

***TECHNICAL
INFORMATION***

**CITIZEN QUARTZ
Cal. No. 896※**

 **CITIZEN**

CONTENTS

§1. OUTLINE	P1
§2. FEATURES	P1
§3. SPECIFICATIONS	P2
§4. HANDLING INSTRUCTIONS	P2
§5. STRUCTURE OF MODULE	P5
§6. DISASSEMBLY/ASSEMBLY OF MODULE WITH LUBRICATION	P6
§7. TROUBLESHOOTING AND ADJUSTMENT	P10

§1. OUTLINE



This "Ana-Digi Lady" is the Citizen's first product in the combination watch for ladies, featuring the minimum size of module among the watches of this type along with a fancy design.

Thus it will meet to the full the requirements of the market as well as make an appeal to the contemporary ladies of the world.

§2. FEATURES

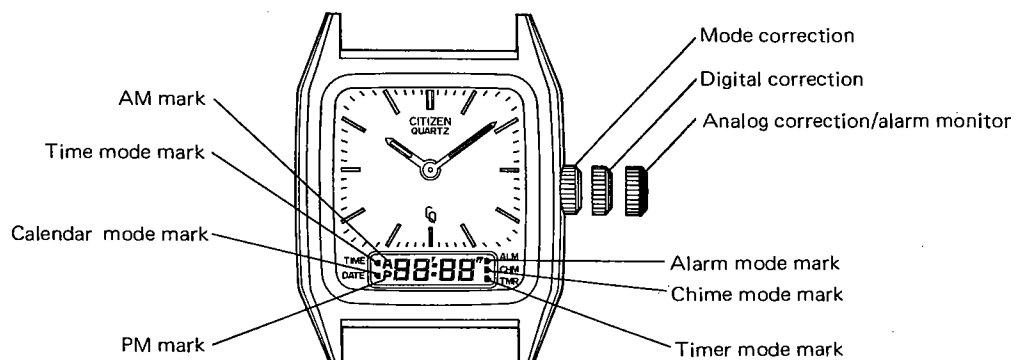
- 1) The Citizen's first combination watch for ladies.
- 2) The minimum size of module among the watches of combination type.
- 3) The operation is possible for multiple functions with just a piece of the crown.
- 4) An electromagnetic correction system is adapted for the analog watch function.
- 5) An hour-based turning of hands is convenient for correction of a time differential.
- 6) The appearance design has a commonness to other gentlemen's combination watches to ensure an application of a paired watches.
- 7) An alarm monitor is possible with every mode for confirmation of each ring.
- 8) The DFC (Digital Frequency Control) method is applied.

§3. SPECIFICATIONS

Caliber No.	8960-02	
Type	Combination quartz watch (with no center second)	
Size of module (mm)	15 (3-9h) x 18 (12-6h) x 20φ Thickness: 2.53 ^t (Power cell part 2.65 ^t)	
Accuracy	±20 sec./month at normal temperatures	
Oscillation	32,768Hz	
Method of display	FE-type nematic LC (liquid crystal) 2-split multiplex driving	
Converter	Bipolar step motor (20 sec. step movement of hands)	
Integrated circuit	C/MOS-LSI (1 unit)	
Effective temperature range	±0°C ~ +55°C (32°F ~ 131°F)	
Adjustment of time rate	DFC method (Unit of measurement of time 10 sec. with no terminal of adjustment)	
Display functions	Time	Hour: minute plus A/P
	Second	Second
	Calendar	Month & date
	Alarm	Hour: minute (only in ON mode)/OFF
	Chime	: 00 (only in ON mode)/OFF
	Timer	00'00" (1-hour counting with setting unit of 1 second)
Additional functions	<ul style="list-style-type: none"> • 12-/24-hour switching function • Alarm monitor • Time differential correcting function • Automatic calendar (28-day system in February) 	
Power cell (Silver oxide cell)	Parts No.	: 280-53 (1 unit)
	Maker code	: SR721W (Ag ₂ O/KOH)
	Size	: 7.9φ x 2.1mm ^t
	Nominal voltage	: 1.55V
	Capacity	: 25mAH
	Lifetime	: About 2 years (20 sec. alarm, 24 hourly chimes & 7.5 sec. timer alarm per day)

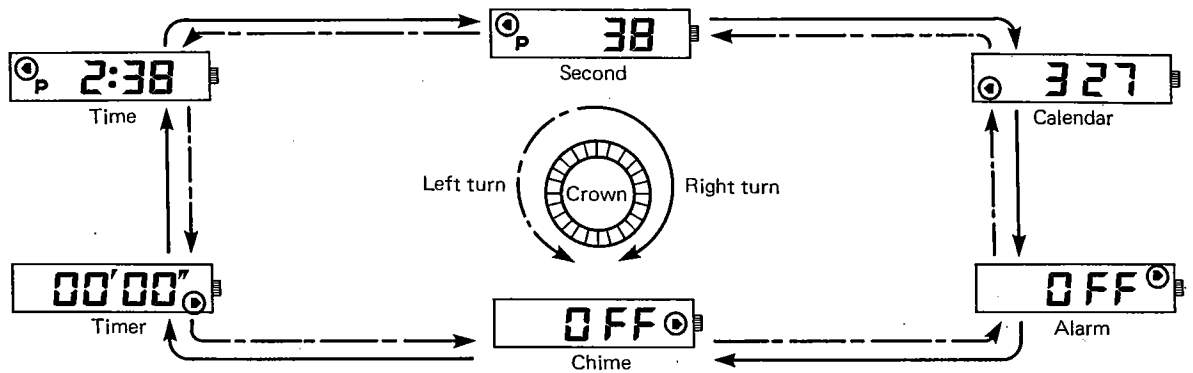
§4. HANDLING INSTRUCTIONS (The flashing is shown by ○.)

4-1. External view of watch



4-2. Switching of mode

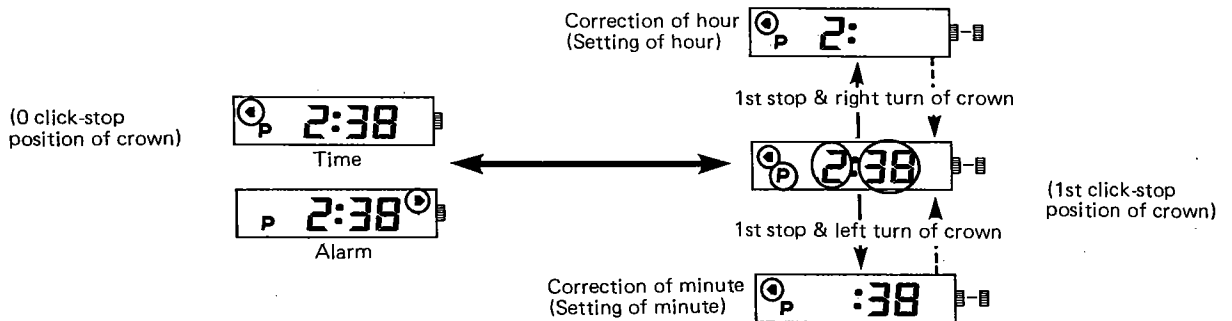
A switching of mode is carried out with the crown set at the 0-stop position.
 (The mode mark is displayed to indicate the function which is presently working.)



4-3. Correction of digital time (Setting of alarm time)

The setting of digital time is identical with the setting of the alarm time.

- The crown is set at the 1st click-stop position in the time display mode (alarm display mode) and then turned right to correct the hour (setting of hour) and turned left to correct the minute (setting of minute) respectively.
 (The descriptions in the parentheses are for the setting of alarm time. See 4-9 for the ON/OFF switching of alarm.)



4-4. Correction of second

With the crown set at the 1st click-stop position in the second display mode, the second is re-set to zero to stop the watch operation.

In this case, the digital watch function is put under the correction mode.

- The watch operation starts again at the moment when the crown is pushed back to its normal position. (0-second setting)
- The digital of minute is carried at the moment of the 0-second resetting by counting 30 or more and omitting 29 or less respectively.
- The analog second is synchronous with the 0-second resetting.

0-reset given at digital n seconds	
Digital second	Analog correction output
$0 \leq n < 30$	Queuing for n-second count*
$30 \leq n < 40$	+2 pulses
$40 \leq n < 60$	+1 pulses

1 pulse = 20 sec.

* A 0-second reset that causes an analog correction does not queue for counting. The count queuing is cancelled by an analog correction given in the count queuing mode.

4-5. Analog correction

1) Correction in time display mode

The correction mode is obtained by setting the crown at the 2nd click-stop position.

- Right turn of crown (1/4 turn)

An hour-based turning of hands is carried out. When a midway stop is desired for the analog correction, give another 1/4 turn to the crown.

- Left turn of crown (1/4 turn)

The time is corrected with every 20 seconds.

A time differential can be conveniently corrected since the second timing is given consecutively.

2) Correction in second display mode

The operation is identical with 1). In this case, the second timing is at pause.

(The digital watch is put under the 0-reset queuing mode.)

4-6. Correction of calendar

The correction mode is obtained by setting the crown at the 1st click-stop position in the calendar display mode. Then the crown is turned right to correct the month and left to correct the date respectively.

- Even in case a non-existing date (such as April 31 and the like) is set, the date will be changed automatically to the first day of the following month after the crown is once set at its normal position.

- As 28 days are usually set in February, it is required to set specially 29 days for a leap year.

4-7. Operation of timer

1) Setting of timer

The setting mode is obtained by setting the crown at the 1st click-stop position in the timer display mode. (In this moment, a sound of confirmation is heard.) The crown is turned right to set the minute and left to set the second respectively. The second is reset (00 second) with a set of the minute. Accordingly the minute must be set first when a setting is required for the second. (1-hour counting with the setting unit of one second)

2) Start/stop

- The counting action is started after setting a time by pushing the crown to its normal position and stopped by setting the crown at the 1st click-stop position respectively.

- A timer tone is heard for 10 ~ 20 seconds when the time is counted up.

- A sound of confirmation is heard in a start/stop mode.

4-8. ON/OFF switching of chime and alarm

An ON/OFF switching is carried out by setting the crown at the 1st click-stop position and then setting it back to its normal position in each mode of chime and alarm.

4-9. Switching of 12-/24-hour displays

A switching is carried out between the 12- and 24-hour displays by setting the crown at the 1st click-stop position and then setting it back to its normal position in the time display mode.

4-10. Alarm monitor

The following four different kinds of alarm monitor tones are provided to this caliber. These monitor tones are heard 1 ~ 2 minutes by setting the crown at the 2nd click-stop position.

- 1) A consecutive tone given in calendar display mode
- 2) An alarm tone given in alarm display mode
- 3) A chime tone given in chime display mode
- 4) A timer tone given in timer display mode

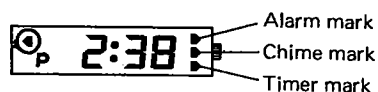
The alarm tones can be stopped at any moment by setting the crown back to its normal position.

4-11. Stopping of alarm tone

A priority is given to any operating way of the crown to stop the ring of alarm.

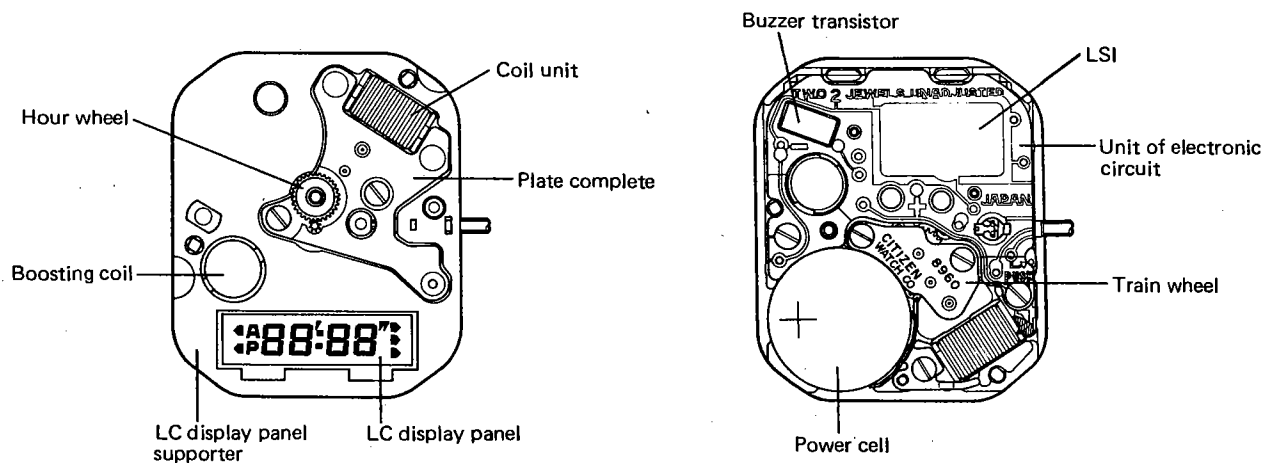
4-12. Display of mode marks

In each display mode of the time, second and calendar, each mode mark is displayed to indicate the working of each function.

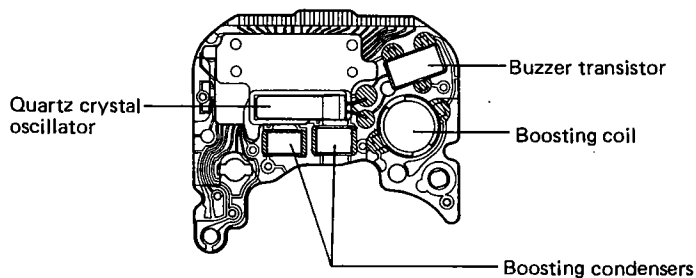


(Time display mode)

§5. STRUCTURE OF MODULE



(Rear side of unit of electronic circuit)



§ 6. DISASSEMBLY/ASSEMBLY OF MODULE WITH LUBRICATION

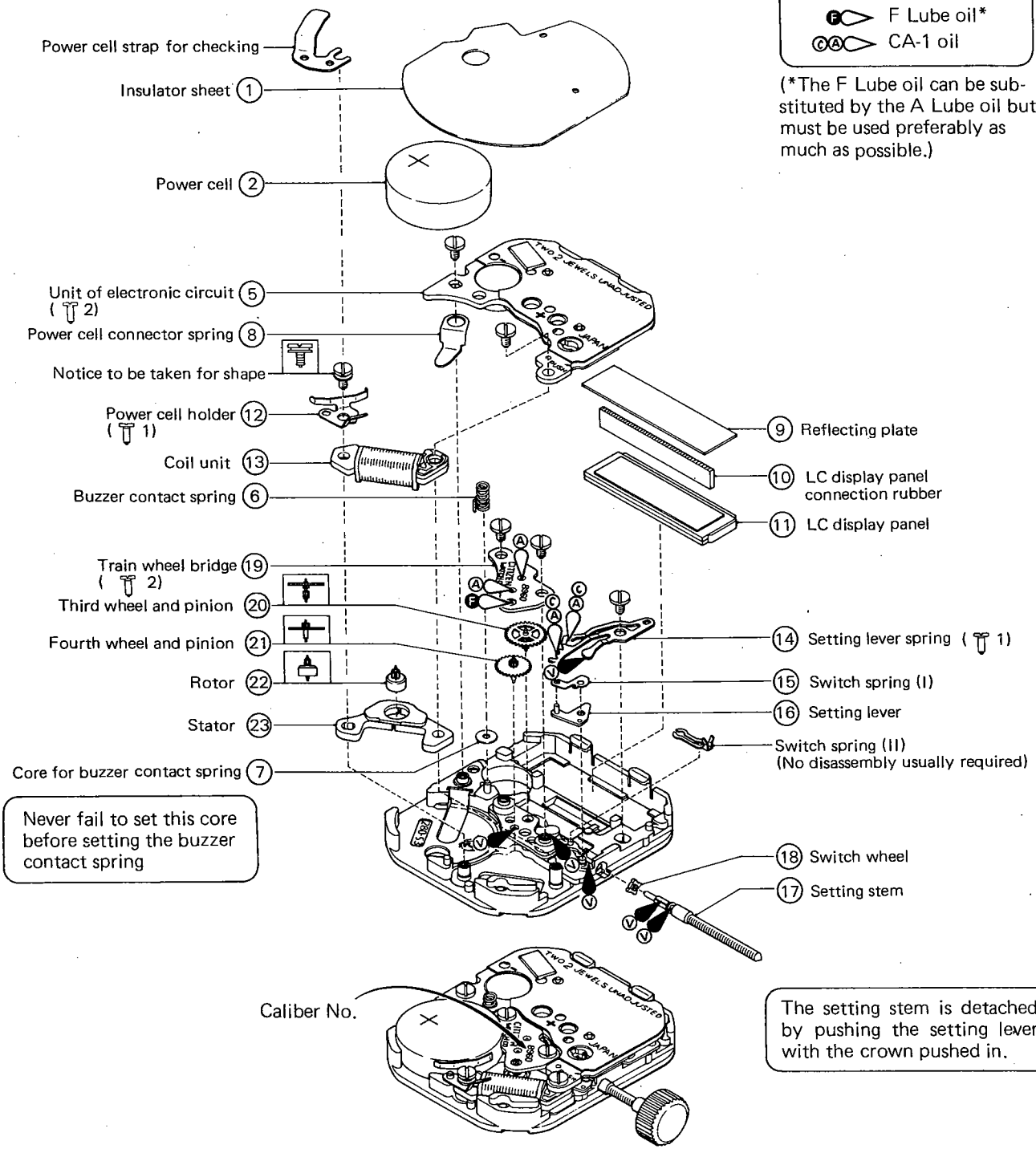
6-1. Procedure of disassembly/assembly

Disassembling procedure : ① → ②⑧
 Assembling procedure : ②⑧ → ①

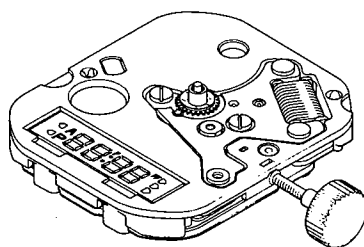
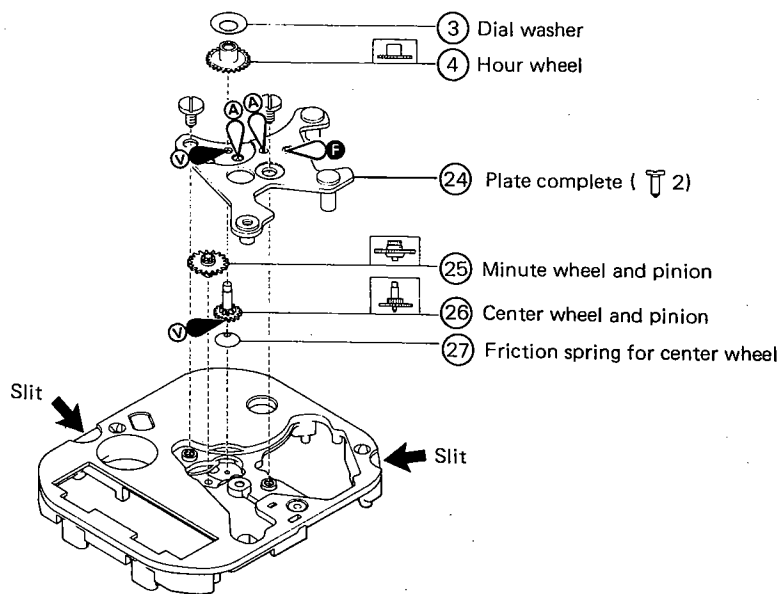
Marks of lubrication

- Ⓐ A lube oil
- ∇ V Lube oil
- Ⓒ F Lube oil*
- Ⓔ CA-1 oil

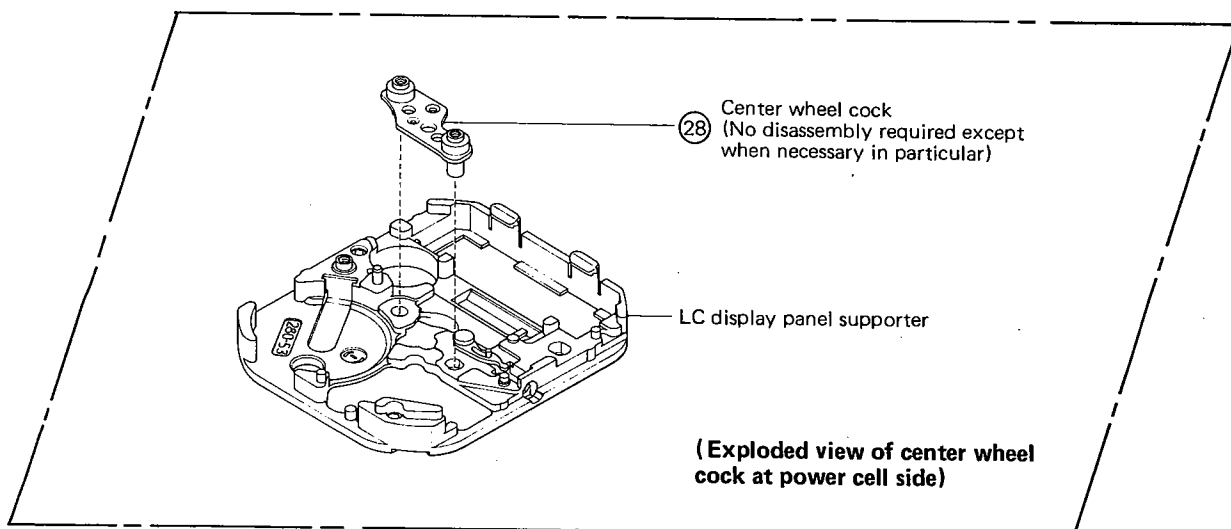
(*The F Lube oil can be substituted by the A Lube oil but must be used preferably as much as possible.)



*The dial is removed by putting a driver or the like into the slit provided at the dial side of the LC display supporter. (←)

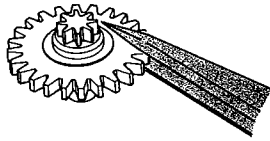


(Dial side)



6-2. Notes on disassembly/assembly plus lubrication

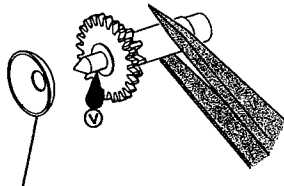
1) Handling of minute wheel and pinion



Never hold the pinion part since it is made of the plastic, and hold the wheel at the gear part.

A damage of the pinion part will cause a stop of the watch operation.

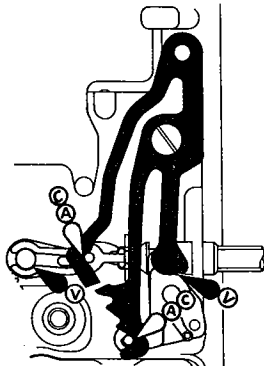
2) How to set friction spring for center wheel



Friction spring for center wheel

The friction spring for center wheel is set as illustrated left after a lubrication of the V Lube oil. After this, the center wheel is set to the center wheel cock.

3) Lubrication to setting lever spring

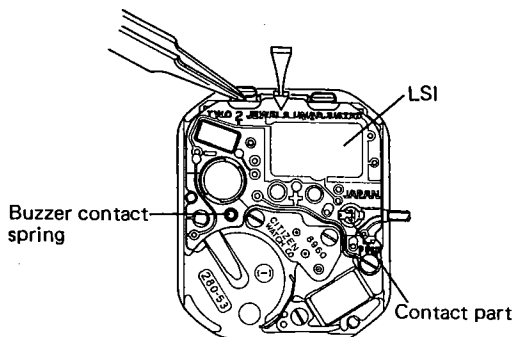


The lubrication is carried out as shown in the left illustration.

In case the V Lube oil is used in place of the CA-1 oil, some effect may be given to the operating moderation of the crown about the pull and rotation. Furthermore the V Lube oil is inferior to the CA-1 oil in terms of the preservation in a long-period application.

In these respects, the CA-1 oil must always be used for the lubrication to the setting lever spring.

4) Setting of unit of electronic circuit



As illustrated, the screw for unit of electronic circuit of the coil terminal side is driven light to give a positioning to the unit of electronic circuit.

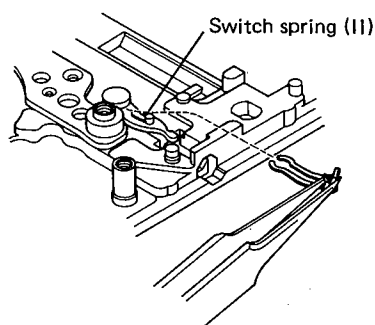
In this case, the following points must be confirmed.

- ① The contact part of the switch spring (II) is seen through the hole of the unit of electronic circuit.
- ② An accurate positioning is given to the unit of electronic circuit against the buzzer contact spring.

After confirmation of above two points, the unit of electronic circuit is set by shunting light the hooking part of the LC display panel supporter by means of a tweezers or the like as illustrated above. Avoid giving a pressure onto the LSI.

Note: The contact part of the switch spring (II) must be put inside the hole of the unit of electronic circuit. If the unit of electronic circuit is set before confirmation of the above point 1, the contact part of the switch spring (II) will surely be broken.

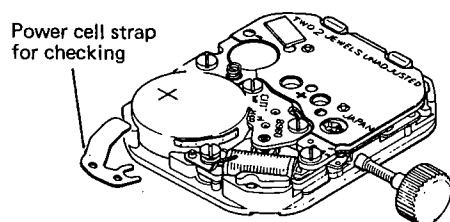
5) Exchange of switch spring (II)



The switch spring (II) is removed easily by holding it with a tweezers and then pulling it toward the crown as illustrated. When setting, the spring (II) is held in the same way as illustrated and then made to cling to the pin that is holding the switch lever.

The switch spring (II) must be handled with a meticulous care since it is easy to receive a malformation.

6) How to set power cell strap for checking



As illustrated, the power cell strap for checking is held fixedly between the power cell holder and the stepped screw that is holding the coil.

The power cell strap for checking is used only with a module in its single unit state.

7) Note on setting of dial

The following point must be confirmed after setting the dial.

- The dial washer is set in a correct way to the center hole of dial. (This checking must be given carefully with use of an eye glass or the like.)

The following point must be checked after setting the hands.

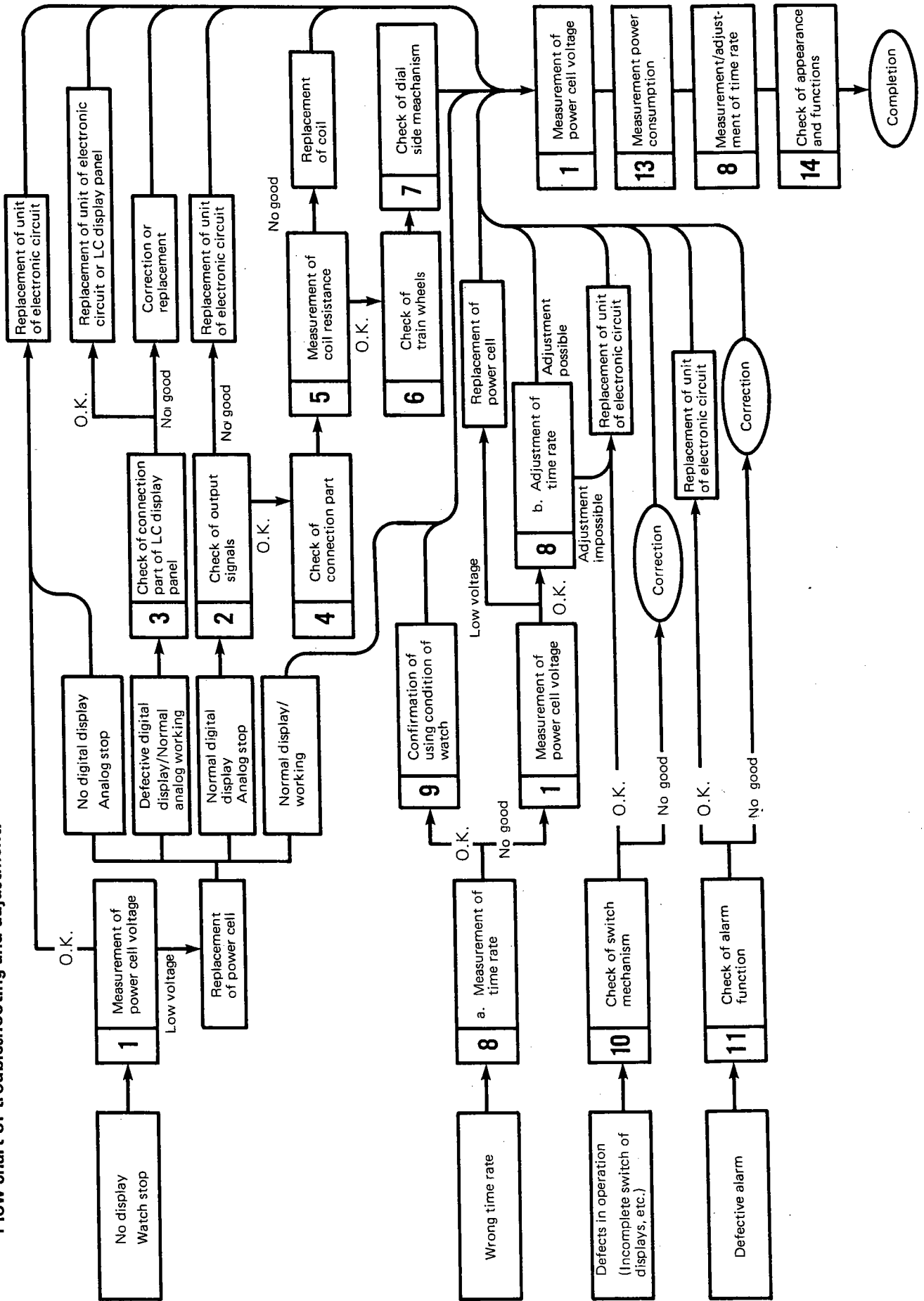
- The movement of hands is smooth and correct with no defect (uneven rotation, play, etc.).

This checking is carried out through a quick setting of analog time.

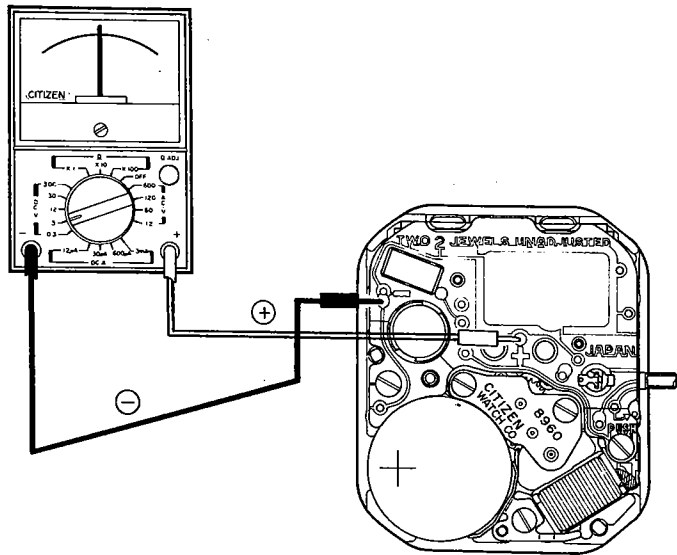
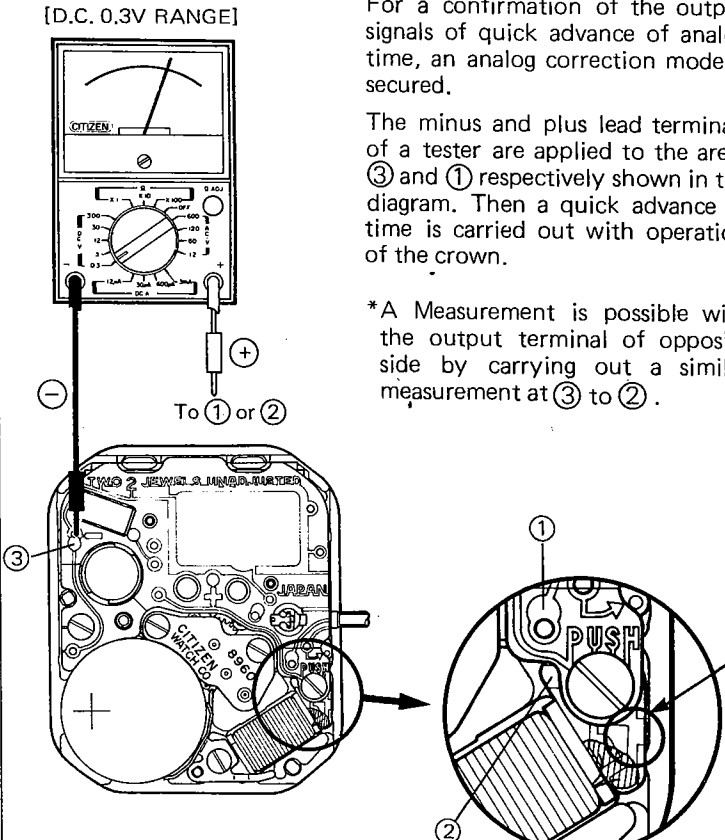
In case some defect is detected through the above inspections, the dial must be set again in a correct way.


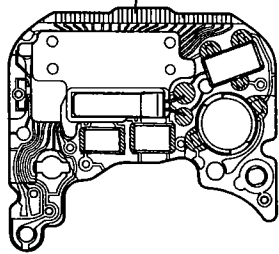
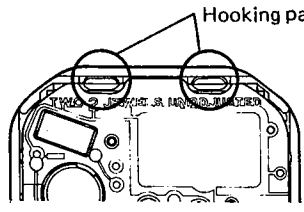
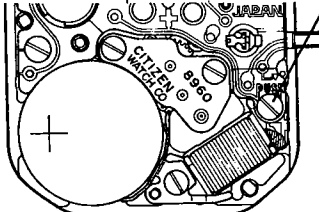
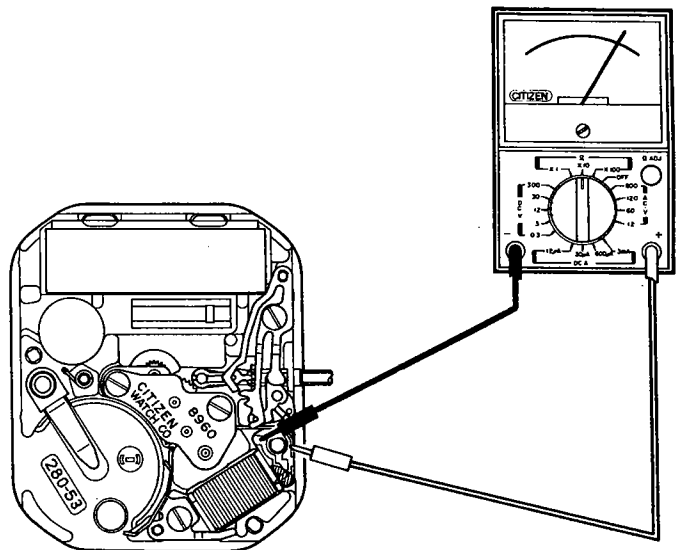
§ 7. TROUBLESHOOTING AND ADJUSTMENT

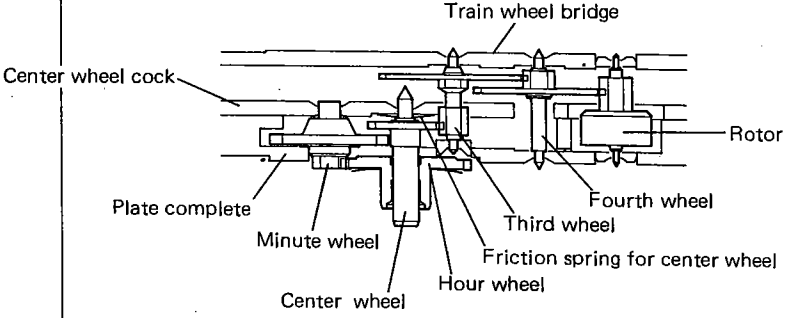
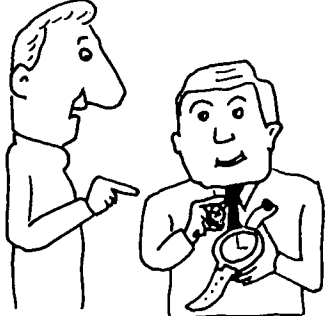
Flow chart of troubleshooting and adjustment.

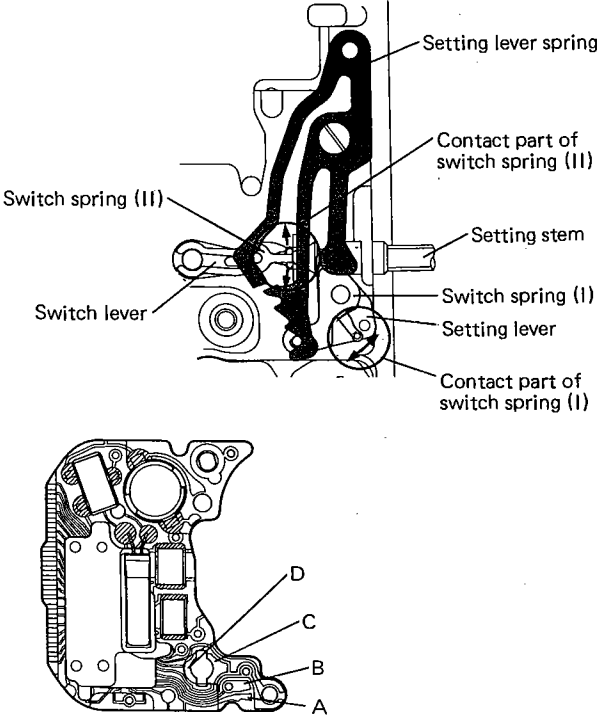
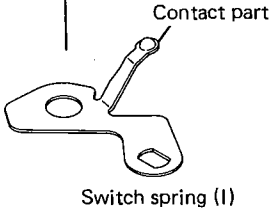
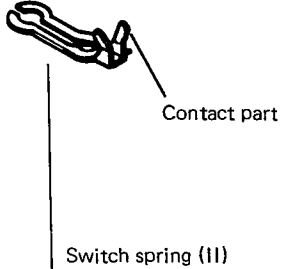


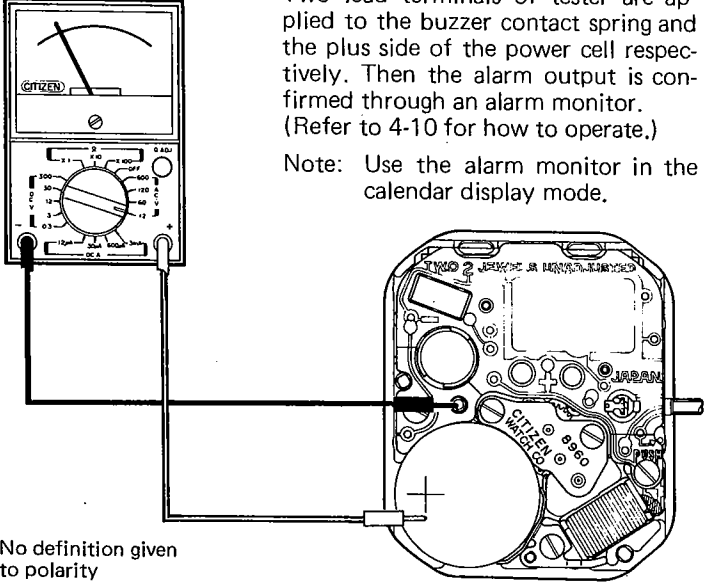
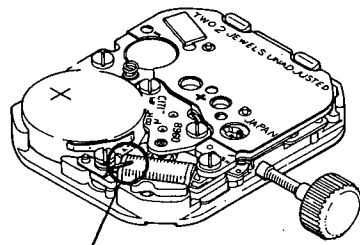
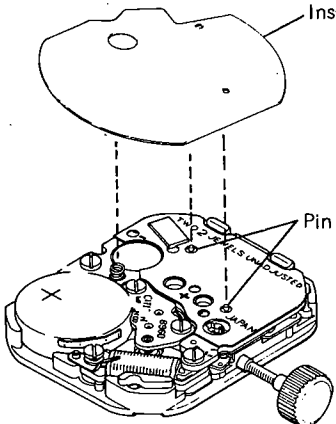
(A power cell strap for checking is conveniently used.)

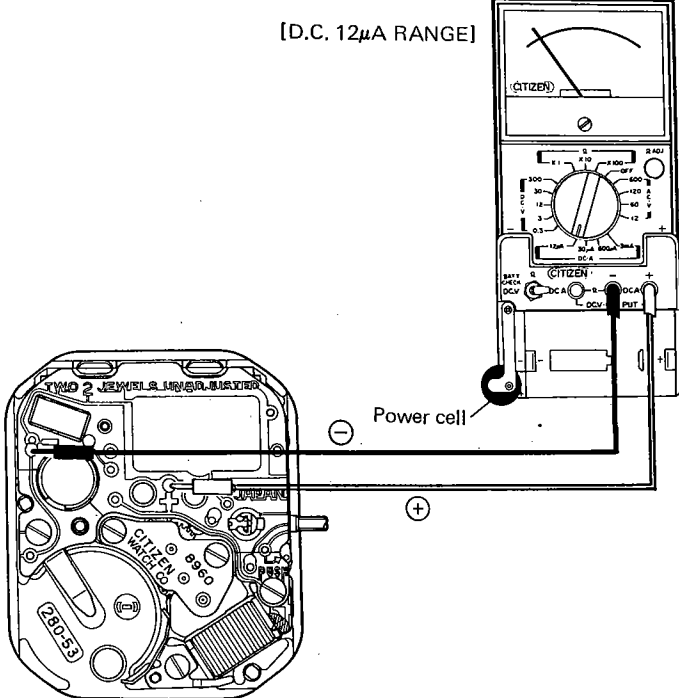
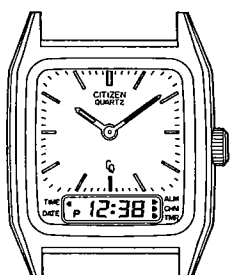
Checking items	How to check	Result and treatment
<p>1 Measurement of power cell voltage</p>	<p>As illustrated, the tester lead terminals are applied to the module.</p> <p>[D.C. 3V RANGE]</p>  <p>*If the screws for electronic circuit are loose, an application of voltage is impossible to the circuit.</p>	<p>Over 1.5V</p> <p>→ O.K.</p> <p>Under 1.5V</p> <p>→ Replacement of power cell</p>
<p>2 Confirmation of output signals</p>	<p>If a confirmation is possible for the quick advance signal, the output signal is normal.</p> <p>[D.C. 0.3V RANGE]</p> <p>For a confirmation of the output signals of quick advance of analog time, an analog correction mode is secured.</p> <p>The minus and plus lead terminals of a tester are applied to the areas ③ and ① respectively shown in the diagram. Then a quick advance of time is carried out with operation of the crown.</p> <p>*A Measurement is possible with the output terminal of opposite side by carrying out a similar measurement at ③ to ②.</p>  <p>Note: Avoid applying the lead terminal to this area as much as possible. The coil may possibly be disconnected. A conduction may not sometimes be secured by the effect of an adhesion cord.</p>	<p>OVER 0.2V</p> <p>→ O.K.</p> <p>When some fault is detected, the unit of electronic circuit must be replaced with new one.</p>

Checking items	How to check	Result and treatment
<p>3 Check of connection part of LC display panel</p>  <p>Connection parts (Electrode part)</p> 	<p>Hooking parts</p>  <ul style="list-style-type: none"> • Make sure that the unit of electronic circuit is hooked to the LC display panel supporter in a correct way. • Make sure that the connection part of the LC display panel is free from any break or crack. • Make sure that the connection part (electrode part) is free from stains or dust and that the pattern has no impairment. • Make sure that the connection rubber of the LC display is free from a twist, wear and defective setting respectively. 	
<p>4 Check of Connection part</p> 	<p>If this screw is loose, the signal sent from the circuit is not transmitted to the coil. And the driving becomes faulty if some foreign matter sticks to the lower surface of the unit of electronic circuit as well as to the upper surface of the coil terminal.</p>	
<p>5 Measurement of coil resistance</p>	<p>[X10 Ω RANGE]</p>  <p>The coil resistance is measured after the unit of electronic circuit is removed. No definition of polarity is given to the lead terminals.</p> <p>*Be careful not to damage both the coil and the coil terminal.</p>	<p>Coil resistance</p> <p>1.0K Ω ~ 1.5K Ω</p> <p>→ O.K.</p>

Checking items	How to check	Result and treatment
6 Check of train wheels	<ul style="list-style-type: none"> • Make sure that each gear is set in a correct way. • A wrong setting or a malformation of the friction spring for center wheel will cause a faulty working of the minute hand. 	
7 Check of dial-side mechanism	<p>A confirmation must be given to the engagement between the hour wheel and the minute wheel and pinion. Pay a particular attention to the breakdown at the pinion part of the minute wheel that may be caused by a setting of the hour wheel.</p>	
8 Measurement/adjustment of time rate	<p>a) Measurement of time rate This watch applies the DFC method, and the analog watch section features a 20-second step movement of hands. Accordingly the time rate must be measured at the digital watch section and with the time of measurement of 10 seconds. In case the measurement is not easy at the digital section, the measurement is carried out at the analog section. In this case, the time of measurement must be set at a multiple of 20 seconds.</p> <p>b) Adjustment of time rate A perfect adjustment is given to this watch at the factory, and accordingly no adjustment is given to the time rate on the market. If a big error should arise in the time rate, the unit of electronic circuit must be replaced with new one.</p>	
9 Confirmation of using condition of watch	<p>The following points are confirmed with the user of the watch.</p> <ol style="list-style-type: none"> 1) A use of the watch outside the effective temperature range 2) A use of the watch in an atmosphere of strong magnetism 3) The time when the last replacement is given to the power cell 4) A wrong handling of the watch 5) The time when the time is set last 	

Checking items	How to check	Result and treatment
<p>10 Check of switch mechanism</p>	 <p>(Rear side of unit of electronic circuit)</p> <p>Function of switch mechanism</p> <ol style="list-style-type: none"> 1) With a pull-out of the crown, the switch spring (I) works to give a contact between the contact part of the switch spring (I) and the switch patterns A and B on the rear surface of the unit of electronic circuit. As a result, a switching is carried out. 2) With a turn of the crown, the switch wheel turns to actuate the switch lever. The switch spring (II) works together with the switch lever. Then the contact part of the spring (II) touches the patterns C and D of the unit of electronic circuit. <p>Defective switching with pull-out of crown A defective switch spring (I) will cause a defective switching, i.e., no correction mode is secured even with a pull-out of the crown or the mode is switched during a correction.</p> <p>Defective switching with turn of crown This defect may be caused mainly by a defect of the switch spring (II). A special attention must be given to the spring (II) since it is very easy to receive a malformation.</p>	  <p>Wear of malformation of contact part → Replacement of switch spring (I)</p> <p>Stains on patterns A and B → To be cleared away</p> <p>Wear of malformation of contact part → Replacement of switch spring (II)</p> <p>Stains on patterns C and D → To be cleared away</p>

Checking items	How to check	Result and treatment
<p>11 Check of alarm mechanism</p>	<p>[A.C. 12V RANGE]</p>  <p>No definition given to polarity</p>  <p>Contact part</p> <p>Confirmation of alarm output signals Two lead terminals of tester are applied to the buzzer contact spring and the plus side of the power cell respectively. Then the alarm output is confirmed through an alarm monitor. (Refer to 4-10 for how to operate.) Note: Use the alarm monitor in the calendar display mode.</p> <p>Confirmation of power cell holder In case the contact part of the power cell holder has some malformation or some foreign substance (dust, stains, etc.) attaches between the cell holder and the case back, the plus side of voltage is not applied to the sound generating part. (In other words, the plus voltage is not applied to the case.)</p>	<p>Tester pointer swiving (about AC 1V) → Nondefective</p> <p>No swing given to tester pointer → Replacement of unit of electronic circuit</p> <p>Malformation of power cell holder → Repair or replacement of holder</p> <p>Dust or stains → To be cleared away</p>
	 <p>Insulator sheet</p> <p>Pin</p> <p>Confirmation of insulator sheet The insulator sheet is set with a positioning given by two pins on the unit of electronic circuit. If some shift is caused to the insulator sheet, the alarm tone will be reduced to cause a defective ring of the alarm.</p> <p>In addition to the above inspections, an impairment, stains and others must be confirmed for the piezoelectric element.</p>	

Checking items	How to check	Result and treatment
<p>12 Measurement of power consumption</p>	<p>[D.C. 12μA RANGE]</p>  <p>1) The range of a tester is set at DC 3 mA. 2) The lead terminals are applied to the module as illustrated above. 3) The range of the tester is set at DC 12μA.</p> <p>The above procedure of measurement must be kept in mind to avoid a tester pointer from swining up to its limit. In case the pointer swings up to its limit, the switch is turned up to DC 3mA and then set at DC 12μA to secure a correct measurement.</p>	<p>Under 1.3μA</p> <p>→ O.K.</p> <p>If the measured value reads 1.2μA or more with a circuit only, the unit of electronic circuit must be replaced with new one.</p> <p>In case the value reads 1.2μA or less with the circuit only, the train wheel or the LC display panel may possibly have some fault.</p>
<p>13 Check of appearance conditions and functions</p>	<ul style="list-style-type: none"> •Check of appearance conditions <ol style="list-style-type: none"> 1) Make sure that no dust nor stains attach onto the dial. 2) Make sure that the digital display has no defect. 3) Make sure that the hands are attached in a correct way. 4) Make sure that a correct time is set. 5) And others. •Check of functions <ol style="list-style-type: none"> 1) Make sure that the switching function has no fault at all. 2) Make sure that the function of the alarm monitor has no defect at all. 3) Make sure that the electromagnetic correction (analog correction) works normally. 4) And others. 	

CITIZEN WATCH CO., LTD.
Tokyo, Japan