

# TECHNICAL GUIDE AND PARTS LIST

CAL. V12 SERIES

ANALOGUE QUARTZ

## CONTENTS

I. FOREWORD .....	1
II. SPECIFICATIONS .....	2
III. LIST OF SCREWS USED.....	2
IV. DISASSEMBLING, REASSEMBLING AND LUBRICATING .....	3
1. Calendar mechanism.....	3
2. Circuit block · Drive Coil · Gear train/Selector mechanism.....	4
«Lubrication List» .....	5
V. CLEANING.....	5
(1) How to clean.....	5
(2) Parts that must not be cleaned.....	5
VI. CHECKING AND ADJUSTMENT .....	6
(1) Structure of circuit block.....	6
(2) Positions of terminals in movement.....	6
(3) Guide table for checking and adjustment.....	7
(4) Procedures for checking and adjustment.....	8
A. Quick start function.....	8
B. Fully charged capacitor.....	8
C. Solar cell output voltage .....	8
D. Solar cell conductivity.....	9
E. Capacitor unit conductivity.....	9
F. Circuit block conductivity .....	9
G. Movement operation.....	10
H. Output signal .....	10
I. Reset condition.....	10
J. Coil block .....	11
K. Accuracy.....	11
L. Operation life.....	11
M. Current consumption .....	11
VII. PARTS LIST.....	12 ~ 13

## I. FOREWORD

The V12 series are battery-less men's analogue quartz watches featuring a higher degree of perfection, developed based on technology and knowhow accumulated through our current V10 series.

### «Features»

1. The V12 series feature the following improvements compared to the current V10 series.

#### 1) More slim, more compact

- The "solar cell dial" structure uses a newly-developed solar cell (formed on a thin stainless-steel substrate) as the dial, allowing the total thickness of the watch to be thinner than ever.
- The plane size is also minimized (equivalent to 10-1/2 size) by the use of the newly-developed small capacitor as well as by the large side cut (19.3 mm) provided in the direction of 3H - 9H.

#### 2) Harder to stop

- The charging capacity has been increased by expanding the surface area of the solar cell and by improving the power generation efficiency under the illumination range that a wrist watch may undergo in normal use.  
Charging efficiency: 1000 lux.H/day
- For more efficient utilization of available energy, the amount of charge into the capacitor has been increased by raising the limit voltage (from 1.8V to 2.3V) so that the duration time is extended.

#### 3) Less care required for after-sales maintenance

Even if a silver battery is mounted by mistake, the new safety mechanism prevents the watch from being powered by it, preventing danger of battery burst, etc.

2. The V12 series also inherits the excellent advantages of the current V10 series.

#### 1) Functions that make the use of solar-powered watch easier and more convenient

##### ● Quick start function:

Even when the capacitor is completely discharged, the watch recharges and will start within a few seconds after exposure to a strong light (more than 3000 lux: i.e. below 6 to 12 cm of a fluorescent lamp or a 60-watt incandescent lamp).

##### ● Charge Demand Display (CDD):

When the capacitor is nearly discharged, the second hand starts moving at two-second intervals to indicate that charging is required. The watch still works for about 15 hours from this state.

##### ● Over-charging prevention function:

When the capacitor is charged to the specified limit (2.3V), the over-charging prevention function operates to prevent capacitor deterioration or damage.

#### 2) Wide-voltage, low-power motor

The specified output torque, anti-magnetism performance, etc. are maintained even when the voltage varies greatly during the charging or discharging of the capacitor.

### «Notes on servicing»

#### 1. Precautions for handling the solar cell dial

- While the base substrate of the solar cell used with this watch is made of rigid stainless steel, its front surface is coated with relatively soft material and requires care to prevent scratches during handling. Especially, never use the surface as a lever support when removing the hands. Scratches or deformation will degrade the characteristics of the solar cell.
- The solar cell dial and holding ring for dial are adhered to each other. Never attempt to separate them.

#### 2. Operation check for movement

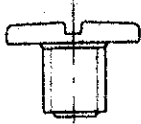
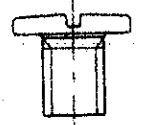
- This watch incorporates a safety mechanism which inhibits the operation of movement when anything other than the exclusive capacitor unit is incorporated in the watch. This function is provided to prevent danger which may be caused when a silver battery loaded by mistake or bursts due to charging. As a result, to check the operation of movement, supply external power.

## II. SPECIFICATIONS

Item	Cal. No.	V121A	V122A
Time indication		Three hands	
Additional mechanism		—	Date
		—	Date quick resetting device
		Second setting device	
		Electronic reset switch	
		Quick start function	
		Capacitor charge demand display (second hand moves at two-second intervals)	
Loss/gain		Monthly rate: less than 20 seconds at normal temperature range (except when second hand moves at two-second intervals)	
		Over-charging prevention function	
Movement size	Outside diameter of main plate	ø25.0 mm x 19.3 mm (3H - 9H) x 24.0 mm (12H - 6H)	
	Casing diameter	ø24.0 mm x 19.3 mm x 23.3 mm	
	Height	2.99 mm	2.35 mm
Regulation system		None	
Quartz Tester measuring gate		10-second gate	
Capacitor		EECW 2R8E334 (Matsushita)	
Jewels		1 jewel	

## III. LIST OF SCREWS USED

Two types of screws are used in Cal. V12 series. When servicing the watch, refer to the table below.

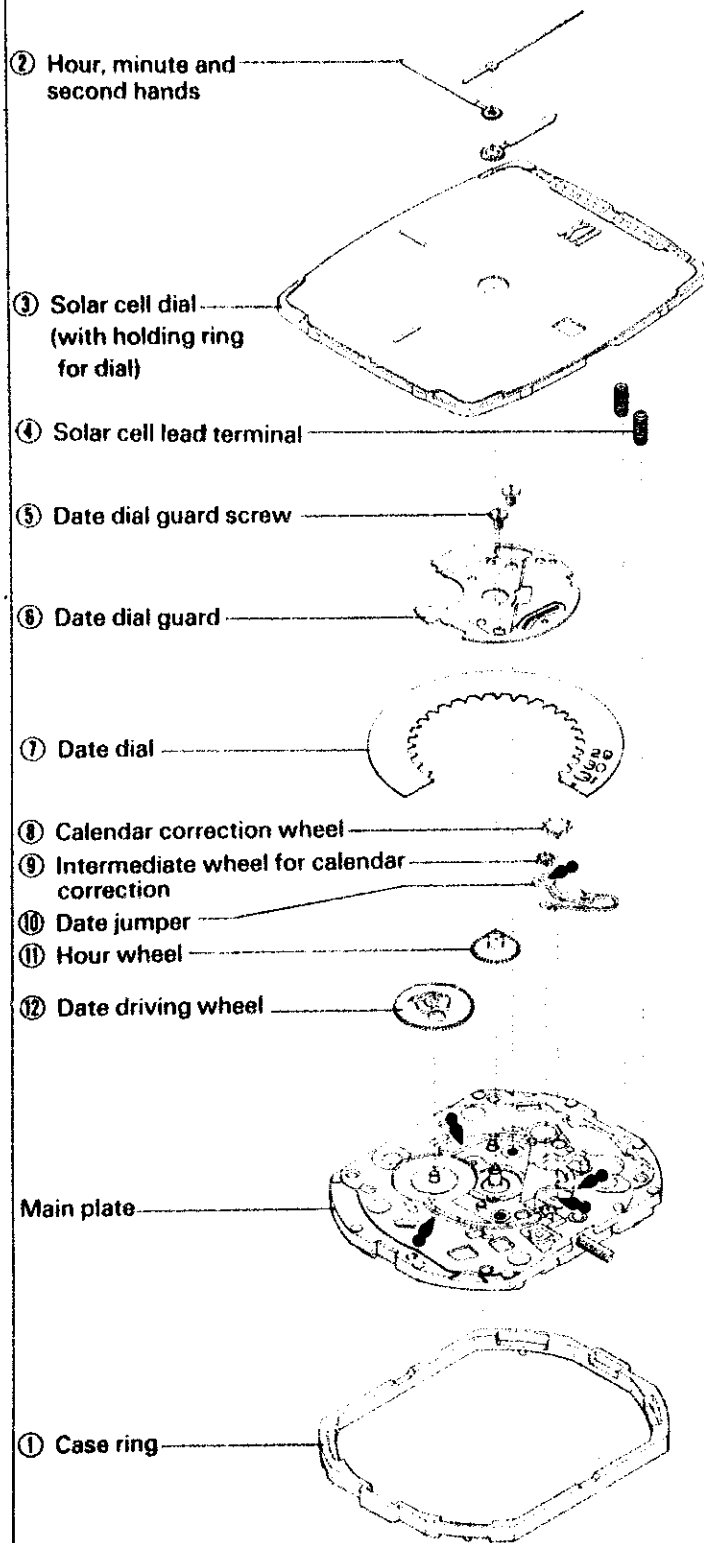
Type	Parts No.	Parts name	Difference (Screw head dia.)
	022 410	Train wheel bridge screw ..... 1 pcs. Coil block screw ..... 1 pcs. Battery connection (+) screw ..... 3 pcs.	Large (ø1.5 mm)
	022 248	Date dial guard screw ..... 2 pcs.	Smaller (ø1.3 mm)

## IV. DISASSEMBLING, REASSEMBLING AND LUBRICATING

Disassembling procedures: Figs ① ~ ⑫

Reassembling procedures: Figs ⑬ ~ ⑰

### 1. Calendar mechanism



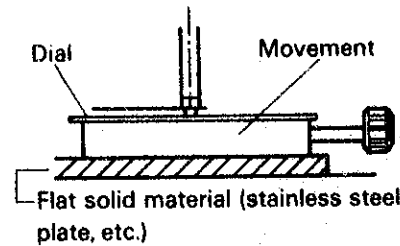
● Lubricating: Moebius A

#### Note on removing the hands

- Never use the solar cell dial as the lever support for removing the hands, for the surface may be scratched or deformed.

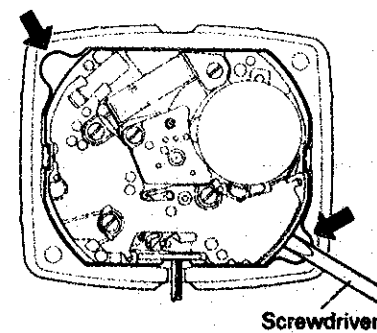
#### Note on fitting the hands

- When fitting the hands, remove the capacitor unit and support the whole surface of the train wheel bridge with a flat solid material (stainless steel, etc.), then press in the hands.

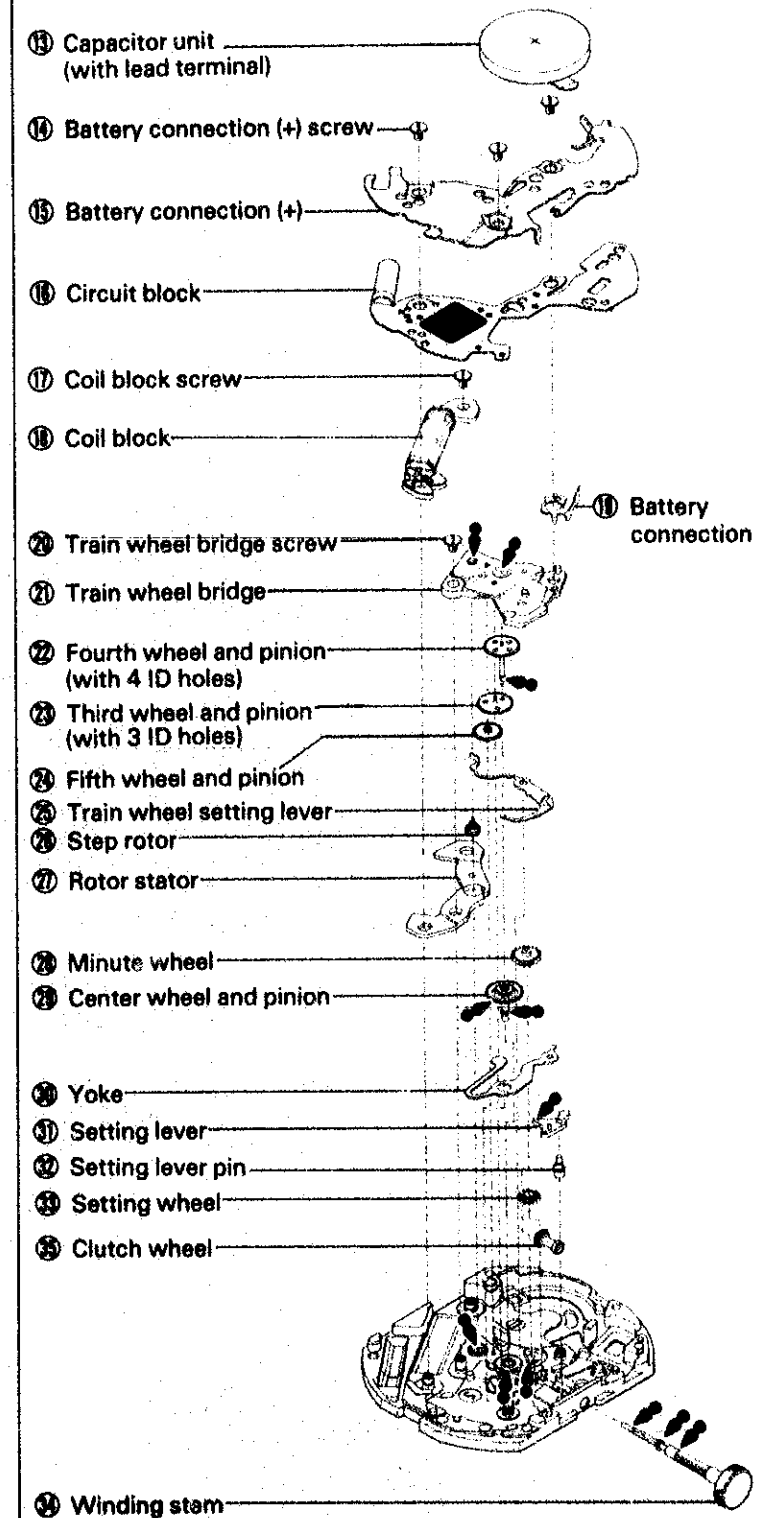


#### Notes on disassembly and reassembly of the solar cell dial

- The solar cell dial and holding ring for dial are adhered to each other; never attempt to separate them.
- The solar cell dial is mounted via the two feet of the holding ring for dial inserted into the guide holes on the main plate and via the two hooks of the holding ring for dial hooked in the guide groove of the main plate. To remove the dial, let it float by inserting a screwdriver into the gaps on 5H and 11H positions of the holding ring for dial as follow:
- Be careful in handling the solar cell dial so as not to deform it or scratch its surface.



### 2. Circuit block · Drive Coil · Gear train/Selector mechanism



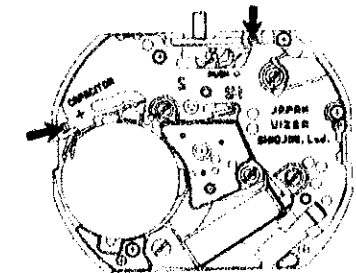
#### Note: HOW TO MOUNT THE CAPACITOR UNIT

The capacitor unit is mounted by inserting it diagonally so that the wider side of the lead terminal comes in contact with the side of the battery connection (-).



#### Note: HOW TO MOUNT OR REMOVE THE BATTERY CONNECTION (+)

The battery connection (+) is equipped with two claws to be inserted in the holes on the main plate. Therefore, the battery connection (+) shall be removed by disengaging these claws after loosening the screw, and shall be mounted by engaging these claws before tightening the screw.



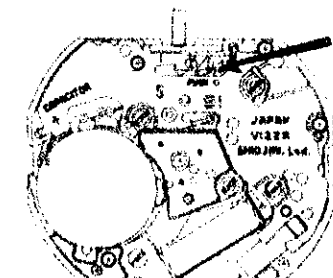
#### Note: BATTERY CONNECTION (+)

Two different part shapes, completely interchangeable, are available. See number ⑮ above or illustration below.




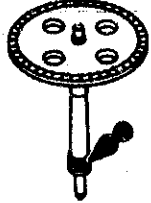
#### Note: HOW TO REMOVE THE WINDING STEM

To remove the winding stem, press the portion indicated with PUSH in the below figure with the crown set to the first click position.



**Note:**  
For the assembly of the gear-train/selector mechanism, refer to the Technical Guide of the V3 series. (The shapes of train wheel setting lever and yoke are partially different from the V3 series.)

«Lubrication list»

		Center wheel and pinion	Fourth wheel and pinion
Date dial guard	● Tip of the date jumper		
Main plate	● Sliding part of date dial (3 portions) ● Rear surface of calendar correction wheel ● Setting wheel shaft ● Step rotor shaft hole ● Center wheel and pinion shaft hole		
Setting lever	● Contact portion with yoke		
Winding stem	● Whole surface		
Train wheel bridge	● Step rotor shaft hole ● Fourth wheel and pinion shaft hole		

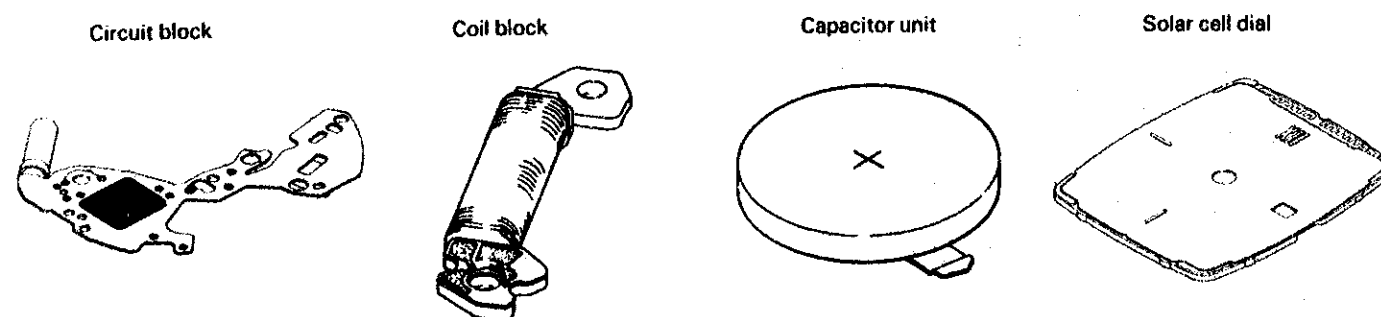
V. CLEANING

● The Cal. V12 series employs many plastic parts. Carefully clean the parts referring to the table below.

(1) How to clean

Name of parts	Cleaning	Drying	Solution	Remarks
● Plastic parts (main plate, train wheel bridge)	● Rinse or scrub with a soft brush.	● Warm air drying	● Benzine ● DIFLON S-3 ● Alcohol	● Use Rodico to wipe off the hard contamination. ● Clean with benzine for a short time.
● Other parts (excluding parts that must not be cleaned.)	● Clean with a cleaner, rinse or gently scrub with a soft brush.	● Warm or hot air drying	● Benzine ● DIFLON S-3 ● Alcohol ● Trichloroethylene	● As the step rotor is a magnetic parts, clean with a pure solution.

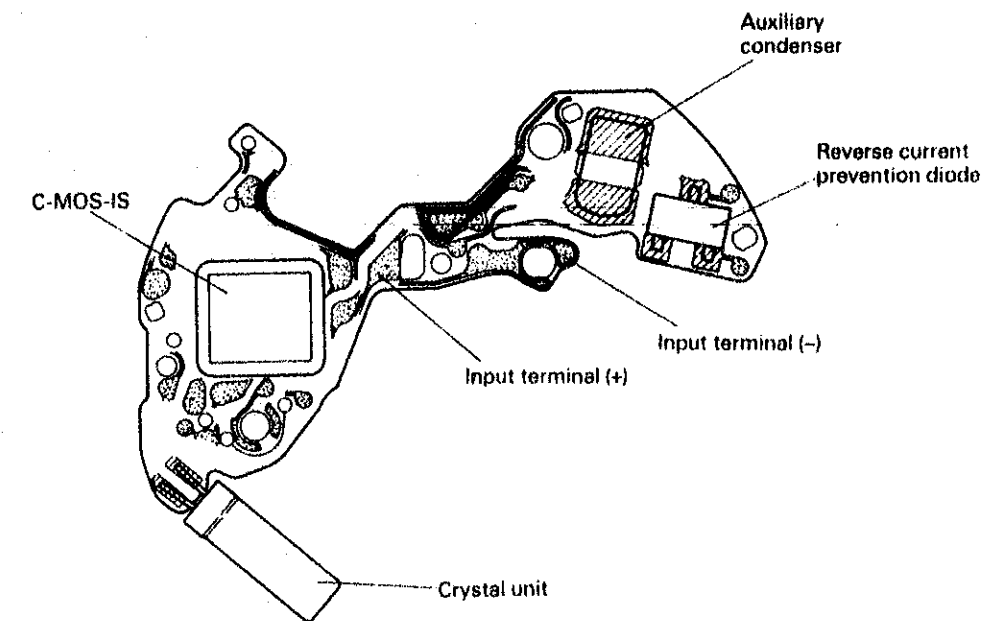
(2) Parts that must not be cleaned



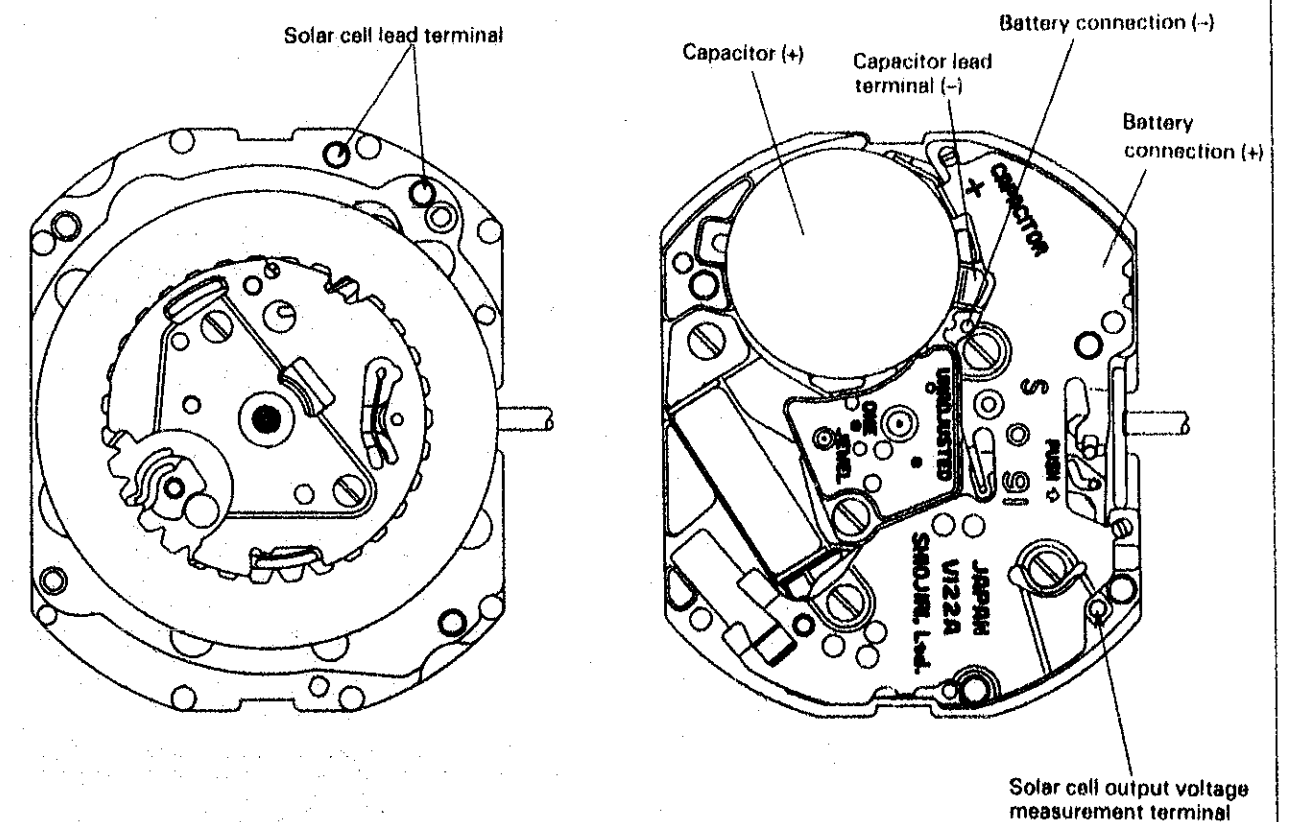
● Be sure to clean only stains on the conductive portions of the circuit block, etc. with a cloth moistened with benzine, DIFLON S-3 or alcohol and dry them with warm air.

VI. CHECKING AND ADJUSTMENT

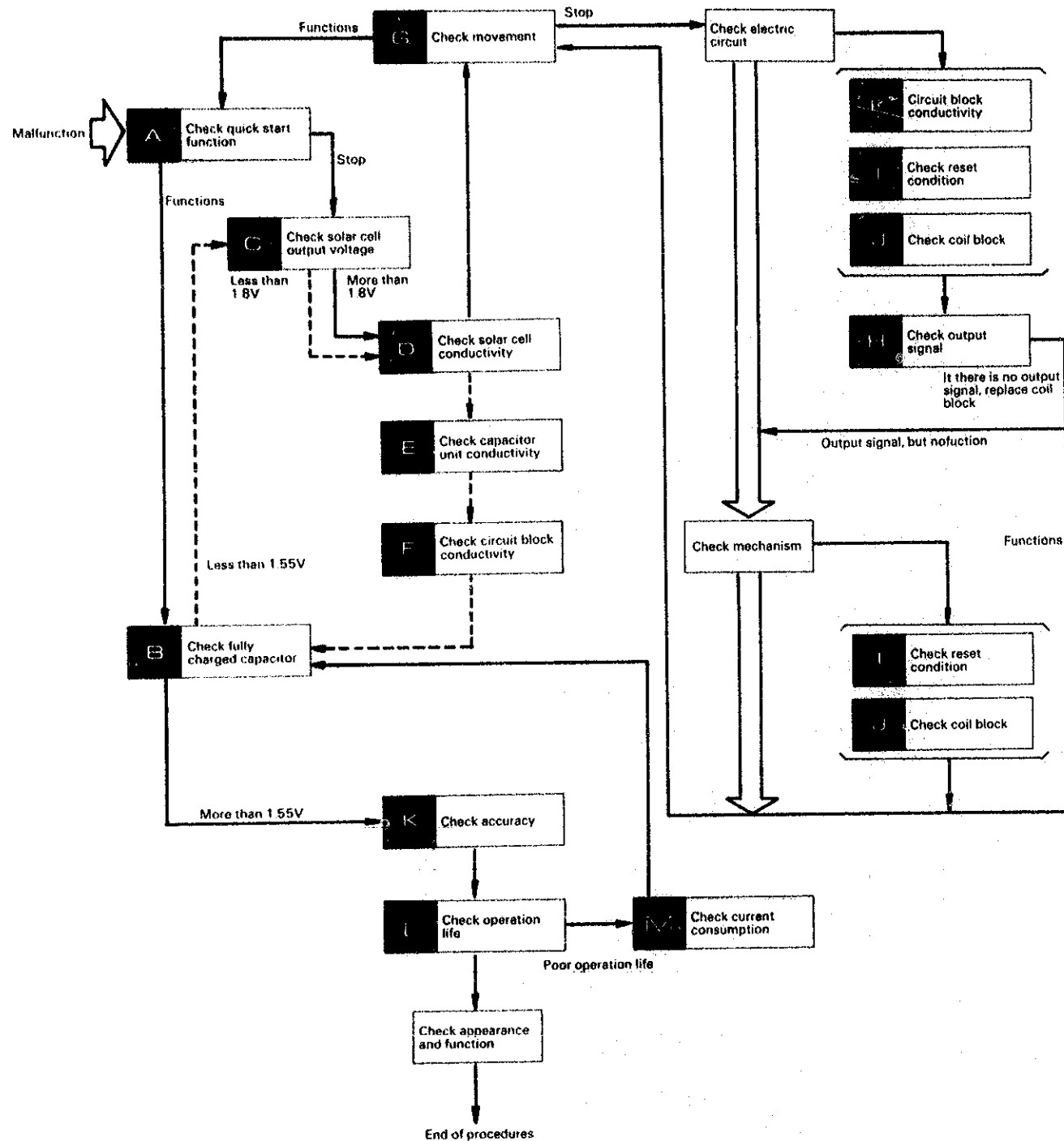
(1) Structure of circuit block



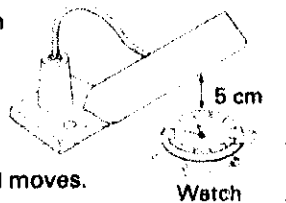
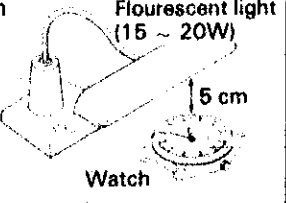
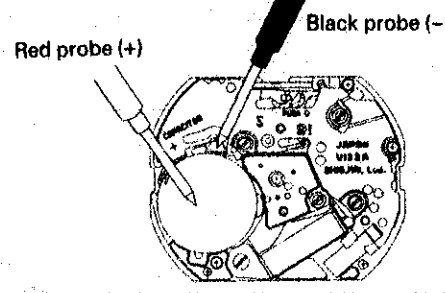
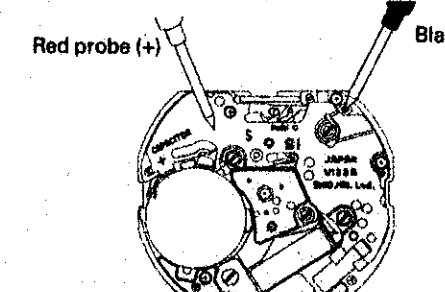
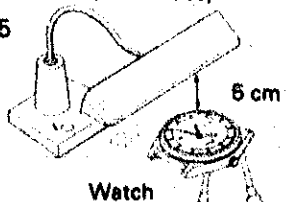
(2) Positions of terminals in movement



(3) Guide table for checking and adjustment



(4) Procedures for checking and adjustment

<p><b>A QUICK START FUNCTION</b></p>	<p>Check that watch starts functioning after illumination.                  (1) Illuminate the watch (the solar cell portion) 5 cm under the fluorescent light (15 ~ 20W) as shown in the right figure.</p>  <p>(2) After 10 second illumination, check that the hand moves.</p>	<p><b>Result:</b></p> <ul style="list-style-type: none"> <li>● Hand moves ..... Normal</li> <li>● Hand does not move.....Defective</li> </ul> <p>Check the conductivity of solar cell lead terminal and replace circuit block.</p> <p>(Hand moves ..... Normal                  Hand does not move .... Defective                  Proceed to <b>C</b>)</p>
<p><b>B FULLY CHARGED CAPACITOR</b></p>	<p>Check the capacitor when it is fully charged.                  (1) To charge the capacitor fully, illuminate the watch (the solar cell portion) 5 cm under the fluorescent light (15 ~ 20W) for 2 hours as shown in the right figure.</p>  <p>(2) Check the capacitor voltage.</p> <ul style="list-style-type: none"> <li>● Remove the case back.</li> <li>● Set up the Digital Multi-Tester (S-840A). (Range to be used: DCV)</li> <li>● Measurement Red probe (+) ... Capacitor (+) surface                      Black probe (-) ... Capacitor lead terminal (-)</li> </ul> 	<p><b>Result:</b></p> <ul style="list-style-type: none"> <li>● More than 1.55V ..... Normal</li> <li>● Less than 1.55V ..... Defective</li> </ul> <p>Proceed to <b>C</b></p>
<p><b>C SOLAR CELL OUTPUT VOLTAGE</b></p>	<p>Check the output voltage from the solar cell which is receiving light.                  (1) With the case back removed, connect the Digital Multi-Tester S-840A as follows.                  Range to be used: DCV                  Red probe (+) ..... Battery connection (+)                  Black probe (-) ..... Solar cell output voltage measurement terminal</p>  <p>(2) With the probes applied to the terminals, expose the solar cell to a light from a fluorescent lamp (15 to 20W) 5 cm directly above the watch.</p> 	<p><b>Result:</b></p> <ul style="list-style-type: none"> <li>● More than 1.8V ..... Normal</li> <li>● Less than 1.8V ..... Defective</li> </ul> <p>Replace the solar cell dial</p>

### D SOLAR CELL CONDUCTIVITY

Check if the conductivity of the solar cell, solar cell lead terminal and circuit block is not obstructed by contamination or poor contact.

Result:

- Conductivity OK → Normal  
Stopped with check **A**  
→ Proceed to **G**
- No voltage with check **B**  
→ Proceed to **E**
- Poor conductivity → Defective  
Remove contamination or dirt.  
Assemble again.

### E CAPACITOR UNIT CONDUCTIVITY

Check the capacitor unit for conductivity.

- (1) Check if the conductivity of the capacitor and lead terminal are not obstructed by short-circuit or contamination.
- (2) Check if the lead terminal is not deformed or its soldering is not slipped.

Result:

- (1)
    - Conductivity OK → Normal
    - Poor conductivity → Defective  
Remove contamination or dirt.
  - (2)
    - Lead terminal not deformed, solder present → Normal
    - Lead terminal deformed and/or solder lost → Defective  
Replace the capacitor unit.
- When both (1) and (2) are normal → proceed to **F** and then, to **B**.  
If the voltage of the capacitor fully charged is still below 1.55V, replace the capacitor.

### F CIRCUIT BLOCK CONDUCTIVITY

Check the circuit block for conductivity.

- (1) Check the battery connection (+) and (-) for screw loose, short circuit and contamination.
- (2) Check for any part unsoldered or short circuited.

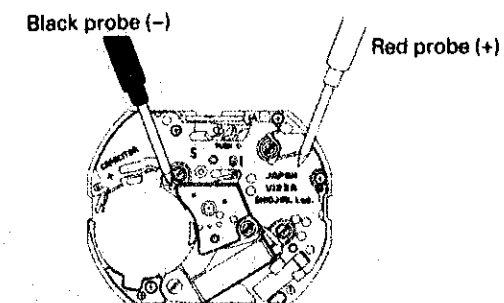
Result:

- (1)
    - Conductivity OK → Normal
    - Poor conductivity → Defective  
Remove the contamination and retighten.
  - (2)
    - No part unsoldered or short circuited → Normal
    - Some part unsoldered or short circuited are present → Defective  
Replace the circuit block
- When both (1) and (2) are normal → proceed to **B**.  
If the voltage is still below 1.55V after replacing the capacitor, replace the circuit block.

### G MOVEMENT OPERATION

Supply an external power and check the operation of the movement.

- (1) Remove the capacitor.
- (2) Using the SEIKO Digital Multi-Tester S-840A with Multi-Adapter MA-40A or a Micro Test, check if the movement operates.  
Red probe .... Battery connection (+)  
Black probe .... Battery connection (-)



Result:

- Operates .... Normal
- Does not operate .... Defective  
Check the electric circuit

### H OUTPUT SIGNAL

With external power supplied, check if the signal is output.

1. Use the Quartz Tester.
2. Check to see if the input indicator light blinks.

NOTE:

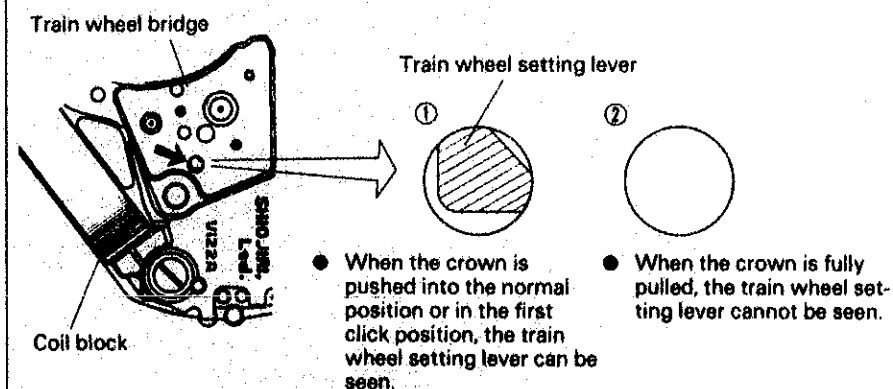
- Checking should be made with the crown set to normal position.
- The US-32 timing microphone cannot be used.

Result:

- Output signal: Normal  
(One-second blinking)
- No output signal:  
(No one-second blinking)

### I RESET CONDITION

- (1) When the crown is fully pulled, the second hand should be stopped completely. When the crown is set to the normal position, the second hand should start moving after 1 second.
- (2) Check the condition of the train wheel setting lever viewing through the hole in the train wheel bridge near the coil block as shown in the figure.



Result:

- (1) Stops completely and starts moving after one second .... Normal  
Does not stop or move irregularly .... Defective  
Proceed to (2)

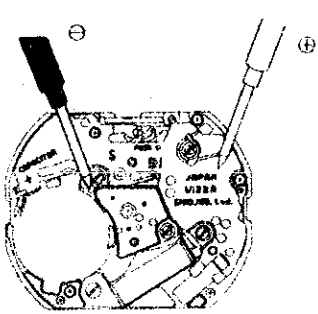
(2)

- Correct (figure ①, ②): Normal
- Falut: Defective  
Replace the train wheel setting lever.

- (3) When the crown is fully pulled, check the output signal by using Quartz Tester.

Result:

- No output signal: Normal
- Output signal: Defective  
Replace the circuit block.

<b>J COIL BLOCK</b>	
Check the coil block for broken wire and short circuit. 1. Set up the Digital Multi Tester (S-840A). Range to be used: $\Omega$	2.4 k $\Omega$ ~ 2.8 k $\Omega$ .... Normal } More than 2.8 k $\Omega$ (Broken wire) } Less than 2.4 k $\Omega$ (Short circuit) .... Defective Replace the coil block.
<b>K ACCURACY</b>	
Check loss and gain by using Quartz Tester (10-second) and an electro-magnetic microphone (DM-1).  <b>NOTE:</b> ● Check accuracy with the crown at normal position. ● The US-32 timing microphone cannot be used. ● Do not measure during two second intervals operation.	<b>Result:</b> Monthly rate (at normal temperature range) Less than 20 seconds: Normal More than 20 seconds: Defective Replace the circuit block
<b>L OPERATION LIFE</b>	
Measure the operating time from the fully-charged condition of the capacitor to the stop of the watch. (1) Check that the capacitor voltage is 1.55V or more. (If it is below 1.55V → proceed to <b>E</b> .) (2) Adjust date and time, and start running. (3) Leave the watch running in a dark place for more than 40 hours. (4) Check to see if the watch keep running.	<b>Result:</b> ● The watch keep running for more than 40 hours → Normal. ● The watch stopped before 40 hours or the time is incorrect (delay) → Defective. Proceed to <b>M</b>
<b>M CURRENT CONSUMPTION</b>	
Use the SEIKO Digital Multi Tester S-840A with Multi adaptor MA-40A. Range to be used: $\mu A$ (1) Remove the capacitor unit. (2) Set the Digital Multi-Tester. Red probe (+) .... Battery connection (+) Black probe (-) .... Battery connection (-)	<b>Result:</b> ● 1.4 $\mu A$ or less → Normal After replacing the capacitor unit: Proceed to <b>E</b> . ● More than 1.4 $\mu A$ → Defective After replacing the circuit block: Proceed to <b>E</b> .
	

## VII. PARTS LIST

CAL V121 A	
PARTS NO.	PARTS NAME
125 530	Train wheel bridge
*221 531	Center wheel & pinion
*221 532	Center wheel & pinion
231 530	Third wheel & pinion
*241 531	Fourth wheel & pinion
*241 532	Fourth wheel & pinion
261 921	Minute wheel
*271 923	Hour wheel
*271 924	Hour wheel
281 530	Setting wheel
282 531	Clutch wheel
*364 530	Winding stem
383 530	Setting lever
384 921	Yoke
391 922	Train wheel setting lever
491 220	Dial washer
701 530	Fifth wheel & pinion
4001 627	Circuit block
4002 627	Coil block
4146 531	Step rotor
4239 627	Rotor stator
4270 627	Battery connection (-)
4271 597	Battery connection (+)
4246 512	Solar cell lead terminal
390 530	Setting lever pin
022 410	Train wheel bridge screw
022 410	Coil block screw
022 410	Battery connection (+) screw
3029 110	Capacitor unit

### Remarks:

\* Winding stem  
 The type of winding stem is determined based on the design of case. Check the case number and refer to "Casing Parts Catalogue" to choose a corresponding winding stem.

\* Center wheel & pinion, Fourth wheel & pinion, Hour wheel  
 There are two different types as specified below.  
 Combination:

*Type	Center wheel & pinion	Fourth wheel & pinion	Hour wheel
S	221 531	241 531	271 923
M	221 532	241 532	271 924

\* abbreviation S .... Short type  
 (Movement type) M .... Standard type

**SUPPLEMENT  
TO  
TECHNICAL GUIDE AND PARTS LIST  
CAL. V12 SERIES**

\* Please attach this sheet to TECHNICAL GUIDE AND PARTS LIST CAL. V12 SERIES issued in 1986, to keep it for ready reference.

CAL. V122 A			
PARTS NO.	PARTS NAME	PARTS NO.	PARTS NAME
125 530	Train wheel bridge	802 531	Date driving wheel
* 221 533	Center wheel & pinion	808 531	Date dial guard
* 221 536	Center wheel & pinion	810 530	Date jumper
231 530	Third wheel & pinion	962 531	Intermediate wheel for calendar correction
* 241 533	Fourth wheel & pinion		
* 241 534	Fourth wheel & pinion	4001 627	Circuit block
261 530	Minute wheel	4002 627	Coil block
* 271 533	Hour wheel	4146 531	Step rotor
* 271 534	Hour wheel	4239 627	Rotor stator
281 530	Setting wheel	4270 627	Battery connection (-)
282 530	Clutch wheel	4271 596	Battery connection (+)
* 354 530	Winding stem	4246 513	Solar cell lead terminal
383 530	Setting lever	390 530	Setting lever pin
384 921	Yoke	022 248	Date dial guard screw
391 922	Train wheel setting lever	022 410	Train wheel bridge screw
701 530	Fifth wheel & pinion	022 410	Coil block screw
737 530	Calendar correction wheel	022 410	Battery connection (+) screw
* 801 676	Date dial	3029 110	Capacitor unit

**Remarks:**

- \* Winding stem  
The type of winding stem is determined based on the design of case. Check the case number and refer to "Casing Parts Catalogue" to choose a corresponding winding stem.
- \* Center wheel & pinion, Fourth wheel & pinion, Hour wheel  
There are two different types as specified below.  
Combination:

*Type	Center wheel & pinion	Fourth wheel & pinion	Hour wheel
S	221 533	241 533	271 533
M	221 535	241 534	271 534

\* abbreviation S..... Short type  
(Movement type) M..... Standard type

\* Date dial (cal. V122A)

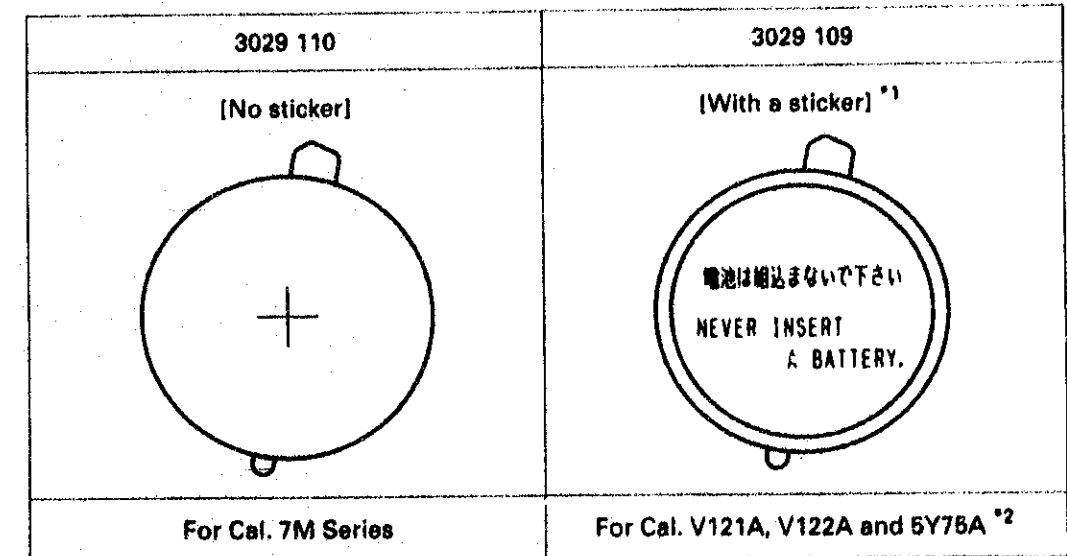
Parts No.	Crown position	Calendar frame position	Ground color	Figure color
801675	3 o'clock	3 o'clock	Gold	Black
801676	3	3	Silver	Black
801681	3	3	Black	White
801709	3	6	Gold	Black
801711	3	6	Silver	Black
801712	3	6	Black	White
801768	2	6	Black	White
801769	4	3	Black	White
801773	4	6	Black	White
801808	4	3	Silver	Black

If any other type of date dial is required, specify ① Cal. No. ② The crown position ③ The calendar frame position and ④ Dial No.

**PART CHANGE INFORMATION**

**Shape Modification of the Capacitor Unit**

It was found recently that some of the Cal. V12 Series watches, though very small in number, could be recharged only insufficiently due to poor conductivity of the capacitor unit. As a remedy for this, a sticker will be plastered on the surface of the capacitor to increase its thickness. The same capacitor unit will be used for the Cal. 7M Series as before without plastering a sticker; therefore, a new code will be assigned to the capacitor unit having a sticker to distinguish between the two.



\*1. The actual description on the sticker will be slightly different from the above illustration.

\*2. Refer to the PARTS LIST for Cal. 5Y75A issued in May 1995.

When ordering the capacitor unit of Cal. V121A/V122A watches for replacement, please specify the part code 3029 109.

Please note that such a charging problem is found in only a small number of Cal. V12 Series watches equipped with the capacitor unit 3029 110. If your customer complains to you about insufficient recharging, please replace the capacitor unit with 3029 109 to be on the safe side. This will at least eliminate a low recharge power as the problem.

Do not use the capacitor unit 3029 109 with Cal. 7M Series watches as the assembling method of the part is different between Cal. 7M and Cal. V12 Series.