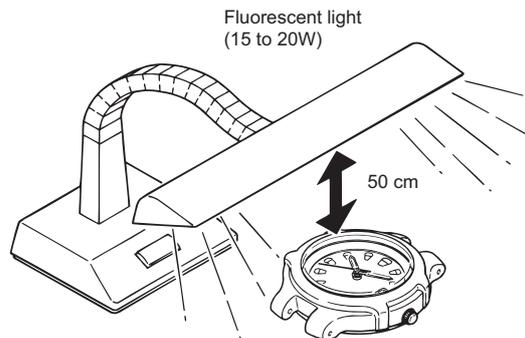


- Checking the quick-start function

The quick-start function can be checked only when the rechargeable battery voltage is less than 0.9V. Before checking the function, therefore, be sure to measure the voltage. (Refer to step 1 in “• Checking the recharging function”.)

<Checking procedure>

- After checking that the watch stops operating, place the watch at a distance of 50cm under a fluorescent light of 15 to 20 watts, exposing the dial side to the light. Then, check if the second hand starts moving at 2-second intervals within 10 seconds.

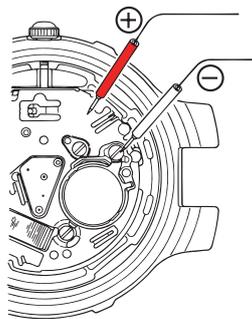


- Checking the recharging function

A conventional method of checking the recharging function is to check the difference of the rechargeable battery voltage between before and after a recharge.

<Checking procedure>

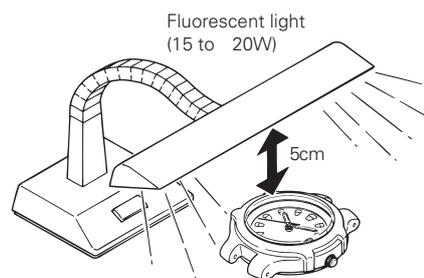
- 1) Apply the probes of the tester as shown in the illustration to measure the voltage of the rechargeable battery before recharge.



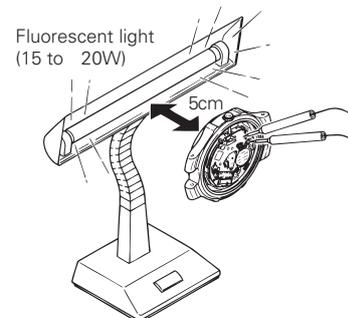
- 2) Place the watch at a distance of 5cm under a fluorescent light of 15 to 20 watts, and charge it for 30 minutes.

Remarks:

- Be sure to use a fluorescent light to charge the watch, as light sources generating heat may cause damage to the watch. To charge the watch efficiently, place it under the center of the fluorescent tube.
- While charging the watch, make sure that the watch temperature does not exceed 60 °C.



- 3) After recharging for 30 minutes, apply the probes of the tester in the same manner as in step 1) above, and measure the rechargeable battery voltage while keeping the watch exposed to the light.



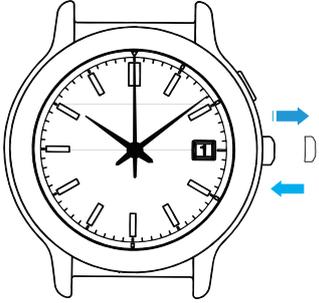
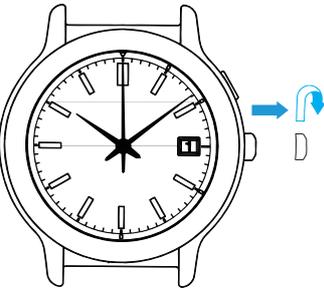
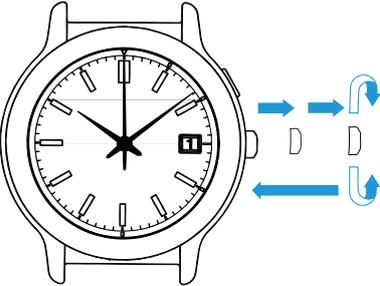
- 4) Refer to the table below to determine whether the recharging function is normal or not.

[Guideline for the quality of the recharging function]

Voltage before recharge	Criteria for recharging quality
0.5 ~ 1.00V	The battery is normal if the rechargeable battery voltage obtained after recharge is more than 1.2V.
1.01 ~ 1.30V	The battery is normal if the rechargeable battery voltage has increased more than 0.04V after recharge.

* The above criteria are applicable only when the rechargeable battery voltage before recharge is within the range of 0.5V and 1.3V.

● **Checking the general function**

Operation	Function	Checkpoint
 <p>Pull out the crown to the 1st click and push it back in to the normal position. Repeat the same several times.</p>	<p>Setting mechanism - function of the time setting</p>	<p>Make sure that it has a click at the 1st click position and the stem is not pulled off.</p>
 <p>Pull out the crown to the 1st click then turn it.</p>	<p>Calendar mechanism - Date change</p>	<p>Make sure that the date changes smoothly</p>
 <p>Pull out the crown to the 2nd click then turn it.</p>	<p>Setting mechanism - hour and minute hand setting</p>	<p>Make sure that the date changes when the hour and minute hands pass around midnight</p>
	<p>Hands installation</p>	<p>Make sure that the hour and minute hands move smoothly (without touching each other or touching the surface of the dial or inside of the glass).</p>

● **CHECKING THE WATER RESISTANCE**

Check the water resistance according to the designated specification of the watch.

Marking on the case back	Test method	Applied pressure
WATER RESISTANT (WATER RESIST)	Air leak test	3 BAR
WATER RESIST 5BAR		5 BAR
WATER RESIST 10BAR		10 BAR
WATER RESIST 15BAR		15 BAR
WATER RESIST 20BAR		20 BAR
SCUBA DIVER'S (AIR DIVER'S) 150 m		18.75 BAR = 150 (m) times 0.125
SCUBA DIVER'S (AIR DIVER'S) 200 m		25 BAR = 200 (m) times 0.125
He-GAS DIVER'S 300 m		37.5 BAR = 300 (m) times 0.125
He-GAS DIVER'S 600 m		75 BAR = 600 (m) times 0.125
He-GAS DIVER'S 1000 m		125 BAR = 1000 (m) times 0.125

● **Accuracy test**

Measure the rate and make sure the value shows within ± 0.50 s/d.

Use 10 seconds gate of the tester.