

***TECHNICAL
INFORMATION***

**CITIZEN QUARTZ
Cal.No.919※※**

 **CITIZEN**

§1. OUTLINE



This is a digital quartz crystal watch with LC display and equipped with a calculator. In response to the diversified requirements of the users, it features multiple functions including an alarm, stopwatch, illumination lamp as well as the time and calendar displays. As for the calculator incorporated, the push-buttons are collected at one corner area to better the operational performance as well as the overall design of the watch.

§2. MAIN FEATURES

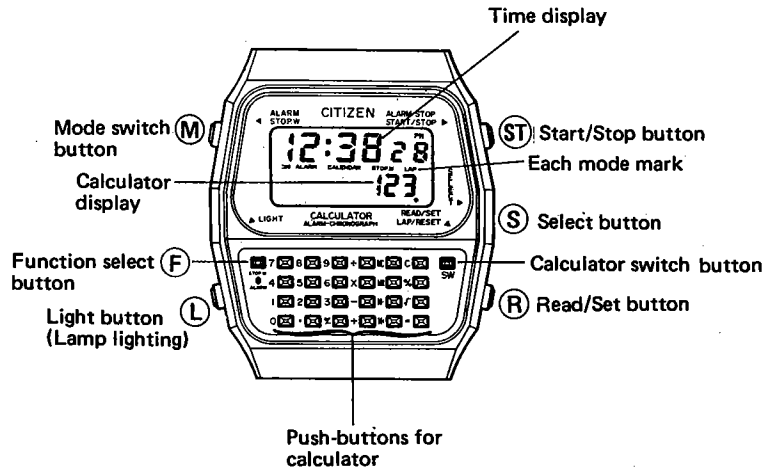
- 1) In addition to the time display (hour, minute, second, AM/PM) and the calendar display (month, date, day), multiple functions are incorporate such as an alarm, stopwatch, illumination lamp, and furthermore a calculator.
- 2) The square push-buttons of the calculator are collected at a corner area, so the operation of the calculator is much facilitated with a betterment in terms of the watch design as a whole.
- 3) An illumination lamp is built into the watch to facilitate an easy reading of the display information even in a dark place.
- 4) The calendar can be set automatically except for the leap-year day (February 29).
- 5) A continuous and accurate operation of the watch and the calculator is ensured about 3 years by just one unit of the small-size silver oxide power cell in spite of the multiple functions incorporated. (5 sec. lamp lighting, 30 sec. alarm sounding and 20 min. calculator operation per day)

§3. SPECIFICATIONS

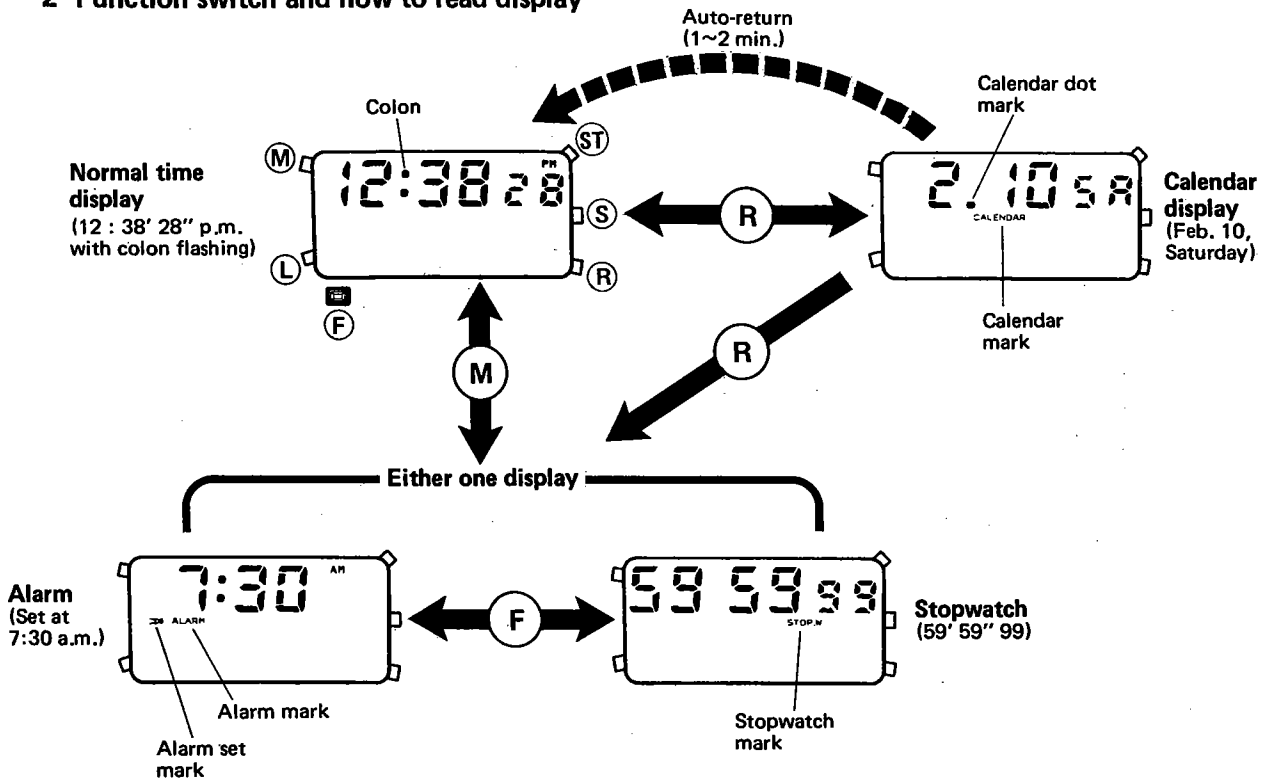
| | | |
|-----------------------------|-----------|---|
| Caliber No. | | 9190A |
| Movement | | Diameter: 31.6mm X 31.8mm |
| | | Thickness: 7.43mm |
| Oscillation | | 32,768Hz |
| Accuracy | | ±10 sec./month (in normal temperatures) |
| Display information | Time | "Hour", "minute", "second" and "AM/PM" |
| | Calendar | "Month", "date" and "day" |
| | Alarm | "Hour", "minute" and "AM/PM" |
| | Stopwatch | "Minute", "second" and "1/100 sec." |
| Correction of display | | Independent correction of each digit by operation of push-buttons |
| Effective temperature range | | 0°C ~ +50°C (32°F ~ 122°F) |
| Integrated circuit | | C/MOS-LSI 3 units (1 for watch, 1 for calculator, 1 for common use) |
| Additional mechanisms | | <ul style="list-style-type: none"> ●Calculator ●Alarm ●Stopwatch ●Illumination lamp ●Automatic calendar setting device (excluding leap year) |
| Power cell | | <p>Small-size silver oxide power cell (1 unit)</p> <p>Parts No. : 280-21</p> <p>Nominal voltage : 1.55V</p> <p>Capacity : 120mAH</p> <p>Size : 11.6mmφ X 4.2mm</p> <p>Life : About 3 years</p> |

§4. HANDLING INSTRUCTIONS

1 Push-buttons and their functions



2 Function switch and how to read display

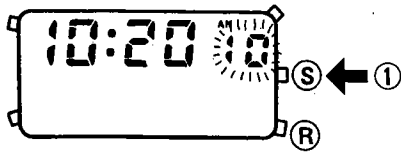


*The both of the alarm and the stopwatch functions cannot be used Simultaneously. Either one of the two functions must be selected in use.

(Normal time display ⇄ Alarm or Normal time display ⇄ Stopwatch)

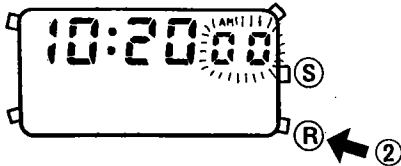
The selection between the "Alarm" and "Stopwatch" is performed with push of (F) button. The (F) button is guarded around it, so it must be pushed with something thin at the tip and with good care not to injure the button.

3 How to set time and calendar

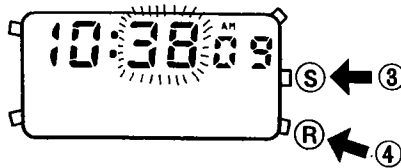


Second setting

① With push of (S) button under the normal time display, the "second" begins to flash to be set.



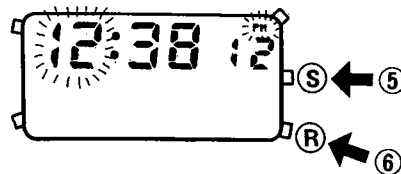
② With push of (R) button, the "second" is reset to zero to start immediately. (One "minute" is carried when the "second" is within the range of 30~59 seconds.)



Minute setting

③ The "minute" begins to flash.

④ The "minute" is carried one by one with every push of (R) button to be set correctly.



Hour setting

⑤ The "hour" plus "AM" or "PM" begin to flash.

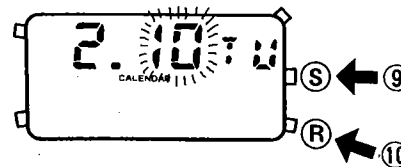
⑥ The "hour" is set making sure "AM" or "PM".



Month setting

⑦ The "month" begins to flash.

⑧ The "month" is set.



Date setting

⑨ The "date" begins to flash.

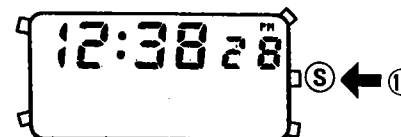
⑩ The "date" is set.



Day setting

⑪ The "day" begins to flash.

⑫ The "day" is set. (The "day" is displayed in English with the first two letters.)



⑬ The normal time display is secured.

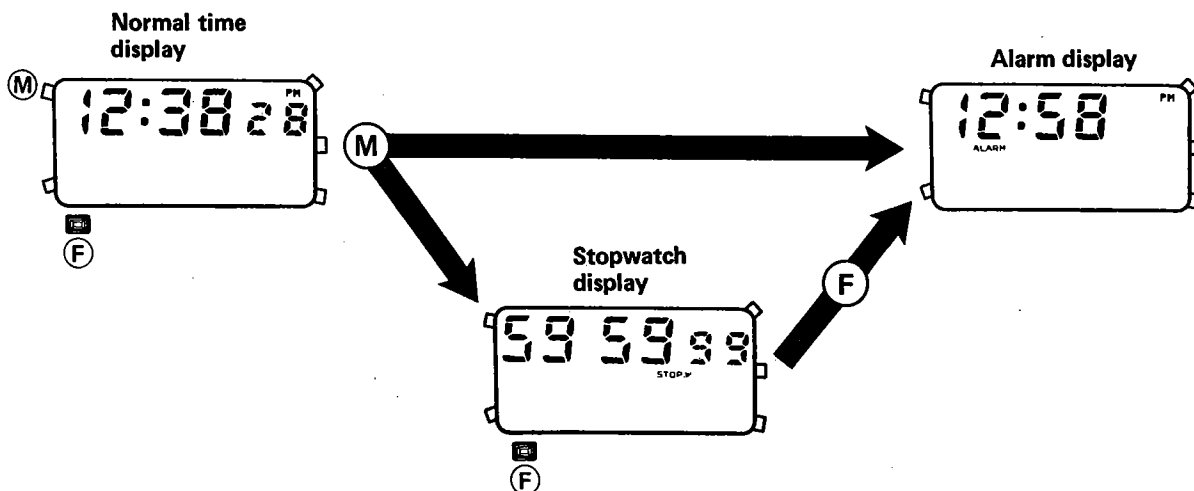
*The colon flashes in the case of ① ~ ⑥ plus ⑬

*The calendar is set automatically after it is once set correctly. The leap-year day (February 29), however, must be set through operation of the push-button.

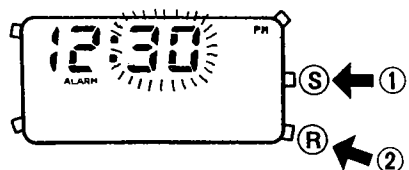
*No switching is possible from the time and calendar setting mode to another function.

4 Operation of alarm

(1) Call-out of alarm display

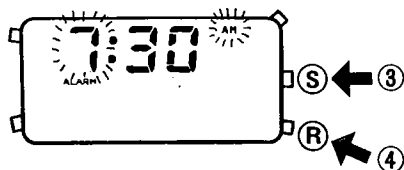


(2) How to set alarm time



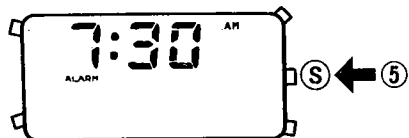
Minute setting

- ① With push of (S) button under the alarm display, the "minute" begins to flash to be set.
- ② The "minute" is set.



Hour setting

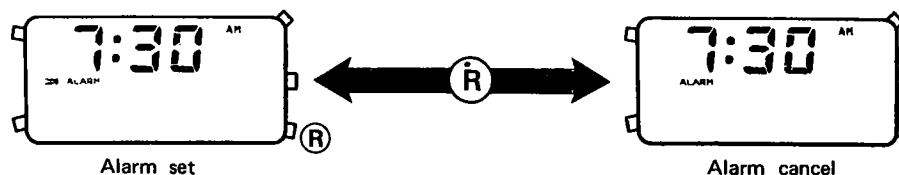
- ③ The "hour" plus "AM" or "PM" begin to flash.
- ④ The "hour" plus "AM" and "PM" is set.



- ⑤ The normal alarm display is secured.

*No colon flashing is given under the alarm display.

(3) Alarm set/cancel



The alarm set mark (➤) appears and disappears with every push of (R) button under the normal alarm display.

The alarm set mark (➤) is displayed when the alarm display is switched to the normal time display in case the alarm is set previously.

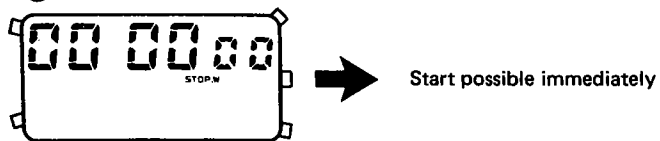
*The alarm sound is stopped with push of (ST) button.

5 Operation of stopwatch

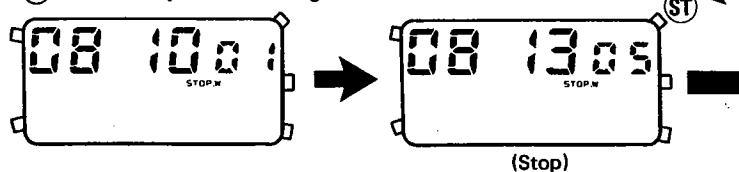
(1) Resetting

The following cases (① ~ ⑤) are presented when the stopwatch function is actuated.

① Resetting state



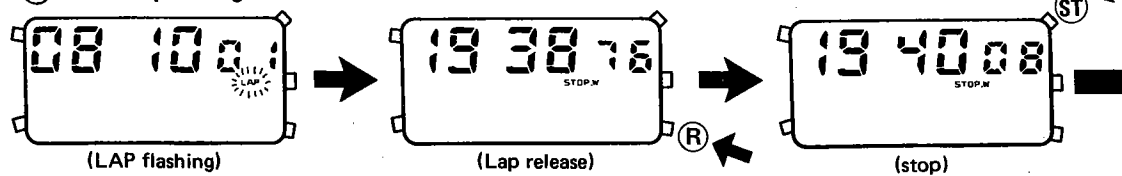
② Under stopwatch timing



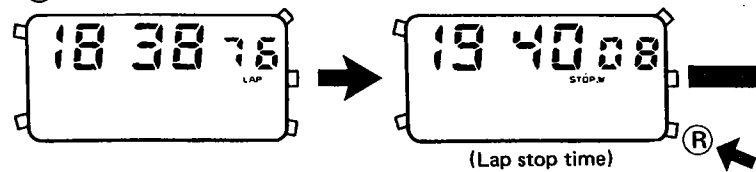
③ Timing Stop



④ Under lap timing

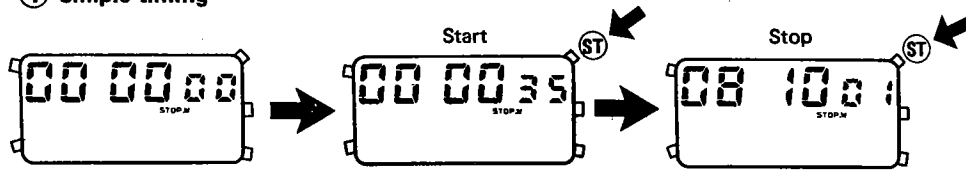


⑤ Lap stop

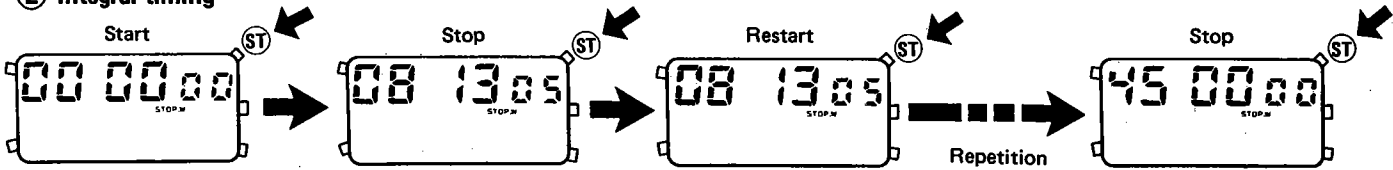


(2) Timing method

① Simple timing



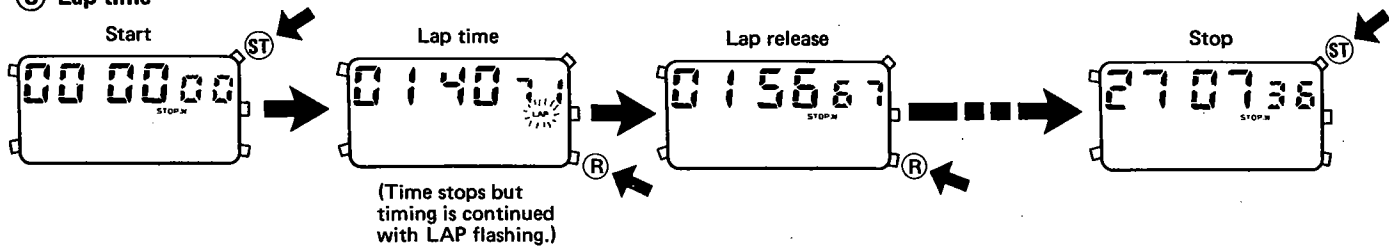
② Integral timing



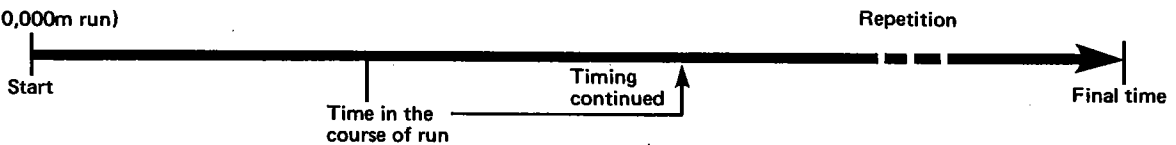
(Ex. Soccer)



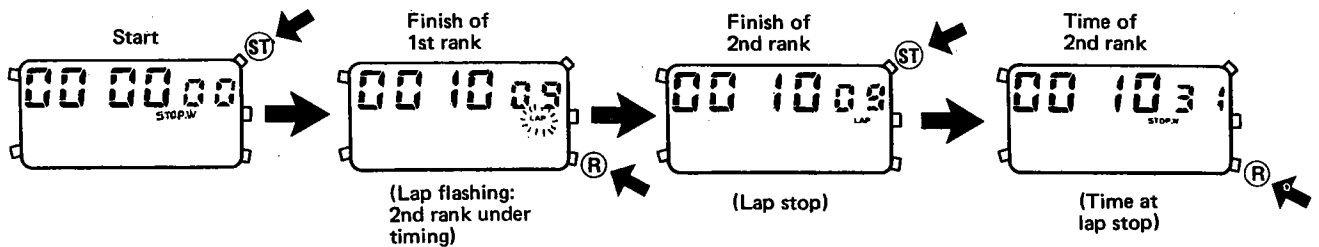
③ Lap time



(Ex. 10,000m run)



④ Timing of 1st and 2nd ranks



*When the timing exceeds 59':59'':99, the 00':00'':00 is displayed to continue the timing thereafter.

*The timing is continued even though the function is changed to the normal time display in the course of the stopwatch timing.

§ 5. HOW TO USE CALCULATOR

(1) Push-buttons and their functions

| | | |
|---|-------------------------------------|---|
| SW | Switch button: | Power switch for calculator. |
| 0 ~ 9 | Ten keys | } Register buttons : For register of numerical value into calculator. |
| | Decimal-point button | |
| C | (1-push) Clear entry button | For correction when register button is pushed by mistake. |
| | (2-push) Clear button: | To clear calculation order as well as all numerical value except for memory contents. |
| +/- | Sign change button: | To exchange plus (+) and minus (-) for numerical value displayed. |
| MC | Memory clear button: | To clear contents memorized. |
| MR | Memory recall button: | To recall numerical value memorized. |
| M+ | Memory plus button: | To add numerical value to memory. |
| M- | Memory minus button: | To subtract numerical value or calculation result from memory. |
| √ | Root button: | To obtain square root. |
| % | Percent button: | To obtain percentage. |
| = | Equal button: | To obtain answer. |
| + - × ÷ | Buttons for 4 rules of arithmetic : | To carry out 4 rules of arithmetic. |
| 123456.78 | Display window: | 8-digit display by floating decimal point system. |
| 26.- | Minus sign | |
| 775." | Memory mark | |
| E | Error mark: | |

"E ." is displayed when operation result exceeds 8 digits (over decimal point) or calculation is impossible to indicate that subsequent calculations are impossible.

2) Notes on calculation

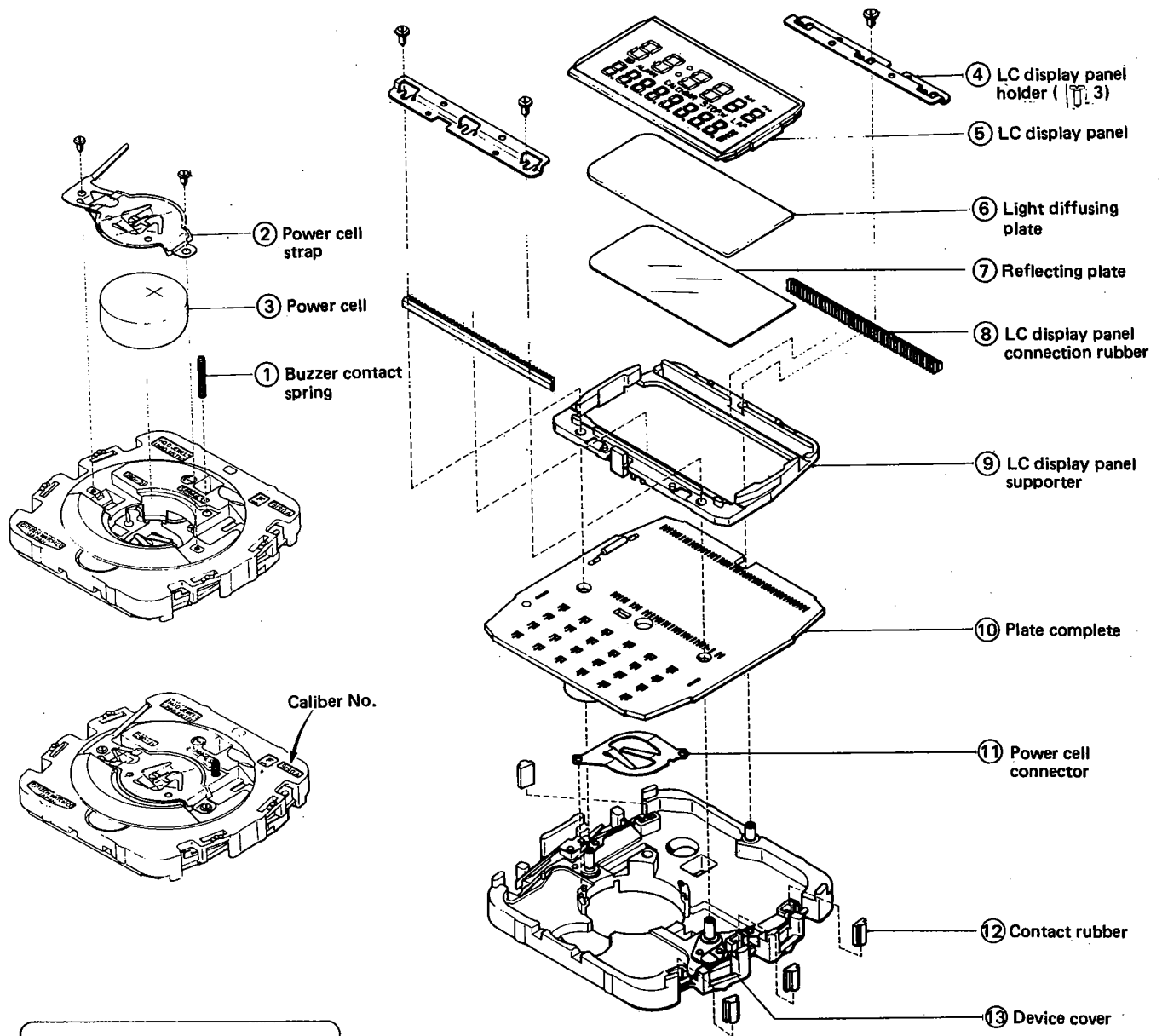
- (1) The push-buttons must be pushed softly. If stronger force than necessary is applied to push the button, some fault may be caused to the calculator.
- (2) The mispush of the buttons for 4 rules of arithmetic can be corrected with subsequent push of the correct buttons.
- (3) When calculations are through, the **SW** button must be pushed to erase the display. (The display is also erased automatically in about 3 minutes after the push of the last button even if the **SW** button is not pushed.)
- (4) It is convenient to use a mechanical pencil (with the lead pushed in) or the like when pushing the buttons. Avoid using a sharp metal substance since it may injure the buttons.

§6. DISASSEMBLY AND ASSEMBLY OF MOVEMENT

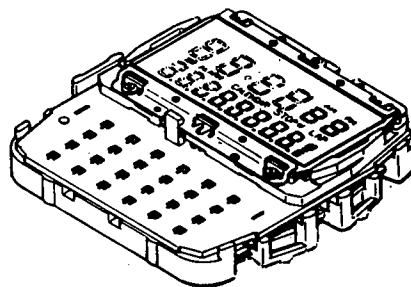
Disassembling sequence: ① ~ ⑬

Assembling sequence: ⑬ ~ ①

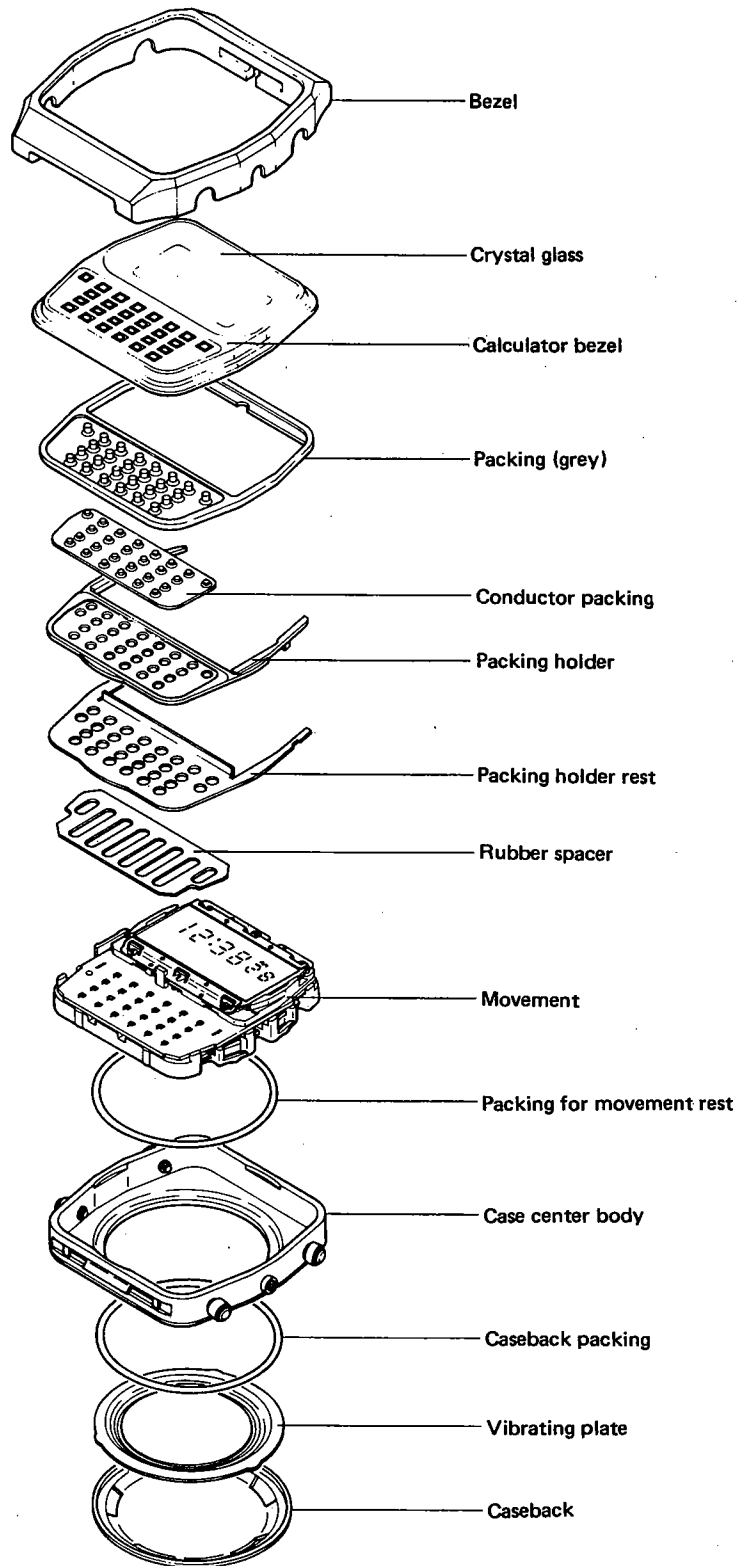
The number of the screw coming with the parts is shown by the symbol like (T 1).



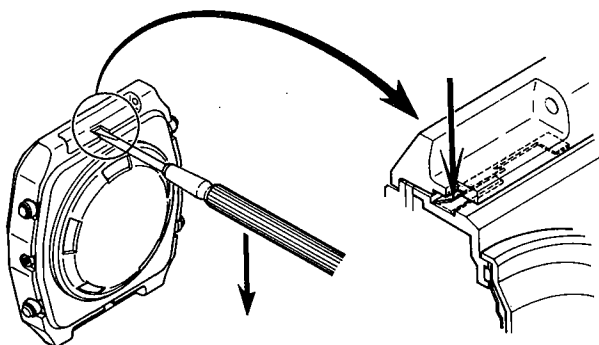
- The power cell must be put into the movement with the plus (+) side up.
- The dust or stains must be cleared away to secure high conductivity.
- Avoid washing the electronic parts.
- No lubrication is required for the movement.



§ 7. Assembly of Appearance Parts
1. Appearance Structure



2. Disassembly of watchcase

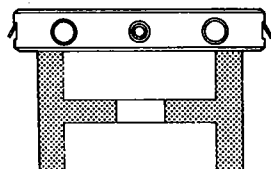


The cross-section of the watchcase appears when the band is removed. And a spring is seen at the cross-section. As illustrated in the diagram, the spring is pushed with a driver to remove the bezel. *The bezel must be removed at the 12-o'clock direction.

3. Assembly of watchcase

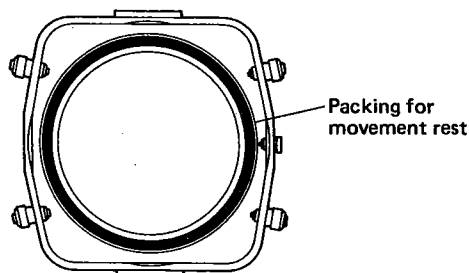
The case back must be removed previously.

The buzzer contact rubber must be assembled before the caseback is tightened.

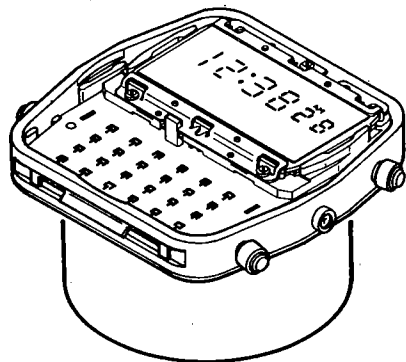


- (1) The lower face of the case center body is held by the end piece.

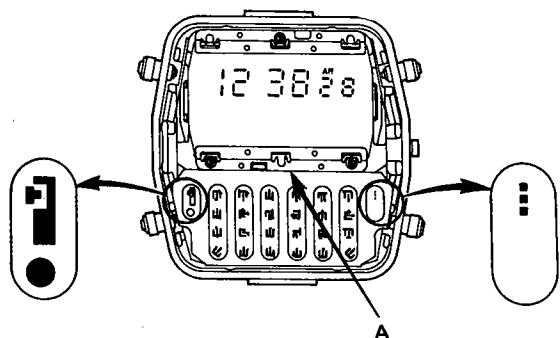
In this case, the biting area to the caseback must be avoided, so the end piece which can hold the case center body at the flat surface must be selected.



- (2) The packing for movement rest must be set accurately to the groove part of the case center body. Be careful not to confuse this packing with that for the caseback since they are in the same size. Avoid applying the silicon oil to the packing.

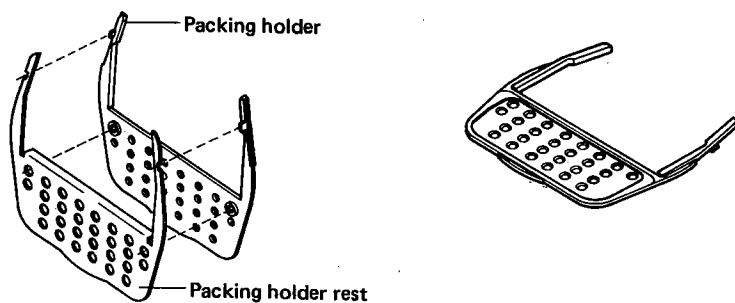


- (3) The movement is set in, making sure the packing for movement rest never protrudes over the back side of the caseback. (To check this protrusion, turn the movement over while holding the movement lightly.)

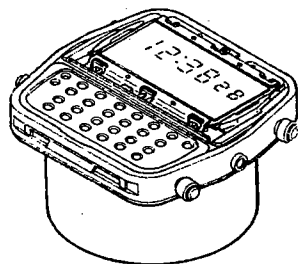


(4) Set the rubber spacer.

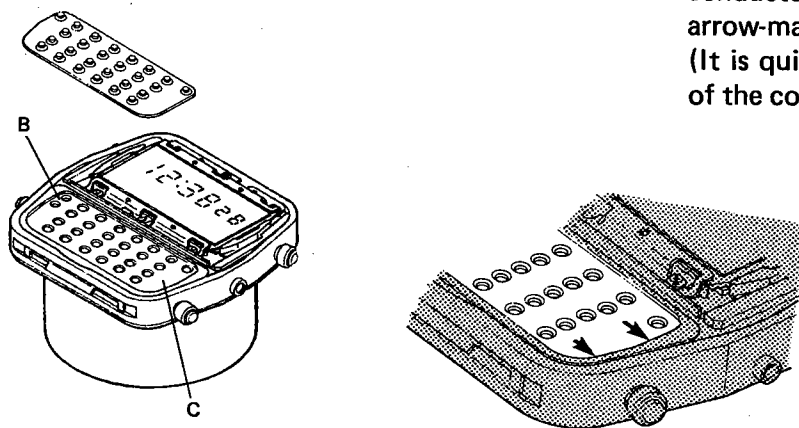
In this case, the rubber spacer must be drifted assuredly toward the A-face of the movement. At the same time, the pattern of the plate complete must come to the center of the hole of the rubber spacer, as illustrated left.



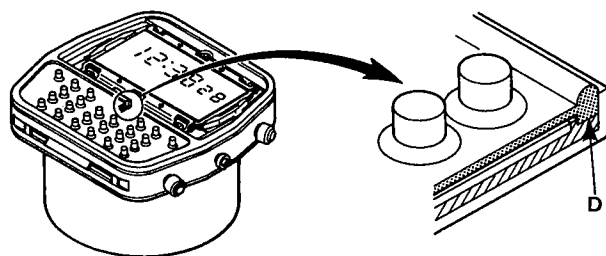
(5) The packing holder rest and the packing holder are combined, matching the concave part of the packing holder rest and the projection of the packing holder.



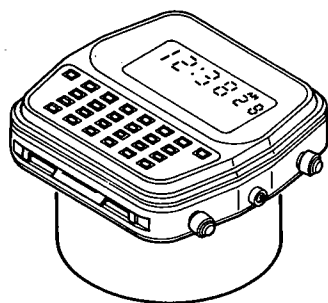
(6) The packing holder rest and the packing holder are put on the rubber spacer. Make sure that the rubber spacer is never seen through each hole of the packing holder. (If the rubber spacer is seen through the hole, the spacer must be reassembled since is out of position.)



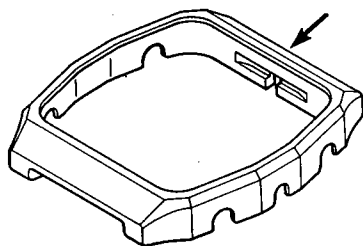
(7) Set the conductor packing, putting the B-part first and then up to the C-part in sequence. In this case, it must be confirmed that the conductor packing never protrudes over the arrow-marked surface of the packing holder. (It is quite all right even though the center area of the conductor packing may swell up a little.)



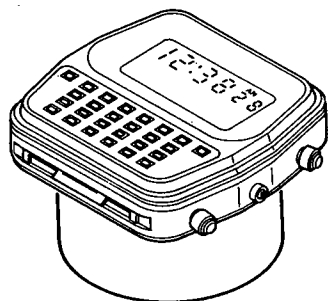
- (8) Put on the packing (grey), first matching the groove at the D-part with the packing (grey) and then setting the packing (grey) along the tip outer circumference of the packing holder in a correct way.



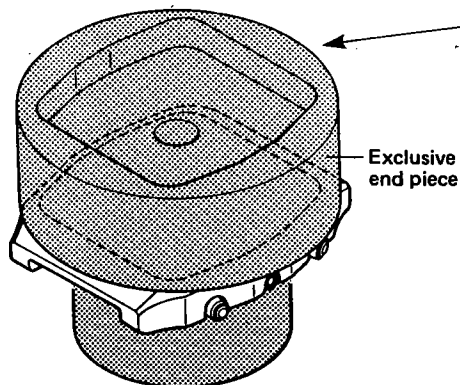
- (9) Put on the calculator bezel.
The calculator bezel must be set softly by securing a correct fit between each projection part of the packing (grey) and the hole of the button part of the calculator bezel. (Swing the bezel softly after putting it on.)
Make sure that the packing (grey) never protrude over the outer circumference of the calculator bezel.



- (10) Set the bezel in the 12-o'clock direction first, pressing down the whole assembly to avoid shifting of the calculator bezel and others.



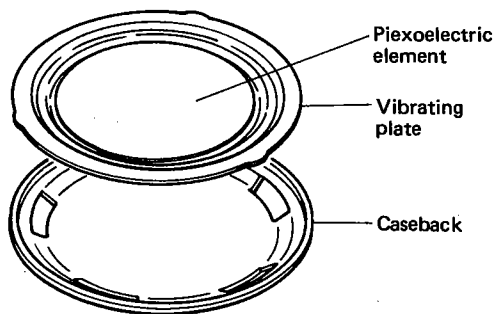
- (11) Push in the bezel strongly with fingers after setting the bezel correctly.
Push in at the 12-o'clock direction first and then the 6-o'clock direction.
A click sound can be heard when the bezel is set correctly.



*Use the exclusive end piece in case the bezel cannot be set with fingers.

Avoid applying too strong force to push the bezel. Push it gently and slowly until a click sound is heard.

The click sound may not sometimes be heard, so the fitting of the spring must be confirmed through the lateral position.



- (12) Assemble the buzzer contact spring.
- (13) Set the caseback packing.
The silicon oil must be applied to the caseback packing.
- (14) Push softly the vibrating plate into the caseback. Avoid pushing the area of the piezoelectric element.
- (15) Screw up the caseback along with the vibrating plate, paying good attention to the vibrating plate. The caseback can be screwed up with fingers.

(16) Give a check to each function as follows.



- ① Push **M** button to call out the stopwatch function, and then check whether the smooth switching is possible between the alarm and the stopwatch with push of **F** button.
- ② Push slowly **SW** button of the calculator to check whether the smooth ON/OFF operation is possible.
In this case, the displays other than **0** . may be given when ON and OFF are repeated continuously. This phenomenon is, however, not defective.
- ③ Push each figure register button to confirm that each figure is displayed correctly. At the same time, the buttons for the memory, clear and other functions are pushed to confirm their correct and smooth operations.

(Note) In case the displays other than **0** . are given through continuous operation of ON/OFF, push the clear-button to secure the **0** . display and the start calculations. The calculations must be carried out slowly and assuredly.

(For reference)

With push of the buttons as indicated below, the calculator functions can be checked totally. First, the power switch is turned ON, and the display of **0** . is confirmed.

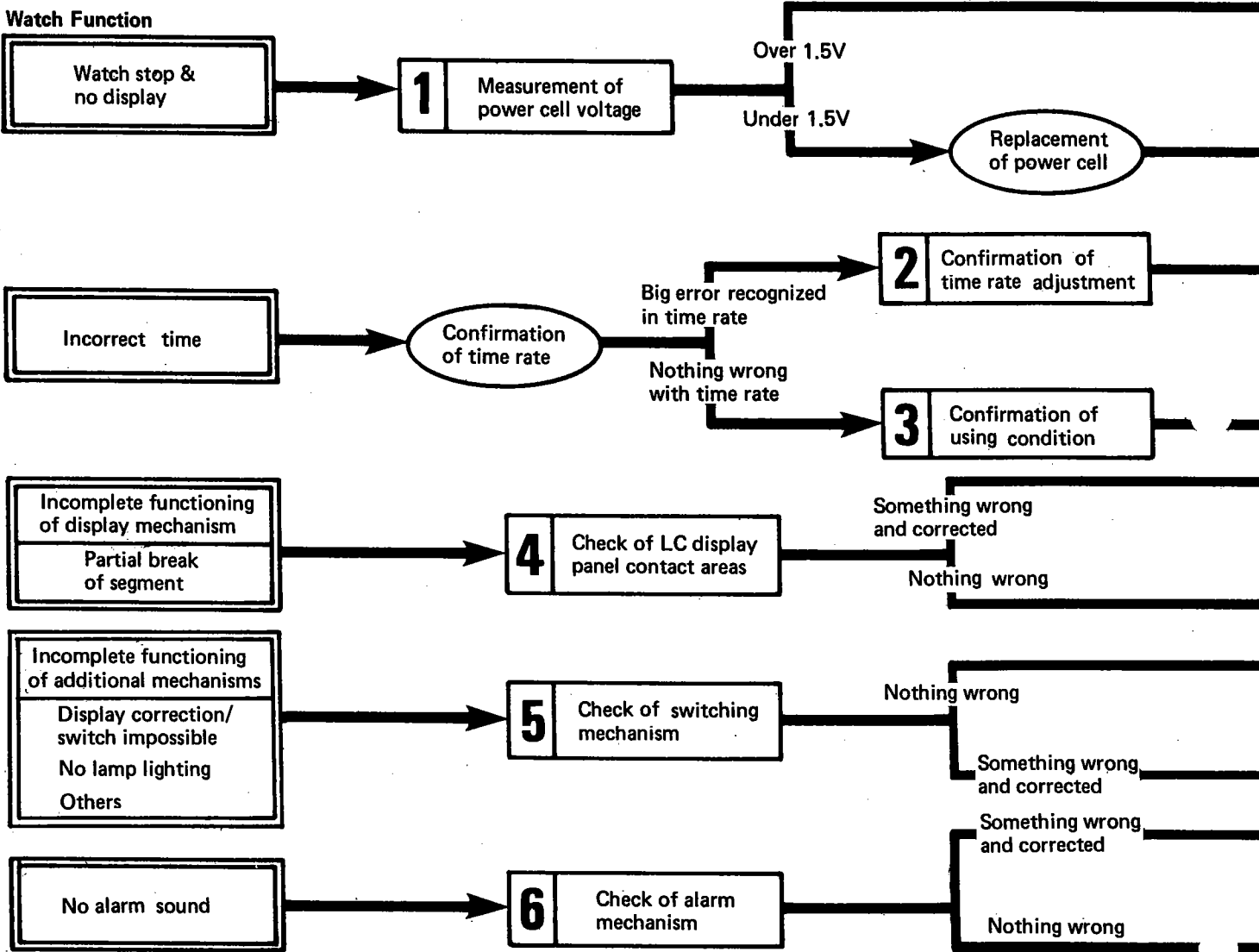
Then, the display of \rightarrow **19753000.** must be given when such buttons are pushed in sequence and in that order as **9 8 7 6 5 4 3 . 2 + 1 - 0 . 1 x 2 0 ÷** .

After this, the display of \rightarrow **10** must be given when the following buttons are pushed in sequence: **C 2 ÷ = % √ M+ M- M M^R M^C +/-** .

*If some fault is detected through the above checks, the assembling must be given again from the start along with the second check.

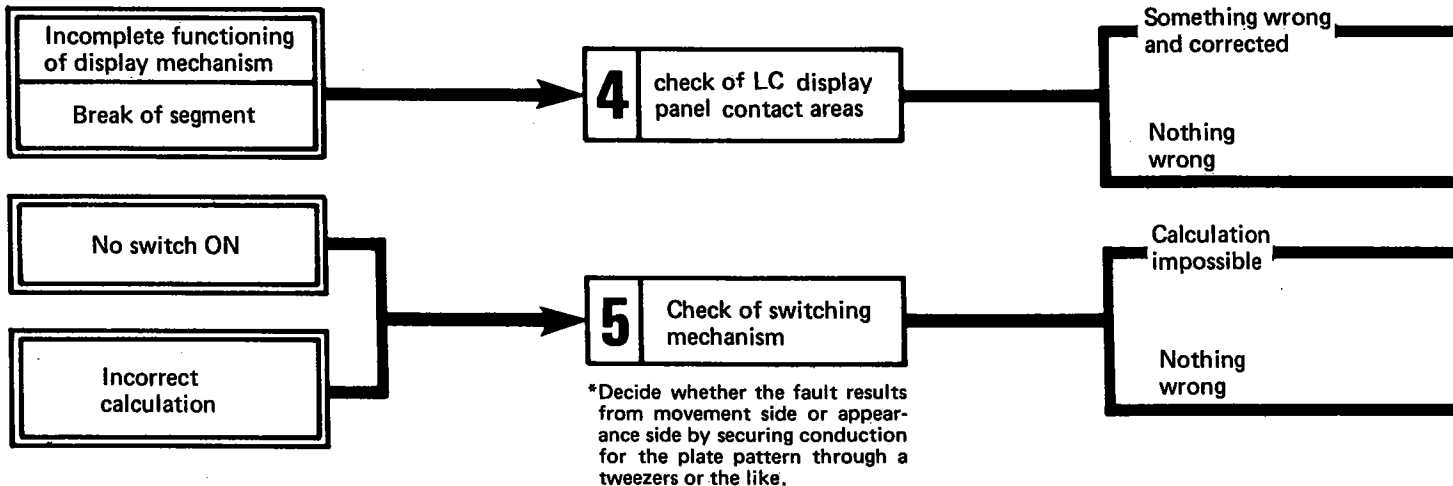
§ 8. TROUBLESHOOTING AND ADJUSTMENT

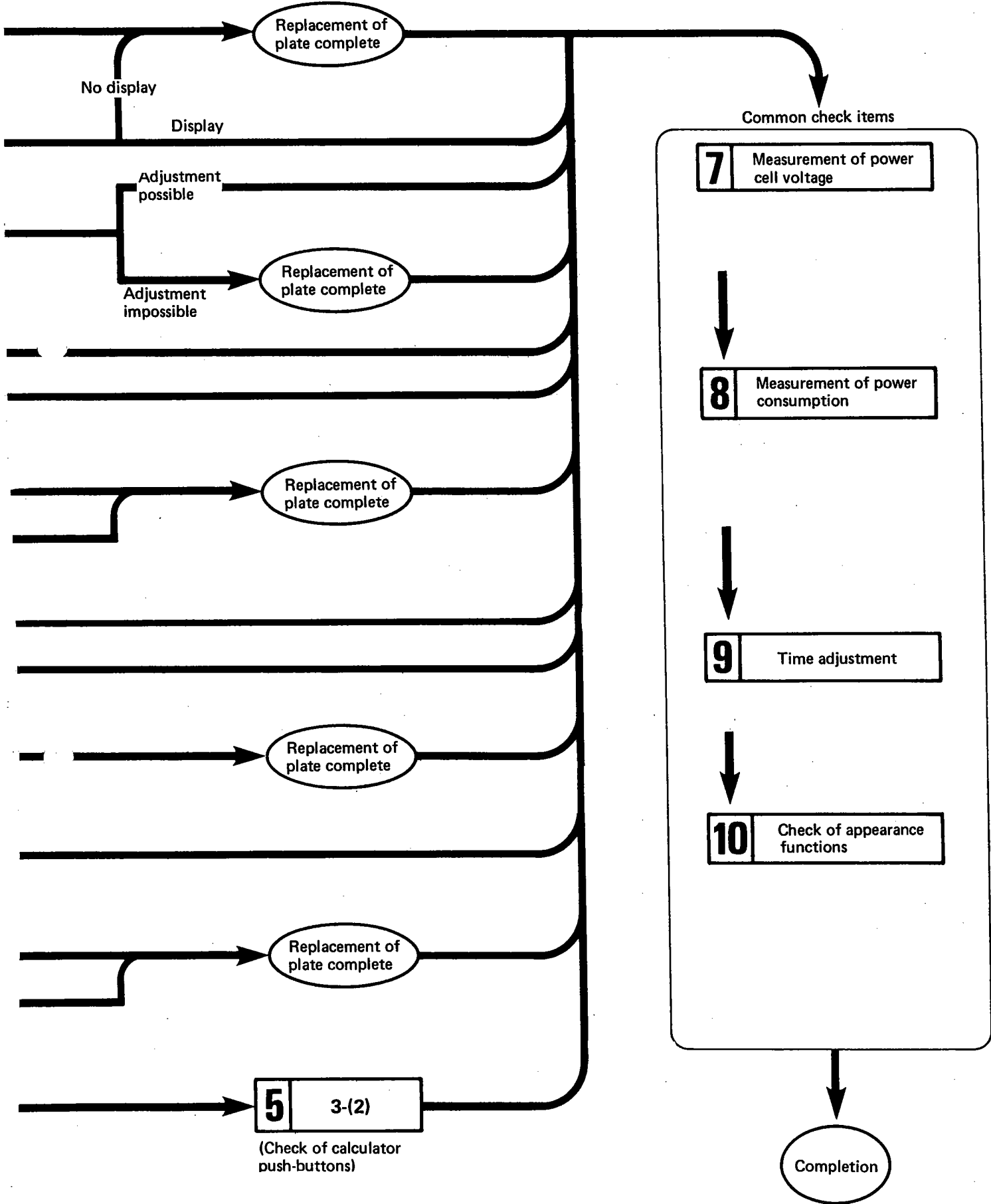
Watch Function

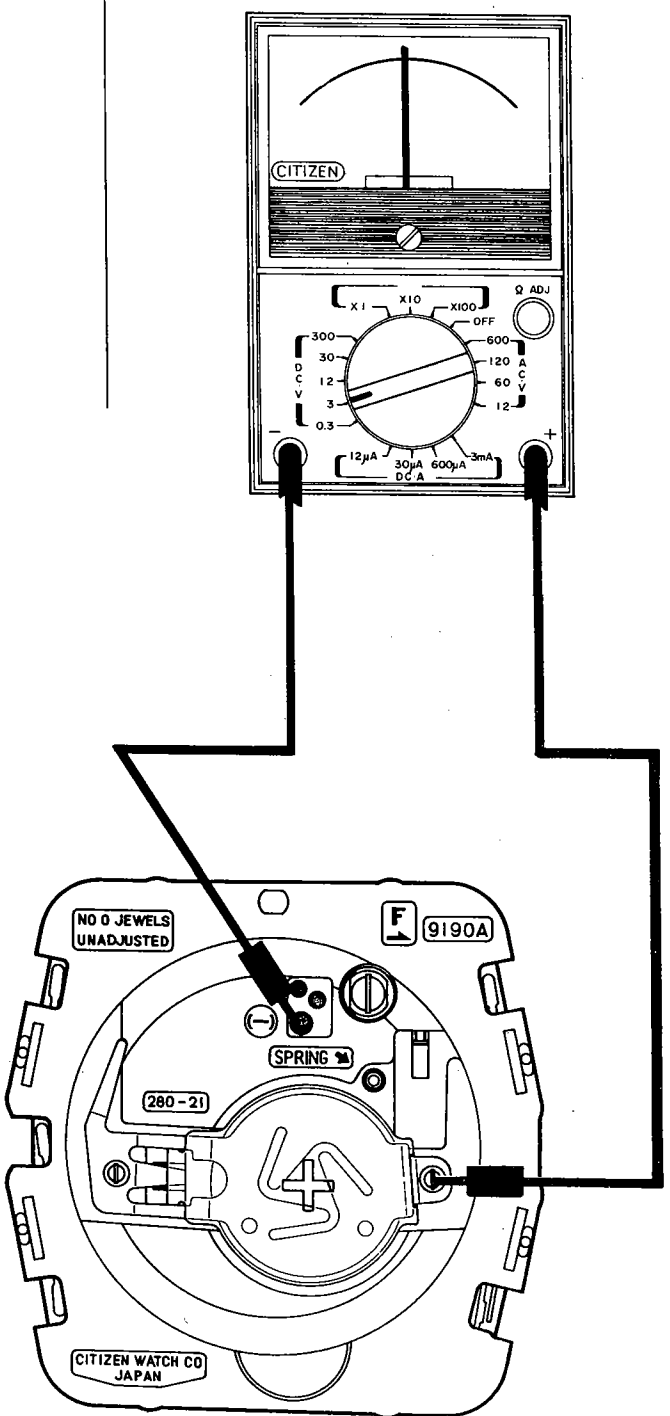


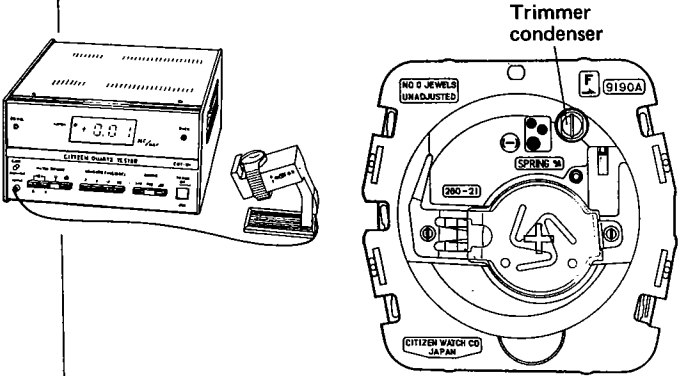
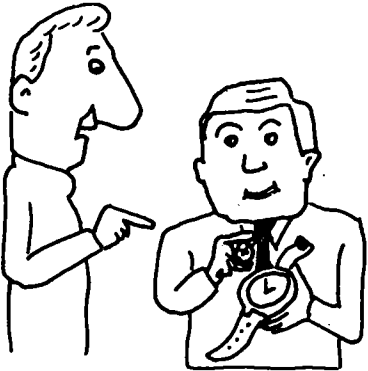
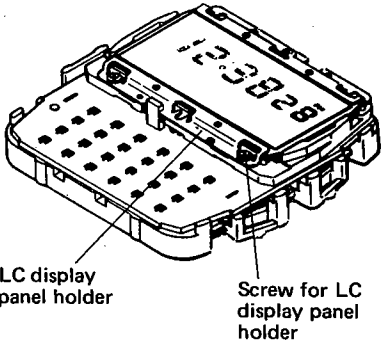
Calculator Function

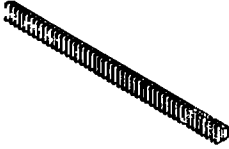
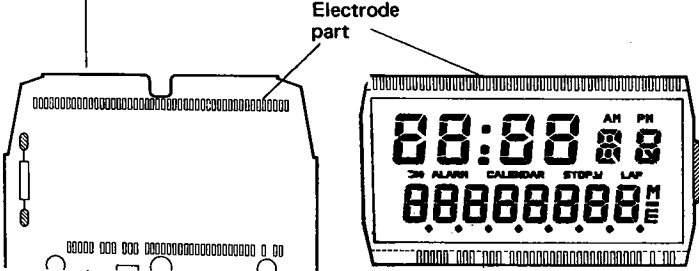
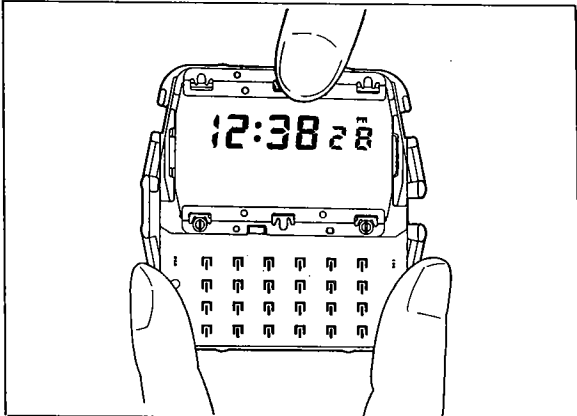
*The power cell voltage over 1.5V must be confirmed.

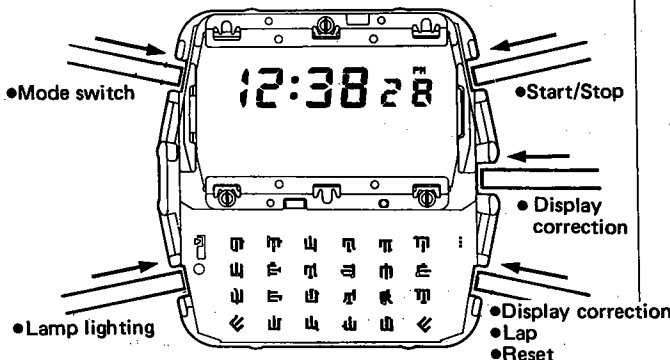
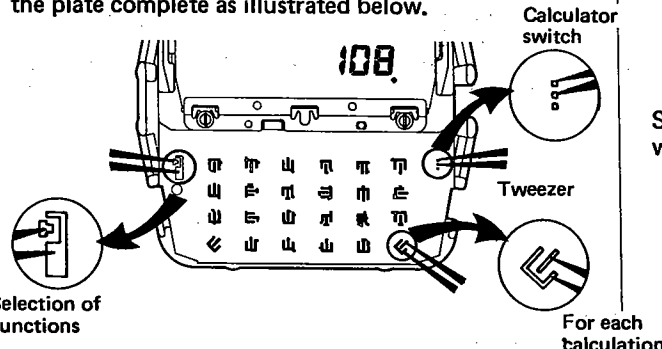
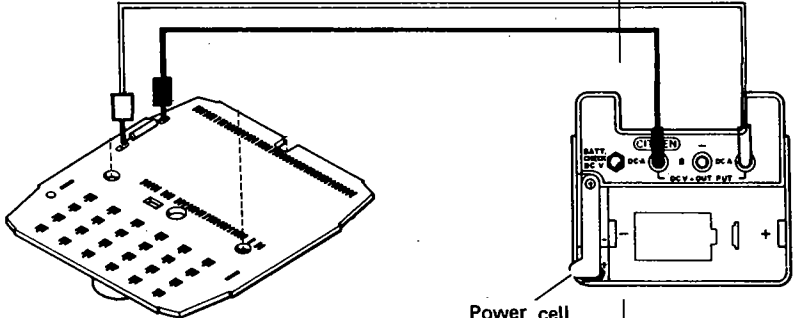


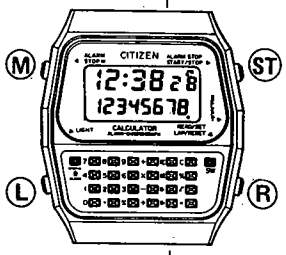
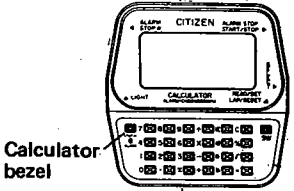
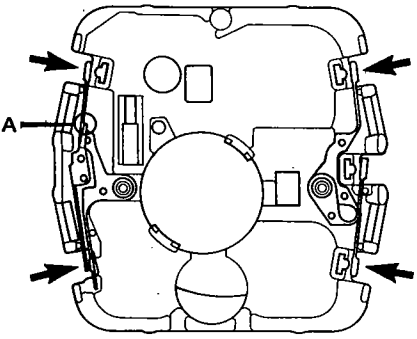
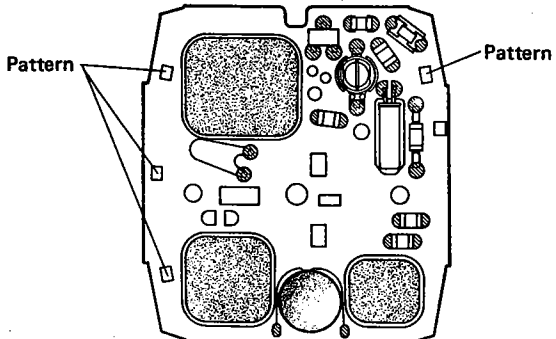


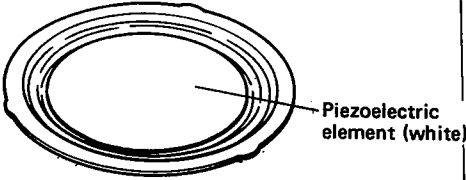
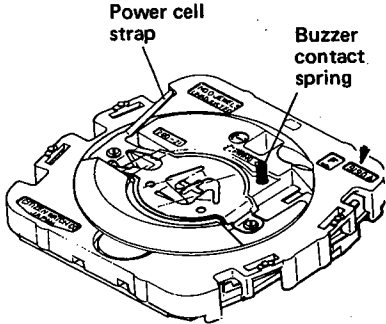
| Check item | How to check | Result and treatment |
|--|--|---|
| <p>1 Measurement of power cell voltage</p> | <p style="text-align: center;">Power cell voltage: Over 1.5V</p>  | <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>Over 1.5V</p> <p>→ Replacement of plate complete</p> </div> <div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> <p>Under 1.5V</p> <p>After replacement of power cell:</p> <p>Display</p> <p>→ 8 Measurement of power consumption</p> <p>No display</p> <p>→ Replacement of plate complete</p> </div> <div style="border: 1px solid black; padding: 5px;"> <p style="text-align: center;">Note:</p> <p>In case the watch has been used more than 3 years, the power cell must be replaced with new one although it shows more than 1.5V output.</p> </div> |

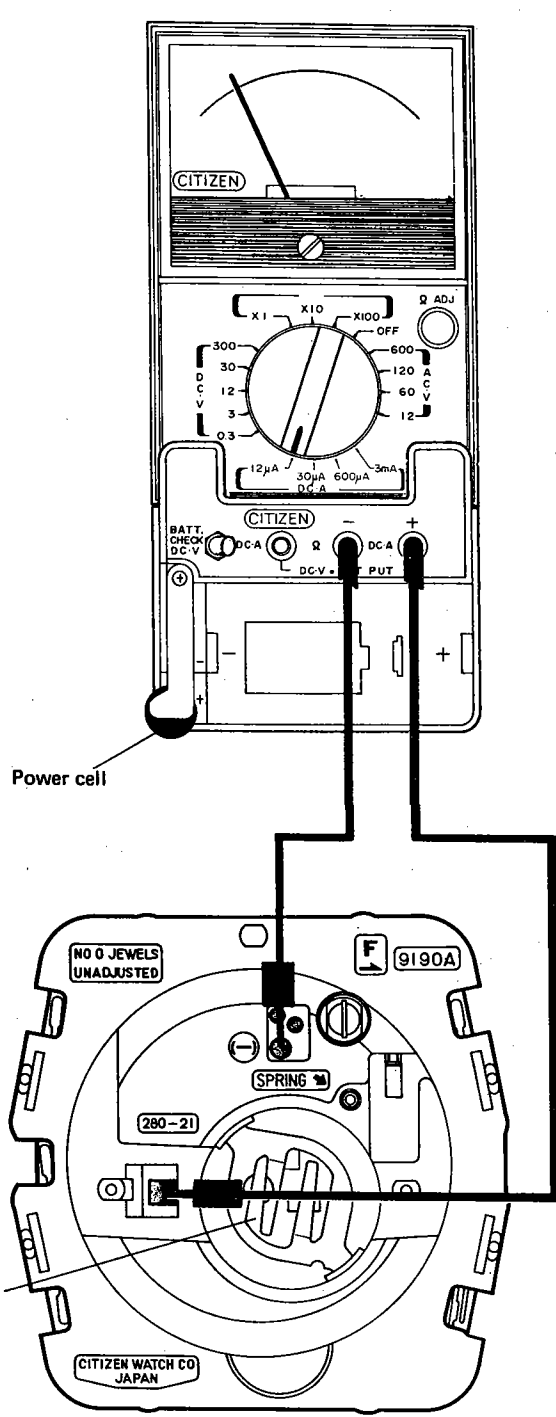
| Check item | How to check | Result and treatment |
|---|---|---|
| <p>2 Confirmation of time rate adjustment</p> | <p>The error of the time rate is corrected through time adjustment by the trimmer condenser.</p>  <p>The time gains when the trimmer condenser is turned in the direction of the arrow mark.</p> <p>Note: Never fail to turn OFF the calculator when measuring the time rate.</p> | <p>Time adjustment possible → Common check items</p> <p>Time adjustment impossible → Replacement of plate complete</p> |
| <p>3 Confirmation of using condition</p> | <p>How the watch has been used is confirmed to the user.</p> <ol style="list-style-type: none"> 1. Did he make any mistake in handling the watch? 2. Did he use the watch in an extreme temperature, i.e., outside the effective temperature range? 3. How many days have passed since the watch had the time adjustment last? 4. Other factors.  | |
| <p>4 Check of LC display panel contact areas</p> | <ol style="list-style-type: none"> 1. Check of screw for LC display panel holder. <ol style="list-style-type: none"> 1) Check whether the screw for the LC display panel holder is loosened or not. 2) Check whether the LC display panel holder is holding the LC display panel evenly with no upward warp.  | <p>Screw broken → Replacement</p> <p>Screw loosened → Retightening</p> <p>Panel held unevenly → Reassembly</p> <p>Panel holder deformed → Replacement</p> |

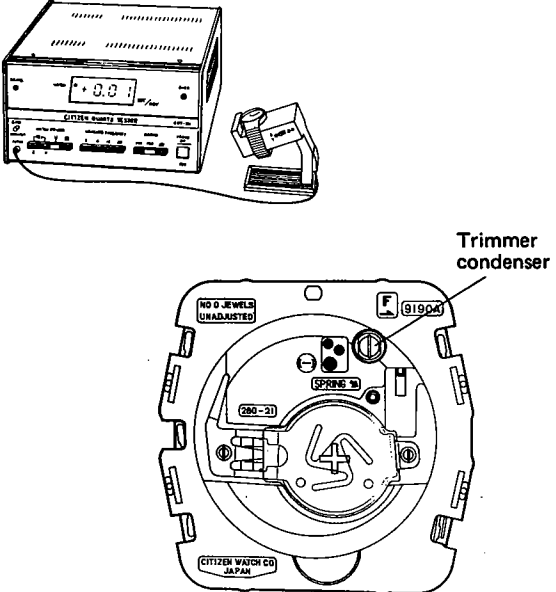
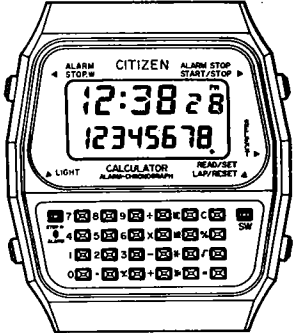
| Check item | How to check | Result and treatment |
|------------|--|---|
| | <p>2. Check of LC display panel contact rubber</p> <ol style="list-style-type: none"> 1) Check whether the contact rubber is twisted. 2) Check whether the contact rubber is worn out or stretched extremely. 3) Check whether some dust or stains stick to the contact rubber.  <p>3. Check whether some dust or other foreign matters stick to the LC display panel and the electrode part of the plate complete and whether the electrode part of the segment broken area has some crack.</p>  <p>*The dust or stains stuck to the electrode part must be cleared away thoroughly in order to secure good display as well as to prevent the increment of the power consumption.</p> <p>Check point: As shown in the diagram below, the area near the segment broken part is pushed softly with a finger. If the broken segment is displayed again, it is known the contact is unsteady there.</p>  <p>Note: Avoid pushing the LC display panel with intensive force since the glass may be broken.</p> | <p>Rubber twisted or worn out → Replacement</p> <p>Dust or stains sticked → Clearing</p> <p>Dust or stains sticked → Clearing</p> <p>Crack recognized → Replacement</p> <p>Nothing wrong with above checks → Replacement of LC display panel</p> <p>Correction impossible yet → Replacement of plate complete</p> |

| Check item | How to check | Result and treatment |
|--|---|---|
| <p>5 Check of switching mechanism</p> | <p>1. As shown in the diagram below, the springs of the areas equivalent to each push-button are pressed to check whether each function can be actuated in a correct way.</p> <p>Note: The matchstick or the like is recommended to use to push the springs instead of use of a hard and sharp substance. Never push the spring strongly but push as softly as possible not to give malformation to them.</p>  <p>To confirm the calculator operation and the function selection, the tweezers are applied to the pattern of the plate complete as illustrated below.</p>  <p>2. Check of lamp lighting As illustrated below, the adaptors of Citizen Multi-Tester are applied to both terminals of the lamp attached to the plate complete. And check whether the lamp lights up or not.</p>  | <p>Nothing wrong with each operation → 3-1) Check of watch push-buttons</p> <p>Something wrong with operation → 4. Check of contact springs</p> <p>No lamp lighting → 2. Check of lamp lighting</p> <p>Nothing wrong with each operation → 3-2) Check of calculator push-buttons</p> <p>Something wrong with operation → Replacement of plate complete</p> <p>Lamp lighting → 4. Check of contact springs</p> <p>No lamp lighting → Replacement of plate complete</p> |

| Check item | How to check | Result and treatment |
|---|--|---|
|  | <p>3. Check of push-buttons</p> <p>1) Check of watch push-buttons Each push-button (located at the side of the watchcase) is taken out from the case.</p> <p>(1) Check whether the push-button has some bend.</p> <p>(2) Check whether any dust or stains stick to the push-button as well as to the areas of the case where the push-buttons are removed.</p> <p>(3) Set each button to the case and check whether a smooth and accurate operation is possible.</p> <p>*The silicon oil must be applied to the packing of each push-button.</p> <p>2) Check of calculator push-buttons</p> <p>(1) Confirm whether each push-button can be operated in a smooth and accurate way.</p> <p>(2) Check whether some dust or stains stick to the conduction rubber which touches the pattern of the plate.</p> <p>(3) When no fault is detected, reassembling must be given following "§7. Assembly Appearance Parts".</p> | <p>Button deformed or broken → Replacement</p> <p>Dust or stains stuck → Clearing</p> <p>No smooth operation → Replacement of calculator bezel</p> <p>Dust or stains stuck → Clearing</p> |
|  | <p>4. Check of contact springs</p> <p>1) Check whether each contact spring (← mark) attached to the device cover has some malformation or breakage.</p> <p>2) Confirm that a gap is secured between each contact spring and each contact rubber (between the springs at the light part).</p> <p>3) Confirm that each contact rubber has a correct contact with the pattern of the plate complete (at A-part for the lamp).</p> <p>4) Check whether some dust or stains stick onto the contact surface.</p> | <p>Spring deformed or broken → Replacement of device cover</p> |
| |  |  |

| Check item | How to check | Result and treatment |
|---|--|--|
| <p>6 Check of alarm mechanism</p> | <p>1. Check of diaphragm Check whether the piezoelectric element attached to the diaphragm installed inside the caseback has something wrong.</p>  <p>vibrating plate</p> <p>Piezoelectric element (white)</p> <p>2. Check whether something wrong is recognized in the shape of the buzzer contact spring and the power cell strap. Also check whether the tips of the contact spring and the strap have correct contact to the piezoelectric element.</p>  <p>Power cell strap</p> <p>Buzzer contact spring</p> | <p>Element cracked → Replacement of vibrating plate</p> <p>Spring worn out or deformed → Replacement</p> <p>Nothing wrong with above checks → Replacement of plate complete</p> |
| <p>7 Measurement of power cell voltage</p> | <p>Refer to 1 Measurement of power cell voltage (Page 18).</p> | <div style="border: 1px solid black; padding: 5px;"> <p>Over 1.5V → 8 Measurement of power consumption</p> <p>Under 1.5V → Replacement of power cell → 8 Measurement of power consumption</p> </div> |

| Check item | How to check | Result and treatment |
|---|---|--|
| <p>8 Measurement of power consumption</p> | <p>1. Only for watch display</p>  <p>Power cell</p> <p>No power cell installed</p> <p>2. Power consumption at calculating time The measurement is carried out after confirming "0." display with push of [SW] button of the calculator. The range of the measurement is set to 600μA for the tester.</p> | <p>1) Measurement under normal time display:</p> <p>Under 4.0μA → 9 Time adjustment</p> <p>Over 4.0μA → 2) Measurement of power consumption at electronic circuit part</p> <p>2) Measurement of power consumption at electronic circuit part (with LC display panel removed)</p> <p>Under 2.0μA → Replacement of LC display panel contact rubber or LC display panel (Be careful of dust and stains at conduction part.)</p> <p>Over 2.0μA → Replacement of plate complete</p> <p>Under 100μA → 9 Time adjustment</p> <p>Over 100μA → Replacement of plate complete</p> |

| Check item | How to check | Result and treatment |
|--|---|----------------------|
| <p>9 Time adjustment</p> | <p>The time rate is measured by a timing machine, and the time is adjusted by means of the trimmer condenser.</p>  <p>The top illustration shows a timing machine with a digital display showing '+0.01' and a small watch component. The bottom illustration shows the back of a watch case with various components labeled: 'NO 0 JEWELS UNADJUSTED', 'F 91904', 'TRIMMER CONDENSER' (with an arrow pointing to a small circular component), 'SPRING 30', '280-21', and 'CITIZEN WATCH CO JAPAN'.</p> | |
| <p>10 Check of appearance functions</p> | <p>Finally, the following points are confirmed as a check of the appearance functions.</p> <ol style="list-style-type: none"> 1. The figures displayed have nothing wrong at all. 2. Each function can be operated correctly with push of each push-button. 3. The dust and stains are cleared away completely from the appearance parts.  <p>The bottom illustration shows the front view of the watch. The LCD display shows the time '12:38 28' and the date '12345678'. The watch face includes labels for 'ALARM STOP', 'CITIZEN', 'ALARM STOP START/STOP', 'LIGHT', 'CALCULATOR ALARM-CHRONOGRAPH', 'REAR/SET LAP/RESET', and 'SW'.</p> | |

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