
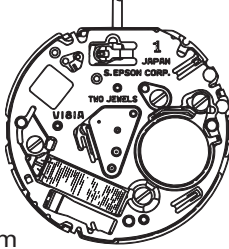
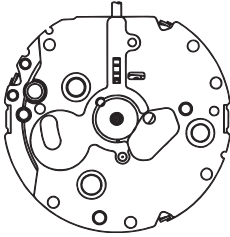


# PARTS LIST/TECHNICAL GUIDE

## ANALOGUE SOLAR Cal. V181A

### [SPECIFICATIONS]

Cal. No.		V181A
Item		
Movement		
 <p>3 hands (hour, minute and second hands)</p>	  <p>Diameter Outside: 20.0mm Casing: 19.4mm Height: 2.20mm</p>	
<b>Motion of the second hand</b>	One-second intervals	
<b>Driving system</b>	Stepping motor 1 piece	
<b>Additional function</b>	Instart-start function Energy depletion forewarning function (The second hand moves at two-second intervals.) Overcharge prevention function Electronic circuit reset function Second hand stop function	
<b>Crown operation</b>	Normal position	Free
	1st click position	Time setting
<b>Loss/Gain</b>	Monthly rate: less than 20 seconds (worn on the wrist at temperature range between 5 to 35 degrees Centigrade)	
<b>Regulation system</b>	Nil	
<b>Gate time for rate measurement</b>	Use 10-second gate	
<b>Current consumption</b>	Movement: less than 0.80 $\mu$ A	
	Circuit block: less than 0.40 $\mu$ A	
<b>Coil resistance</b>	Coil block: 1.80 - 2.20 K $\Omega$	
<b>Power supply</b>	Power generator	Solar power generation system
	Rechargeable battery	MT616 Manganese titanium lithium rechargeable battery
	Operating voltage range	0.45V - 2.20V
	Power reserve	From full charge to stoppage: Approximately 2 months
<b>Number of jewels</b>	2 jewels	

SEIKO WATCH CORPORATION

## FEATURES

The Cal. V181 is an analogue watch with a solar power generation system.

- Solar power generation system

The watch operates while charging electricity by converting light received on the dial to electrical energy. It lasts for 2 months after full charge.

- 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.

- 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.

- 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
60W 60cm/Incandescent light	500	110 hours	8 hours	100 minutes
General offices/ Fluorescent Light	700	82 hours	6 hours	75 minutes
30W 70cm/Fluorescent light	1,000	60 hours	4 hours	55 minutes
30W 20cm/Fluorescent light	3,000	20 hours	1.3 hours	18 minutes
30W 12cm/Fluorescent light	5,000	10 hours	33 minutes	9 minutes
30W 3cm/ Fluorescent light	10,000	5 hours	15 minutes	5 minutes
Cloudy weather/Sunlight	10,000	5 hours	15 minutes	5 minutes
Fair weather/Sunlight	100,000	2.1 hours	7 minutes	2 minutes

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 50 °C.

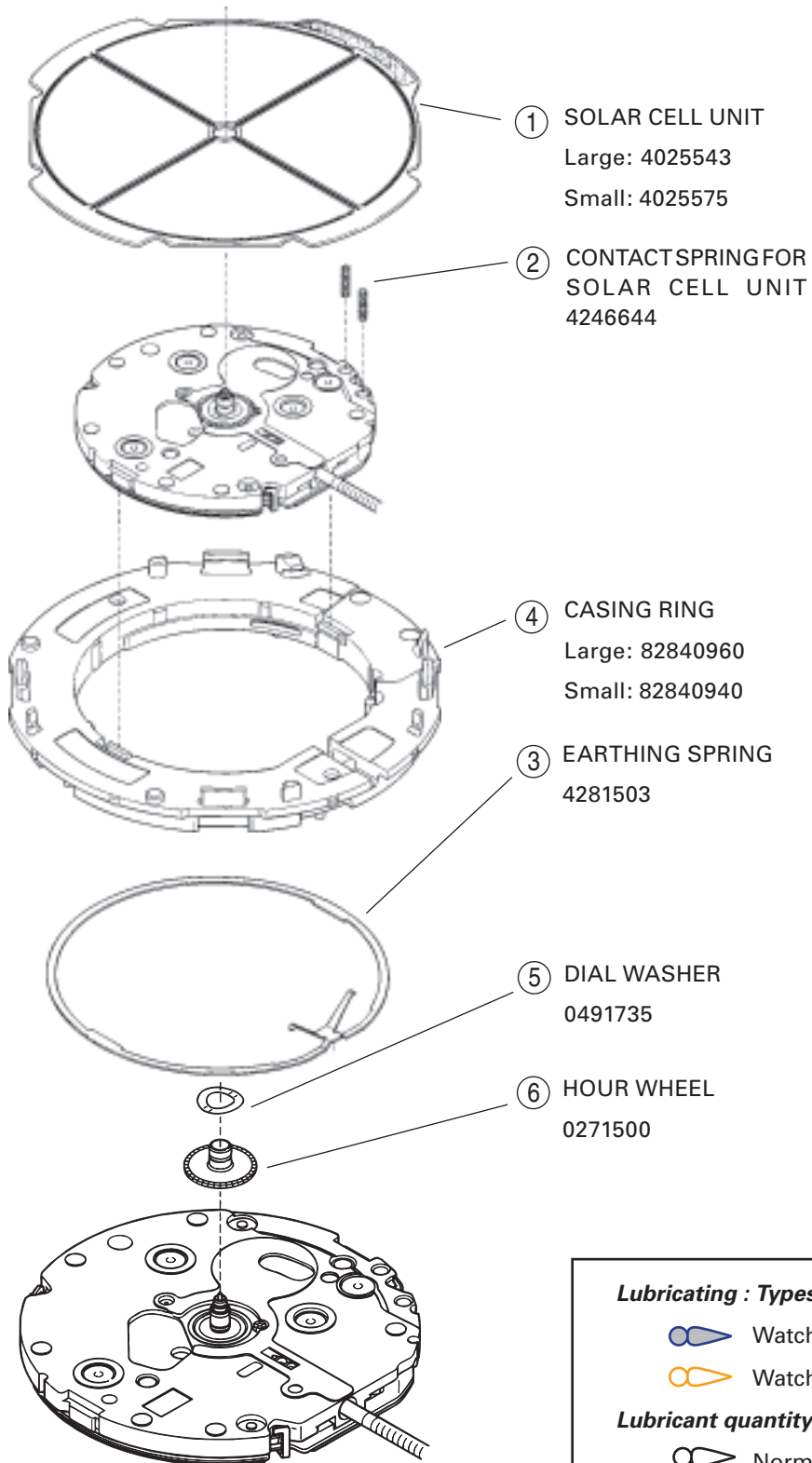
# PARTS LIST

Cal. V181A

## [SOLAR POWER GENERATION MECHANISM]

Order of disassembly: ① → ②⑧

Order of assembly: ②⑧ → ①



### Lubricating : Types of lubricant

 Watch Oil AO-3

 Watch Oil AO-2

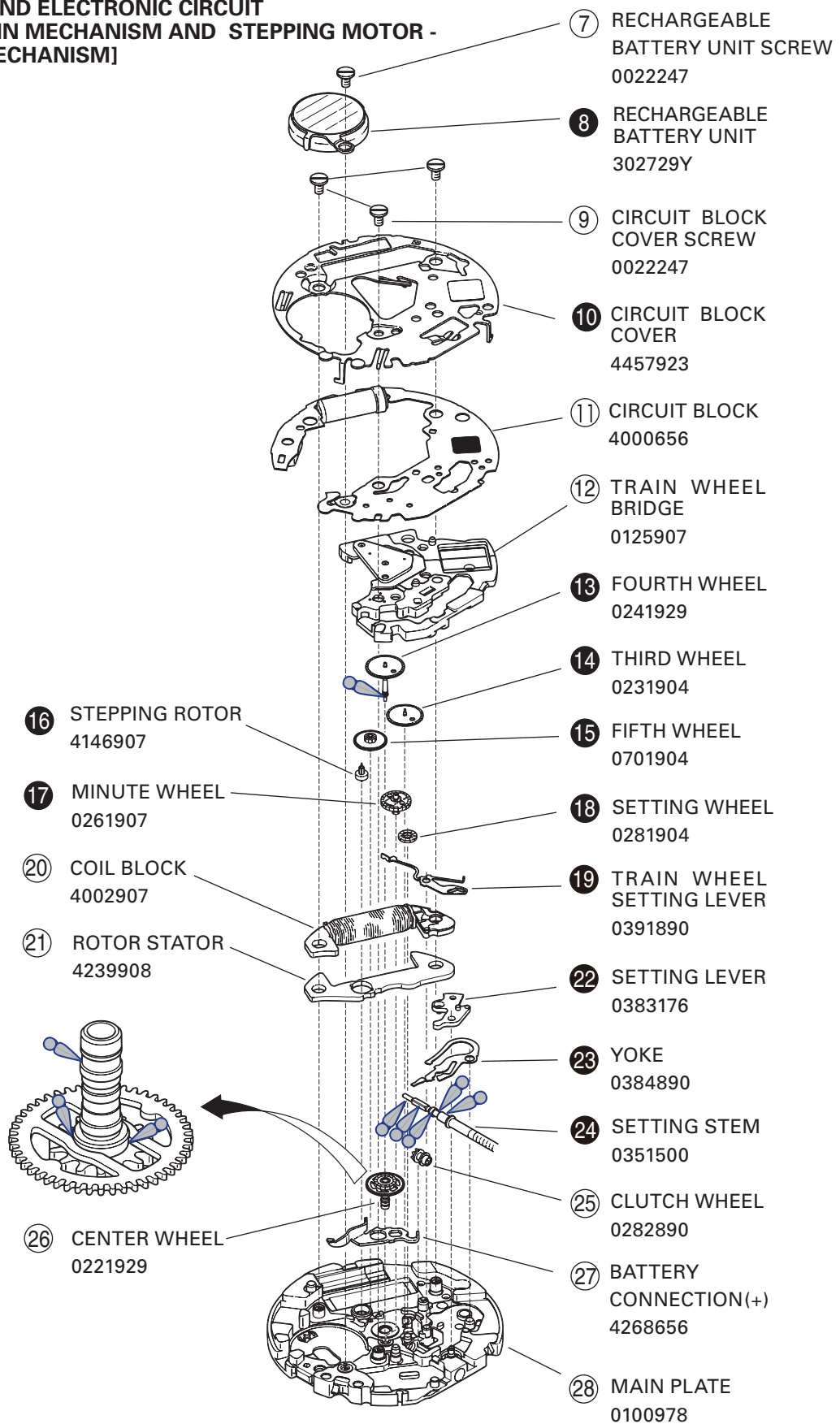
### Lubricant quantity:

 Normal quantity

# PARTS LIST

Cal. V181A

**[BATTERY AND ELECTRONIC CIRCUIT  
- GEAR TRAIN MECHANISM AND STEPPING MOTOR -  
SETTING MECHANISM]**



● Please see the remarks on the following pages.

# PARTS LIST

Cal. V181A

- 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.

④ Casing ring    Large: 82840960    Small: 82840940

②④ Setting stem    0351500

\* For screw down crown models, the stem is assembled to the crown and is not available separately.

**Note:**

① Solar cell unit            Large: 4025543                      Small: 4025575

\* When ordering this part, make sure which size you need by visually observing the disassembled part. Our parts catalogue currently shows both sizes under the same model.

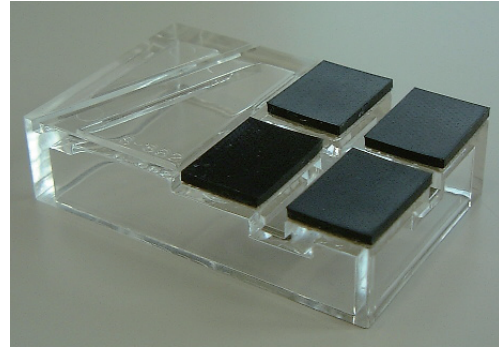
# PARTS LIST

Cal. V181A

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

- **Movement holder**

UNIVERSAL MOVEMENT HOLDER (S-682)



- **Watch oils**

SEIKO watch oils (AO-3 and AO-2)

AO-3



AO-2



## 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.

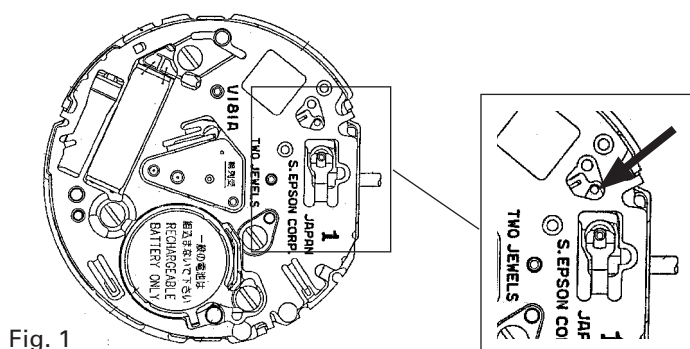


Fig. 1

### ● SOLAR POWER GENERATION MECHANISM – POSITIONS OF THE HOOKS

<Disassembling>

Dial

The dial is fixed to the CASING RING with four hooks of the CASING RING (a, b, c and d in Fig. 2).

When disassembling the dial, insert the tip of a screwdriver into a gap between the dial and the SOLAR CELL UNIT near a hook, then, pry up the dial to release it (refer to the Fig. 3). Follow the same procedure to release all the four hooks.

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

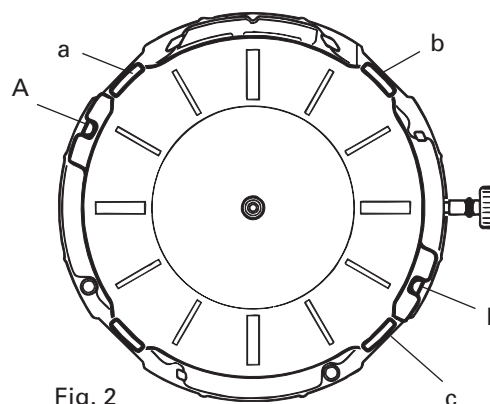


Fig. 2

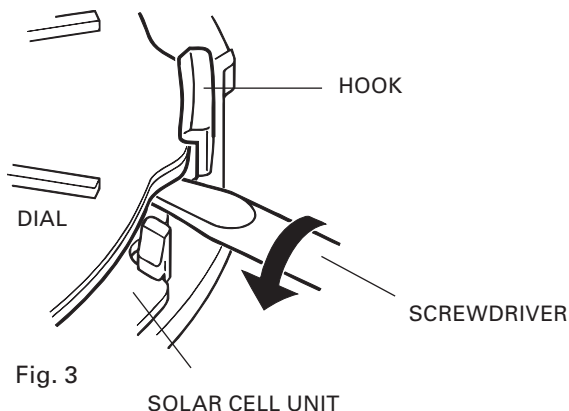


Fig. 3

## ① SOLAR CELL UNIT

The positions of a hook for the SOLAR CELL UNIT are different for a large size one (a, b, c and d in Fig. 4) and a small size one (a, b and c in Fig. 5). Following illustrations show their positions for each size of the SOLAR CELL UNIT.

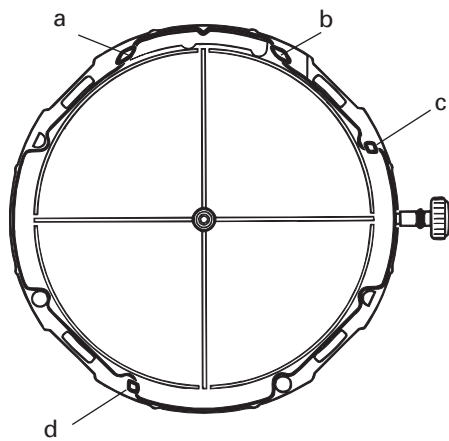


Fig. 4 (Large size)

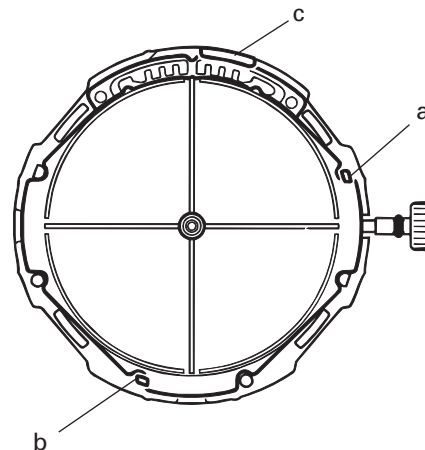


Fig. 5 (Small size)

When disassembling the SOLAR CELL UNIT, insert the tip of a screwdriver into a gap between the SOLAR CELL UNIT and the CASING RING near a hook of the CASING RING, then, pry up the SOLAR CELL UNIT to release it (refer to the Fig. 6). Follow the same to release all the hooks except for the hook c for the small size SOLAR CELL UNIT.

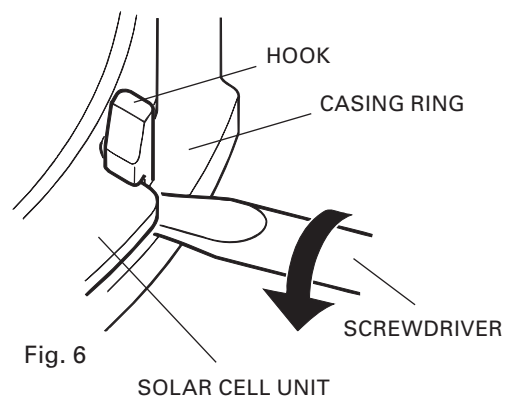


Fig. 6

When releasing the hook c for the small size SOLAR CELL UNIT, release the hook a and b, then, gently slide the SOLAR CELL UNIT as illustrated in Fig. 7. DO NOT insert a screwdriver near the hook c as it may damage the SOLAR CELL UNIT.

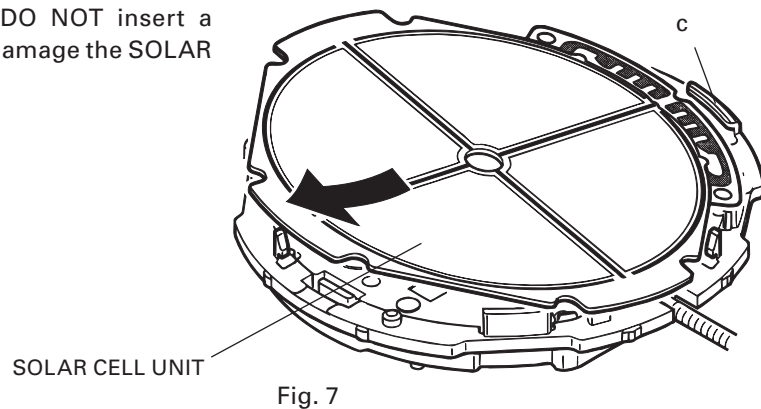


Fig. 7



### ③ EARTHING SPRING

The EARTHING SPRING is fixed to the CASING RING with its two hooks (a and b in Fig. 8). Please release them when disassembling the spring from the CASING RING.

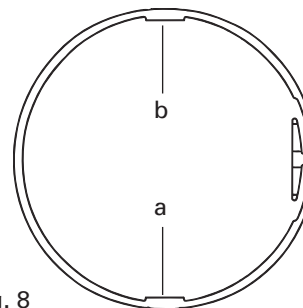


Fig. 8

### ④ CASING RING

When disassembling the CASING RING from the movement, release its two hooks (a and b in Fig. 9).

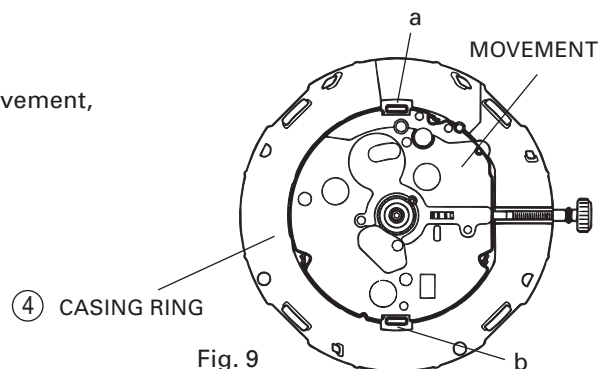


Fig. 9

### <Reassembling>

When reassembling the CASING RING, the EARTHING SPRING, the SOLAR CELL UNIT and the dial, please make sure that all the hooks are secured.

## ● RECHARGEABLE BATTERY AND ELECTRONIC CIRCUIT

### ⑧ RECHARGEABLE BATTERY UNIT

Please refer to the assembly position of the RECHARGEABLE BATTERY UNIT as illustrated in Fig. 10.

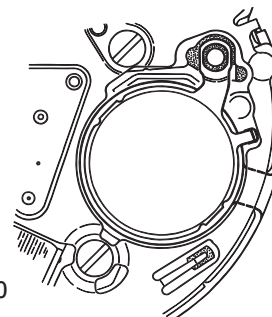


Fig. 10

### ⑧ RECHARGEABLE BATTERY UNIT

### ⑩ CIRCUIT BLOCK COVER

The cover has three hooks to fix it to the MAIN PLATE (Fig. 11). Make sure that all the hooks are disengaged or secured when disassembling or reassembling it.

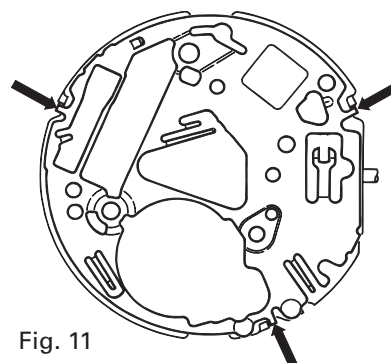


Fig. 11

## ● GEAR TRAIN MECHANISM - WHEEL ASSEMBLY POSITION AND LUBRICATION INSTRUCTIONS

- 13 FOURTH WHEEL      16 STEPPING ROTOR
- 14 THIRD WHEEL      17 MINUTE WHEEL
- 15 FIFTH WHEEL      18 SETTING WHEEL

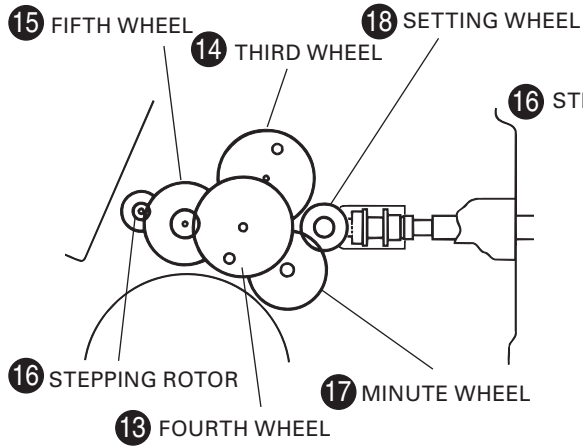


Fig. 12 Wheel assembly position

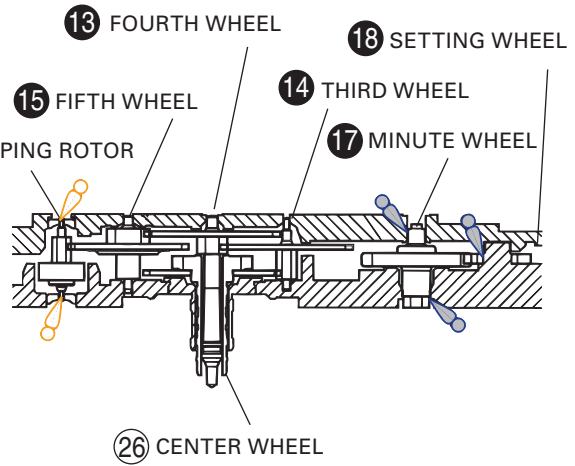


Fig. 13 Lubrication instructions

## ● SETTING MECHANISM - ASSEMBLY POSITION AND LUBRICATION INSTRUCTIONS

- 19 TRAIN WHEEL SETTING LEVER (Fig. 16)
- 22 SETTING LEVER (Fig. 15)
- 23 YOKE (Fig. 14)

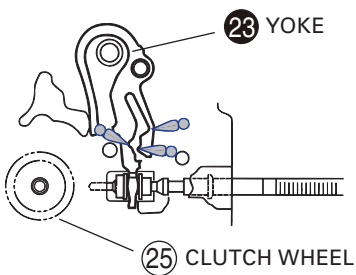


Fig. 14

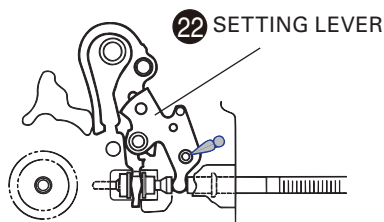


Fig. 15

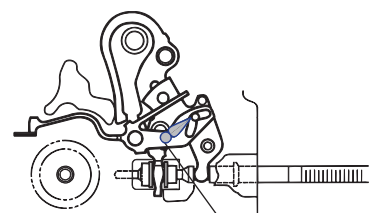


Fig. 16

## REMARKS ON INSPECTION AND MEASUREMENT

### ● CHECKING THE ELECTRICAL CHARACTERISTICS

<Coil resistance>

Check the resistance of the ⑳ COIL BLOCK if it falls between 1.80 and 2.20 kΩ.

<How to measure the current consumption for the whole movement>

- 1) Remove the ① SOLAR CELL UNIT and the ⑧ RECHARGEABLE BATTERY UNIT from the movement.
- 2) Connect the (-) probe to the (-) input terminal of the ①① CIRCUIT BLOCK and (+) probe to the ⑳ BATTERY CONNECTION (+) as illustrated in Fig. 17.

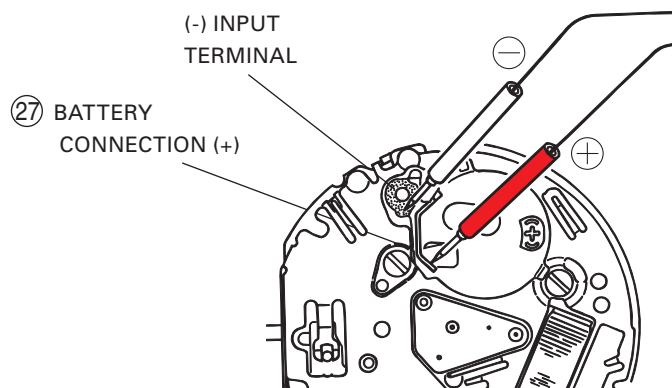


Fig. 17

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

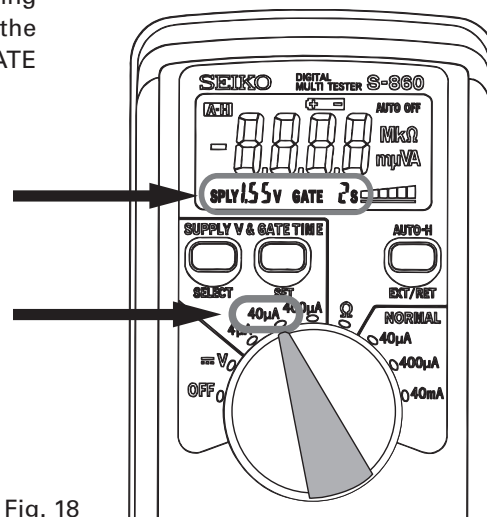


Fig. 18

- 3) Wait until a stable measurement becomes available. It usually takes 30 seconds to a few minutes for getting a stable measurement.
- 4) Make sure that the read value is less than 0.80μA.

<How to measure the current consumption for the CIRCUIT BLOCK alone>

1) Connect each probe to the appropriate (-) and (+) input terminal of the ⑪ 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 $\mu$ A of SUPPLY V (=1.55V) & GATE TIME (2S).
- \* Avoid exposing the CIRCUIT BLOCK to direct light in order to obtain the correct measurement.

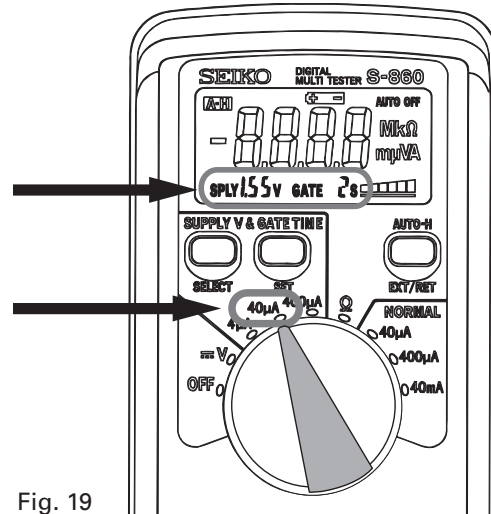


Fig. 19

- 2) Wait until a stable measurement becomes available. It 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 $\mu$ A.

## [Structure of the CIRCUIT BLOCK]

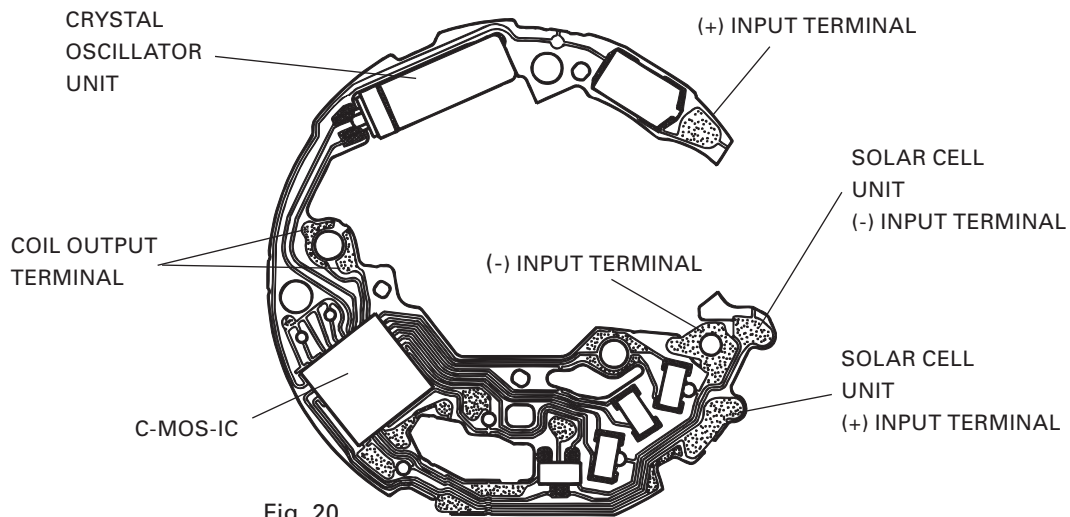


Fig. 20

**Note:** In case the measurement of the current consumption for a whole movement exceeds the standard value but the measurement for the circuit falls below the standard value, a problem in the gear train mechanism is suspected. Please disassemble and overhaul the movement and measure the current again.

## ● CHECKING THE SOLAR POWER GENERATION SYSTEM

<How to check the solar power generation with the watch>

- 1) Remove the **8** RECHARGEABLE BATTERY UNIT from the watch.
- 2) Pull out the crown to the 1st click in order to reset the circuit.
- 3) Connect the (-) probe to the (-) input terminal for the SOLAR CELL UNIT and (+) probe to the **10** CIRCUIT BLOCK COVER (as illustrated in Fig.21).

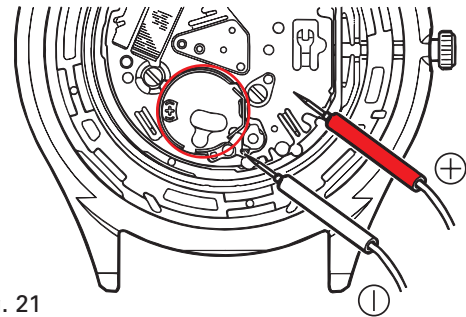


Fig. 21

- \* When measuring the voltage using the SEIKO digital multi-tester (S-860), use the range of mV (Fig. 22).

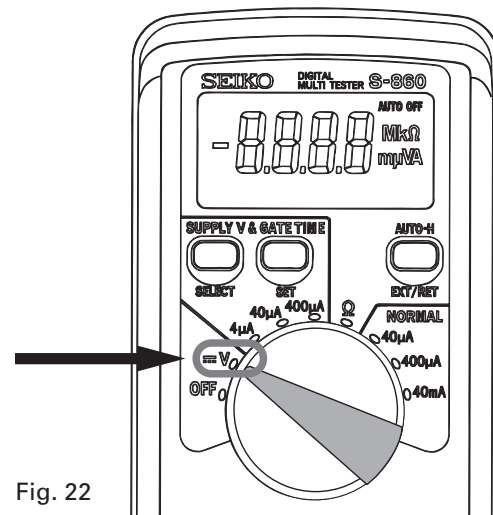


Fig. 22

- 4) Expose the watch to the light of a fluorescent lamp (use the one with 15 to 20 watts) at a distance of 5 cm while connecting the probes to the watch (Fig. 23).
- 5) Read the measurement and check if it exceeds 2.3 V.

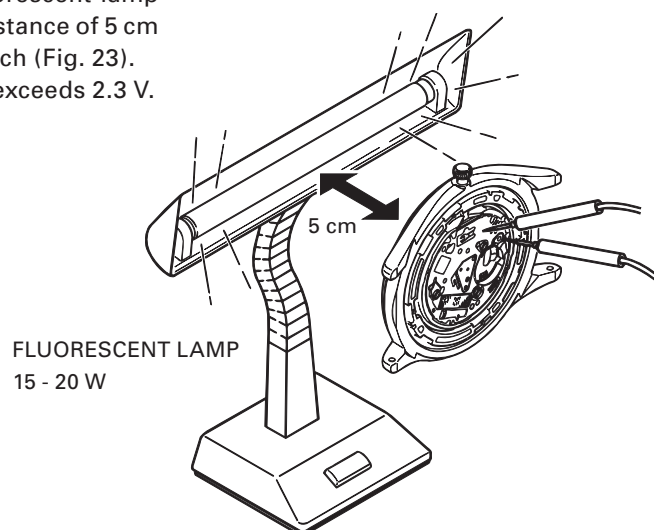


Fig. 23

<How to check the solar power generation with the SOLAR CELL UNIT alone>

- 1) Connect each probe to the appropriate (-) and (+) output terminal of the ① SOLAR CELL UNIT. As the positions of the output terminal are different for a large size one and a small size one, please refer to the following illustrations in order to find the right positions of the terminal.

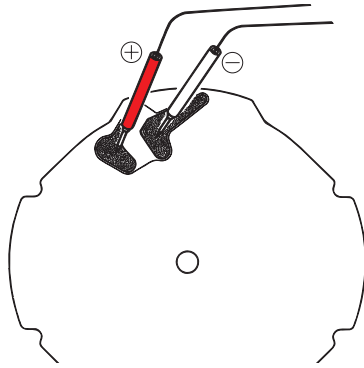


Fig. 24 ( Large size )

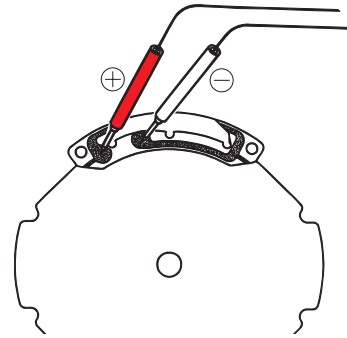


Fig. 25 ( Large size )

- \* When measuring the voltage using the SEIKO digital multi-tester (S-860), use the range of mV (Fig. 26).

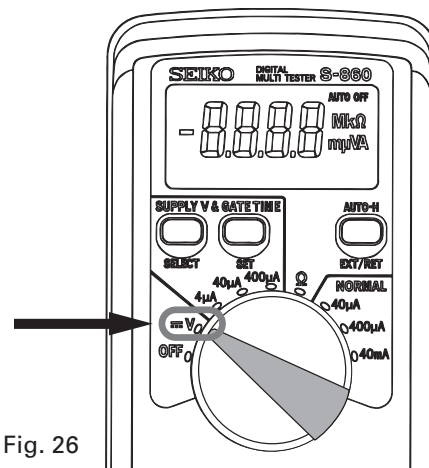
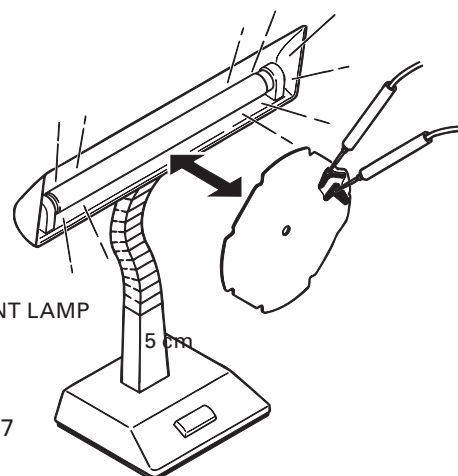


Fig. 26

- 2) Expose the SOLAR CELL UNIT to the light of a fluorescent lamp (use the one with 15 to 20 watts) at a distance of 5 cm while connecting the probes to the solar cell unit (Fig. 27).
- 3) Read the measurement and check if it exceeds 2.3 V.



FLUORESCENT LAMP  
15 - 20 W  
5 cm

Fig. 27

**Note:** In case the measurement of the voltage for the watch does not achieve the standard value but the measurement for the solar cell unit alone exceeds the standard value, a problem in the electrical conductivity between the solar cell unit and the movement is suspected. Inspect the electrical conductivity, especially at the ② CONTACT SPRING FOR SOLAR CELL UNIT, and check the solar power generation system again.

## ● CHECKING THE INSTANT-START FUNCTION

The instant-start function works when the voltage of the rechargeable battery is more than 0.9V. Therefore, please measure the battery voltage and make sure that the battery is ready for checking the instant-start function.

- \* When measuring the voltage of the rechargeable battery, connect the (-) probe to the ⑦ RECHARGEABLE BATTERY UNIT SCREW and (+) probe to the ⑩ CIRCUIT BLOCK COVER as illustrated in Fig. 28.

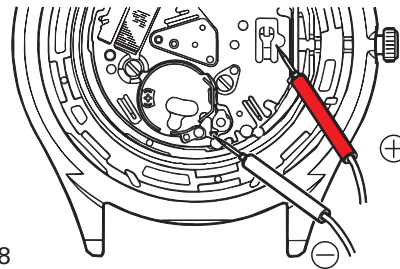


Fig. 28

<How to check the instant-start function>

- 1) Place the watch which stops working at a distance of 50 cm under the fluorescent lamp of 15 to 20 watts (Fig. 29).
- 2) Check if the second hand of the watch starts moving at 2-second intervals within 10 seconds.

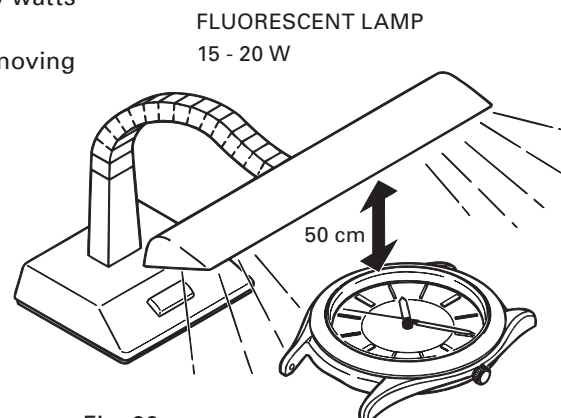


Fig. 29

## ● CHECKING THE RECHARGING FUNCTION

In order to check the recharging function, measure the voltage of the rechargeable battery before and after recharging. If the voltage increases to a certain extent, it shows that the recharging function is working properly.

- 1) Measure the voltage of the rechargeable battery before recharging (please refer to Fig. 28 of page 15 for where to apply the probes of the tester).
- 2) Recharge the watch by placing it at a distance of 5 cm under the fluorescent lamp of 15 to 20 watts for 30 minutes (Fig. 30).

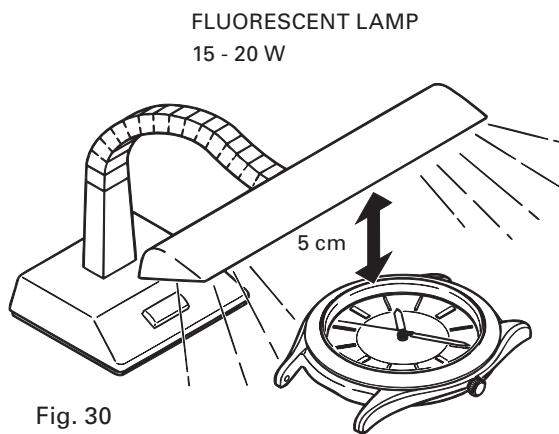


Fig. 30

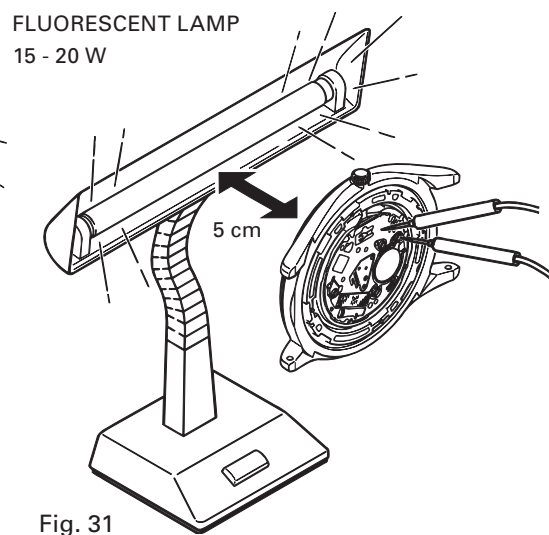


Fig. 31

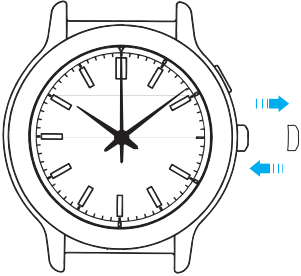
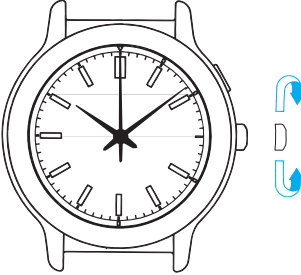
- 3) Measure the voltage again while keeping the watch exposed to the light (Fig. 31).
- 4) Compare the difference of the voltage before and after recharging. Refer to the table below for the criteria of the inspection.

Table - criteria recharging function Cal. V181A

The voltage BEFORE recharging	Results after recharging and criteria for checking the function	
	Recharging function works fine	The battery needs to be inspected and replaced if necessary
0.50V - 1.00V	More than 1.20V	Less than 1.19V
1.01V - 1.30V	Increased by 0.04V or more	Not increased or increased but not more than by 0.04V

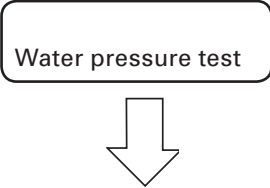




● CHECKING THE GENERAL FUNCTION

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 - switching the function of the time setting</p>	<p>Make sure that it has a click at each position and the stem is not pulled off.</p>
 <p>Pull out the crown to the 1st click, then turn it.</p>	<p>Second hand stop function (if available)</p>	<p>Make sure that the second hand stops when the crown is pulled out to the 1st click.</p>
	<p>Setting mechanism - hour and minute hand setting</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>
	<p>Hands installation</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	Condensation test	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		Water pressure test
He-GAS DIVER'S 600 m		75 BAR = 600 (m) times 0.125
He-GAS DIVER'S 1000 m		Condensation test

● **CHECKING THE ACCURACY - INSTANTANEOUS RATE**

Measure the rate and make sure the value shows within  $\pm 0.66$  s/d.

Use 10-second gate of the tester.