

SEIKO

QUARTZ *LC*

Cal.A159A

PARTS LIST

Calibre No.

A159A

Style Name

**QUARTZ LC
ALARM CHRONOGRAPH**



Characteristics

Case diameter : ϕ 28.9 mm
 Maximum height : 7.0 mm
 Frequency of quartz crystal oscillator : 32,768 Hz
 (Hz=Hertz Cycle per second)
 Time functions : Digital Display System showing hour, minute, second and day
 Calendar functions : Digital Display System showing month, day and date
 Chronograph functions : 12-hour Digital Display System showing minute and second (or minute, second and 1/10 second within 20 minutes measurement)
 Alarm functions : Can be set to operate at desired minute and 12-hour
 Time micro-adjustor : Trimmer condenser system
 Illumination light for digital display panel :
 Illuminated in coordination with the touch-button depressing



4001 881



4033 880



4245 880



4313 880



4410 881



4510 880



4521 510
4521 511



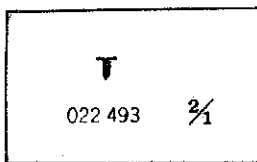
4540 880



4580 880



SEIKO SB-BU



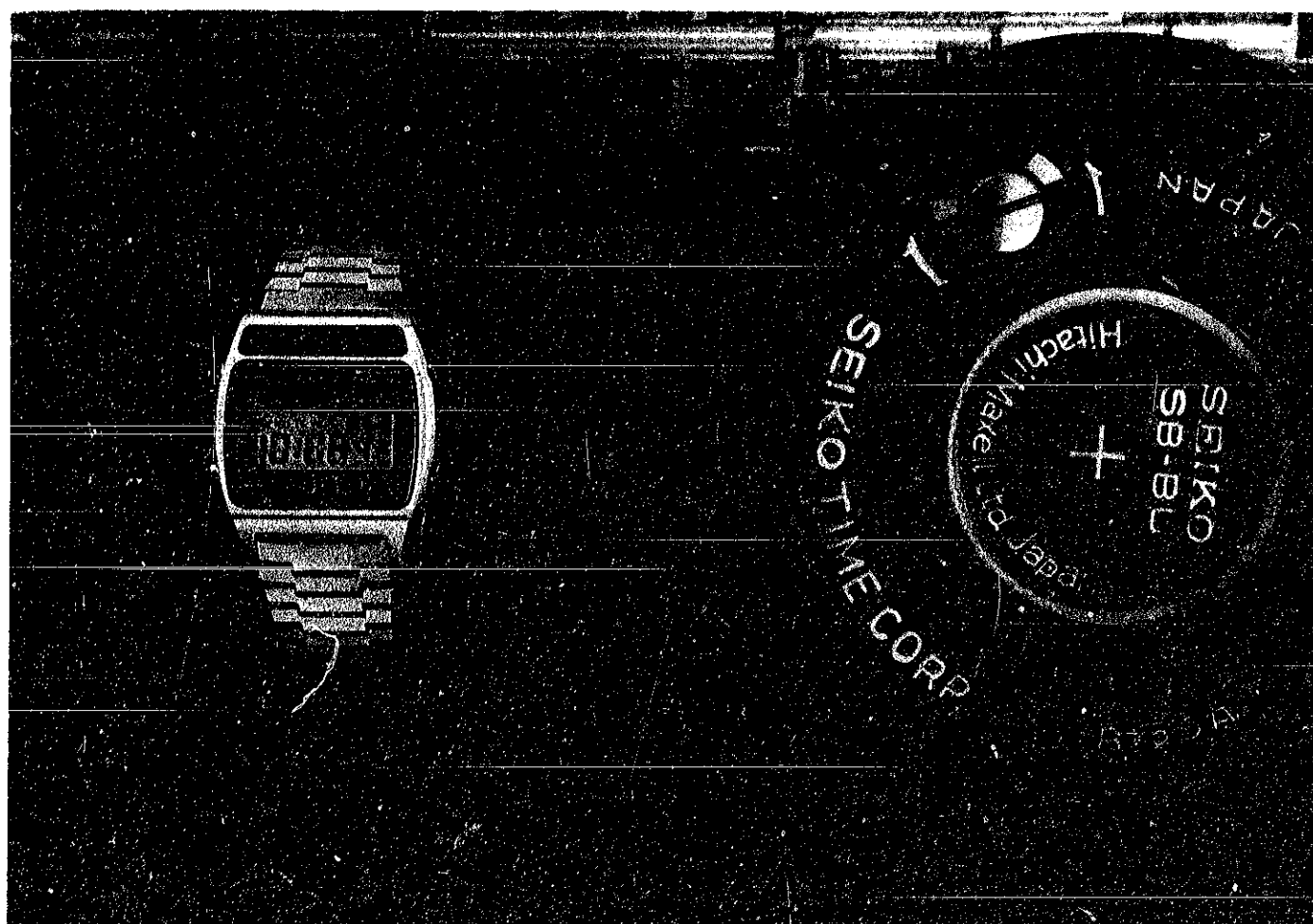
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022 493 2/1

Calibre No.		Style Name	
A159A		QUARTZ LC ALARM CHRONOGRAPH	
PART NO.	PART NAME	PART NO.	PART NAME
4001 881	Circuit block		
4033 880	Frame for liquid crystal panel with bulb		
4245 880	Switch spring		
4313 880	Connector		
4410 881	Circuit bridge plate		
4510 880	Liquid crystal panel		
4521 510	Reflecting mirror (Silver)		
4521 511	Reflecting mirror (Gold)		
4540 880	Spring for liquid crystal panel		
4580 880	Speaker block		
022 493	Liquid crystal panel holder screw		
SEIKO SB-BU	Silver oxide battery		

TECHNICAL GUIDE

SEIKO DIGITAL QUARTZ

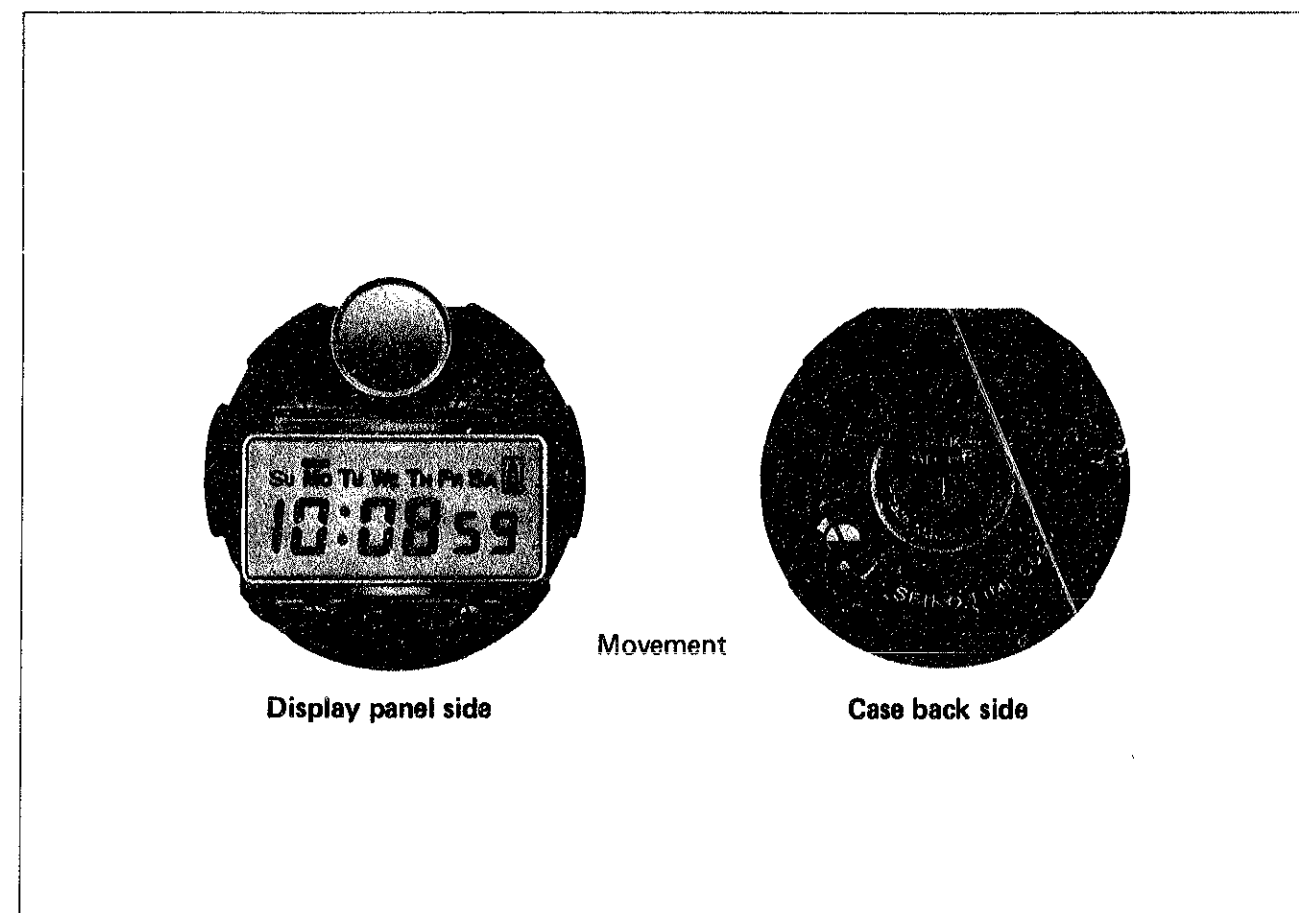
CAL. A159A



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Display panel side

Movement

Case back side

I. SPECIFICATIONS AND FEATURES

1. Specifications

Item	Calibre No. A159A
Display medium	Nematic Liquid Crystal, FEM (Field Effect Mode)
Display system	Four-function changeover system with time, stopwatch, alarm setting and time/calendar setting functions. <ul style="list-style-type: none"> Time function: Digital display system showing hour, minute, second & day. In the time function, calendar and time set for the alarm are displayed by depressing a button. Calendar: Digital display showing month, date & day. Time set for the alarm: Digital display showing hour, minute and "A" (for AM)/"P" (for PM) Stopwatch function: 12-hour digital display system showing hour, minute, second and 1/10 second (The 1/10 second measurement is possible up to 20 minutes.) Alarm setting function: Alarm time can be set to operate at the desired minute and 12-hour (with "A" (AM)/"P" (PM) indication).
Additional mechanism	<ul style="list-style-type: none"> Pattern segment checking system Illuminating light
Crystal oscillator	32,768 Hz (Hz. = Hertz . . . cycles per second)
Loss/gain	Loss/gain at normal temperature range Mean monthly rate: less than 10 seconds Annual rate: less than 2 minutes Temperature compensation device
Casing diameter	φ28.9 mm
Height	7.0 mm
Operational temperature range	-10°C ~ +60°C (14°F ~ 140°F)
Regulation system	Trimmer condenser
Battery power	SEIKO SB-BU silver oxide battery, 1.5V Battery life is approximately two years. (If the light is used 5 times a day and the alarm is used once a day.)
IC (Integrated Circuit)	C-MOS-LSI 1 piece

2. Features

(1) A complete "multi-functional" digital watch

- Not only has the time function but also such functions as an alarm function and a stopwatch function as well as all functions most frequently referred to in every day use, Cal. A159A can be really called a complete "multi-functional" digital watch.
- The function indicating mark on the display panel shows which function of the watch is operating.
- The alarm can be either stopped or reset by the repeated pushing of the button. This easy button operation enables the watch to sound the alarm except when it is not required.

(2) Each function can be used independently

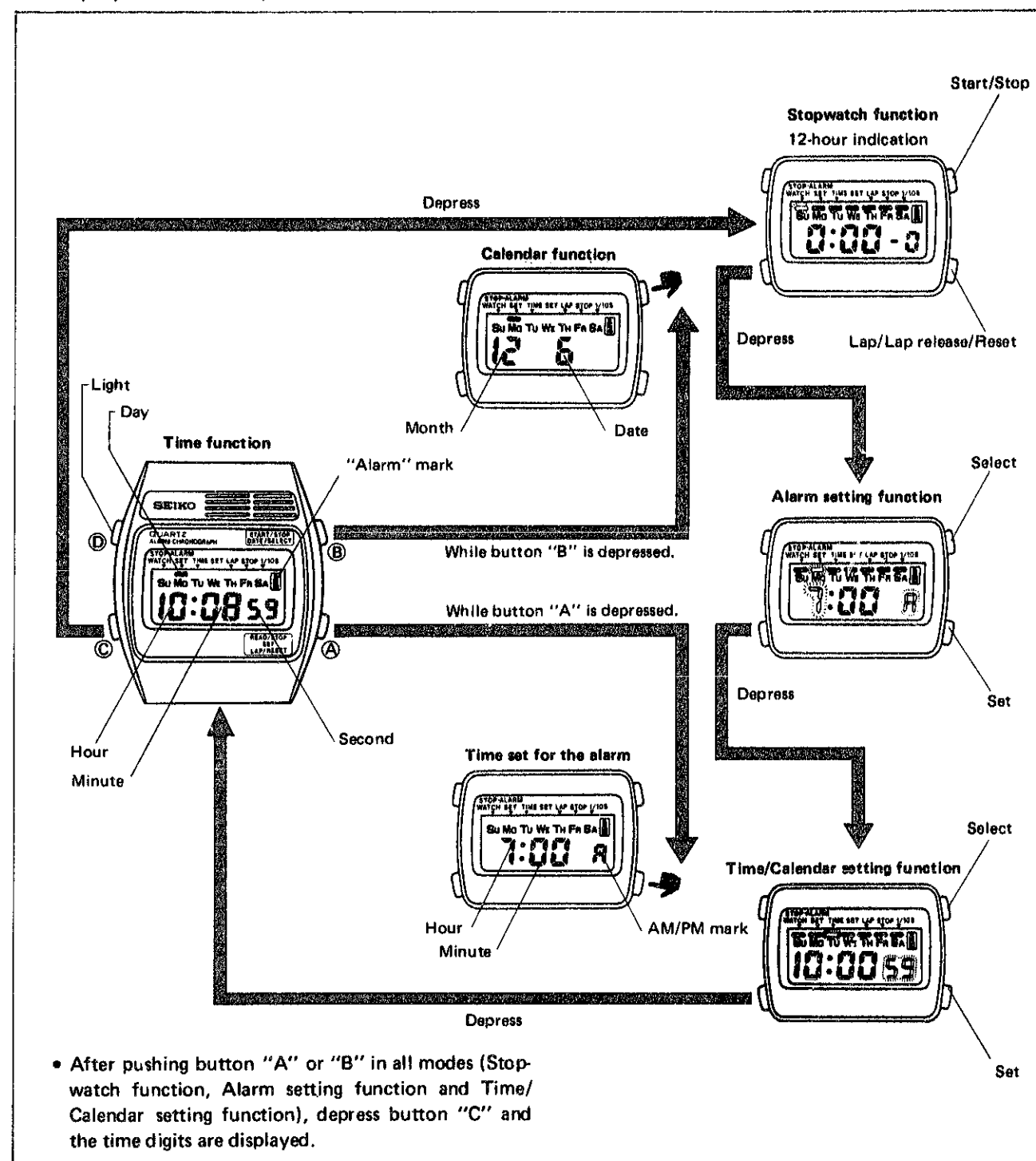
As each function of the watch operates independently, a changeover at any time of one function does not affect whatsoever the accurate and correct performance of the other function, i.e. the time, stopwatch or alarm function.

(3) Thin and compact model which is designed to sound a clear alarm

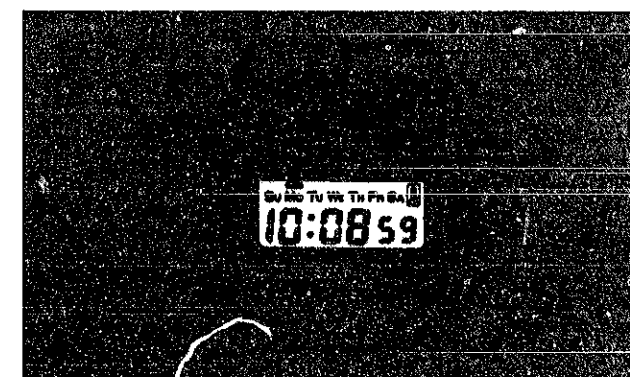
- The speaker is so constructed in the movement so that the alarm sounds clearly through the front panel.
- The development of the ultra-small speaker has made it possible for the movement to be made thin and compact despite its having an alarm function.

II. HOW TO USE

• Display and button operation



- Depress button "D" in all functions to activate the illuminating light.



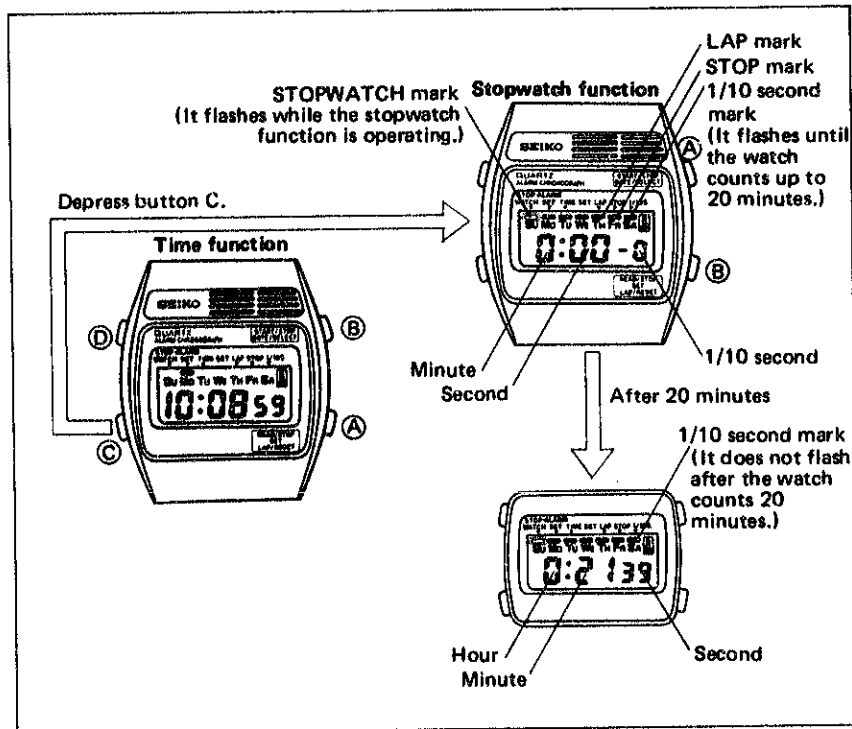
1. How to use as a stopwatch

(1) Preparation

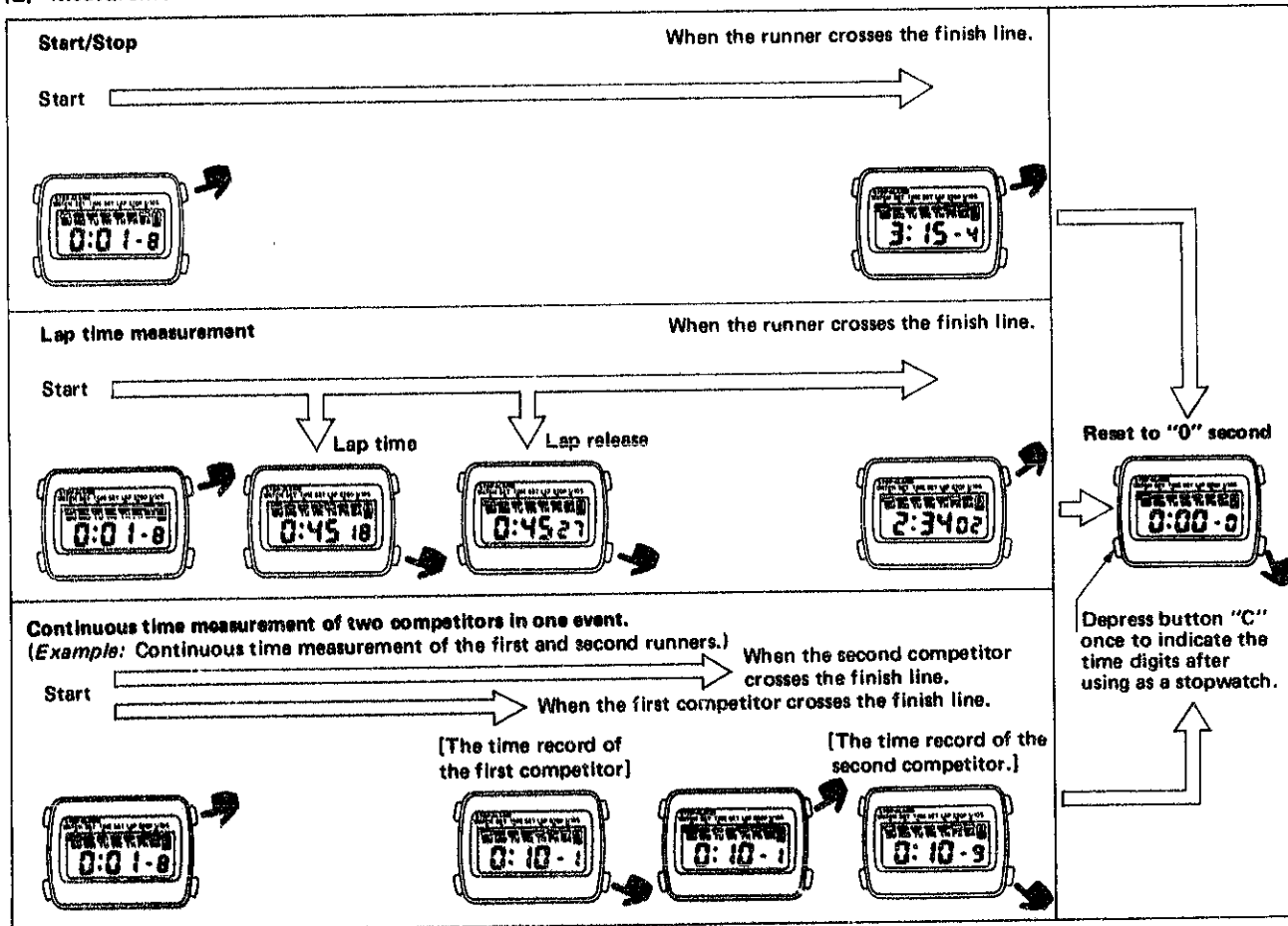
Be sure to start the stopwatch device from the reset position. (All digits must indicate "0".)

[How to reset to "0:00 00"]

- Depress button "B" to stop the stopwatch function (STOP mark is flashing.).
- Then depress button "A" once or twice.

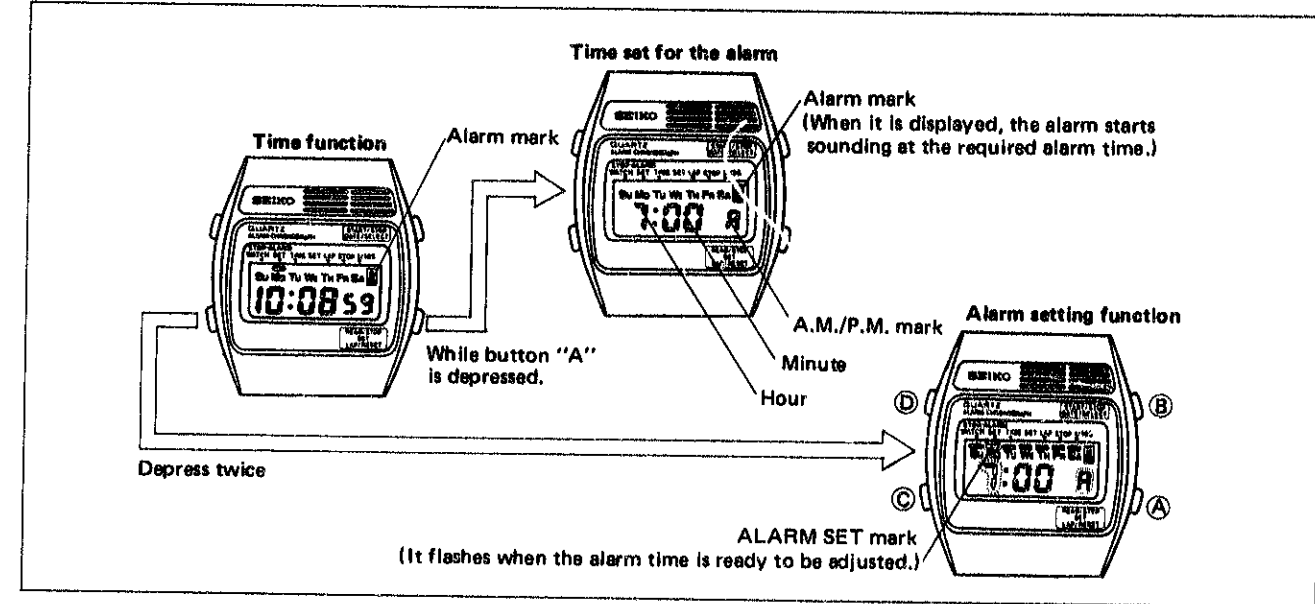


(2) Measurement



- If the stopwatch function is changed over to the time and calendar function when the LAP or LAP/STOP mark is displayed, the Lap is released when the time and calendar function is changed over to the stopwatch function again.
- The stopwatch functions and the time and calendar functions work independently. When the stopwatch functions are used for a long time, it is recommended that button "C" is depressed to indicate the time function. That prevents the button from being depressed by mistake.

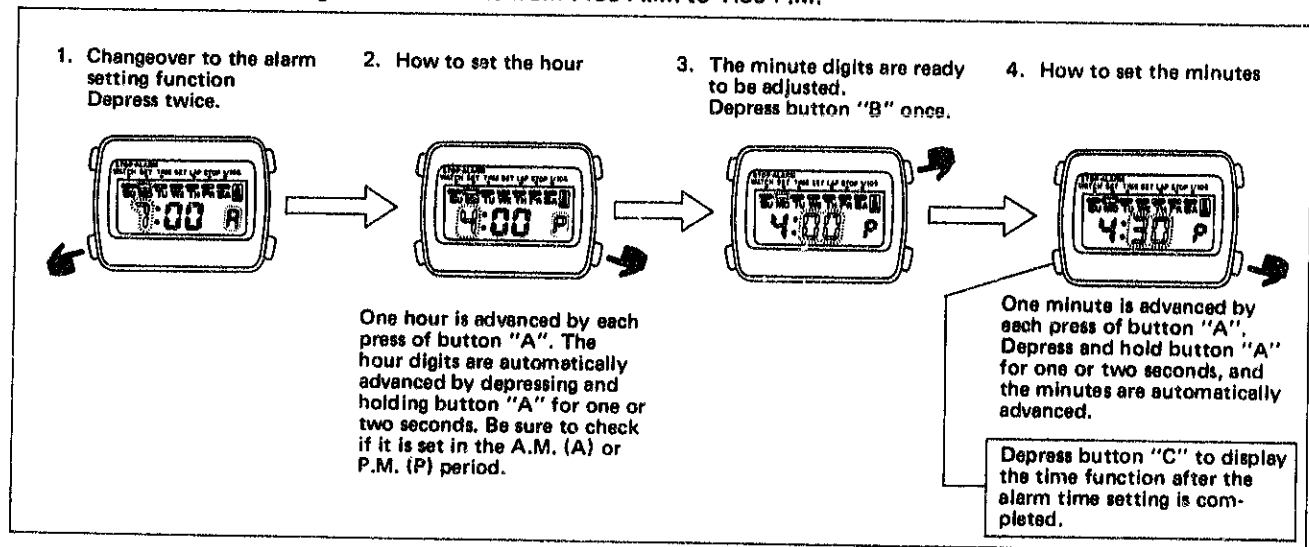
2. How to use the alarm



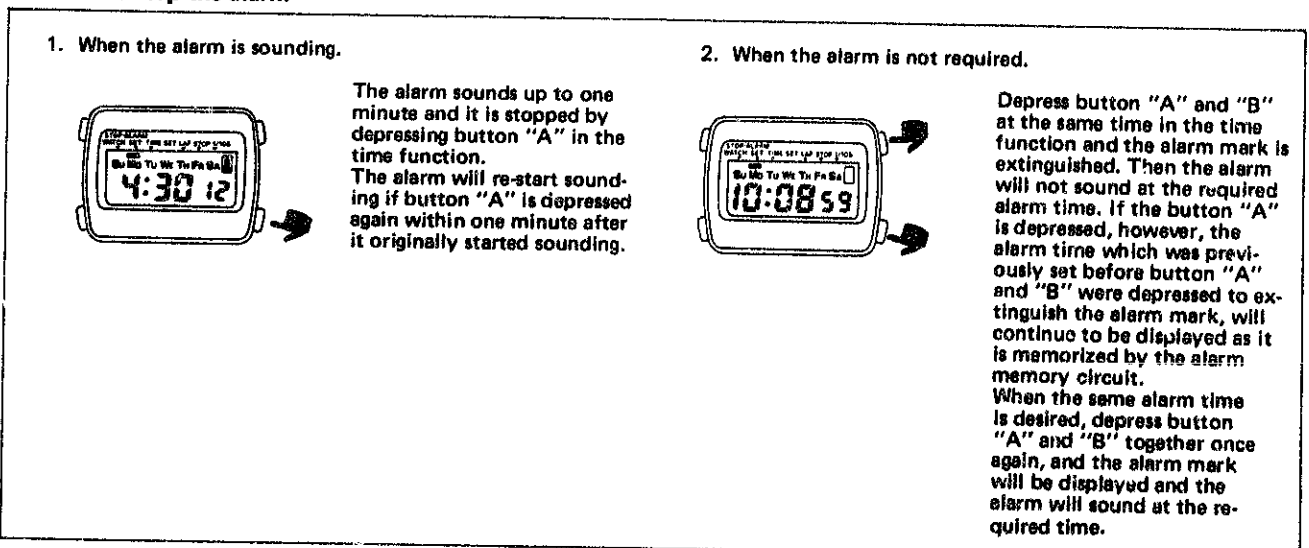
(1) How to set the alarm time

(The alarm mark is displayed when the alarm time is set.)

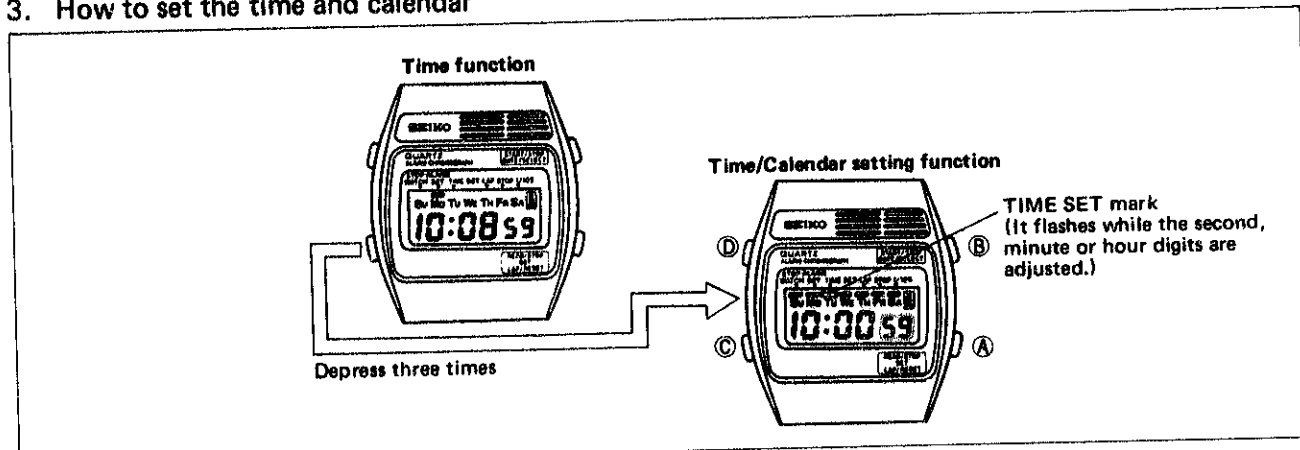
Example: How to change the alarm time from 7:00 A.M. to 4:30 P.M.



(2) How to stop the alarm



3. How to set the time and calendar



Example: How to change the indication of 10:08:42 AM of December 6, Monday into 7:00:00 PM of August 10, Wednesday.

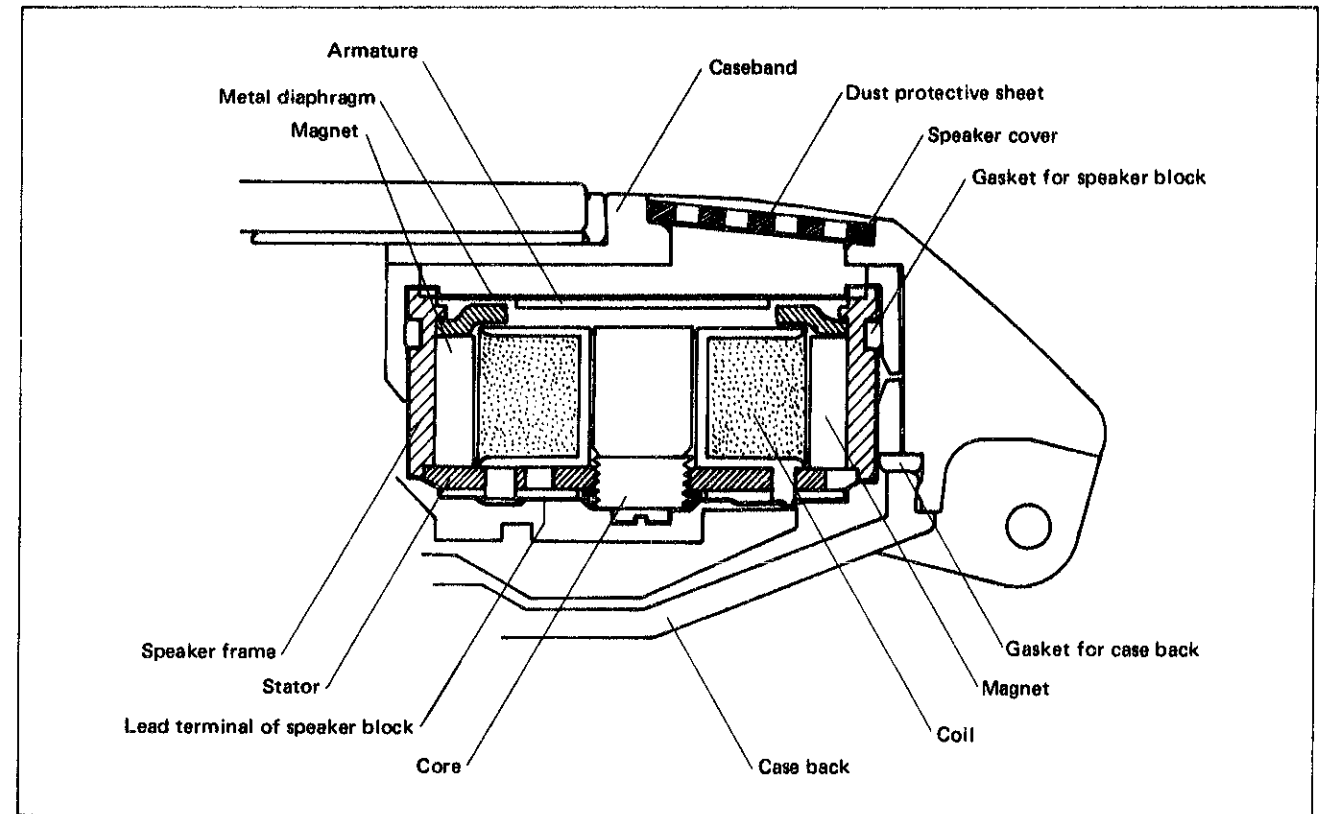
Digits and mark to be adjusted	Button operation	
	SELECT (Selection of the digits and mark to be adjusted.)	SET (Adjustment)
Second	Depress button "C" three times to operate the time and calendar setting function.	One flashing digit is advanced by depressing button "A". The digits are automatically advanced by depressing and holding button "A" for one or two seconds.
Minute		Depress button "A" in accordance with a time signal and the second is reset to "00".*
Hour	A.M. or P.M. mark is displayed.	Be sure to check if it is set in the A.M. (A) or P.M. (P) period.
Date	Calendar digits are displayed.	
Month		
Day		After the time and calendar settings are completed, depress button "C" to display the time function. Remarks: If button "C" is depressed once again, the second digits start flashing to be adjusted.

* When the seconds count any number from "00" to "29", the seconds are automatically reset to "00" and starts immediately when the button is depressed. If, however, the seconds count any number from "30" to "59" when the button is depressed, one minute is added and the seconds return to "00".

III. SPEAKER MECHANISM AND ITS WORKING PRINCIPLE

1. Speaker mechanism

The speaker for the SEIKO Digital Alarm Chronograph Cal. A159A has been specially developed by SEIKO for use in SEIKO alarm wrist watches. It is an ultra-small speaker characterized by excellent durability in shock and humidity, with low current consumption and high efficiency, all of which are vital to the speaker for a wrist watch.

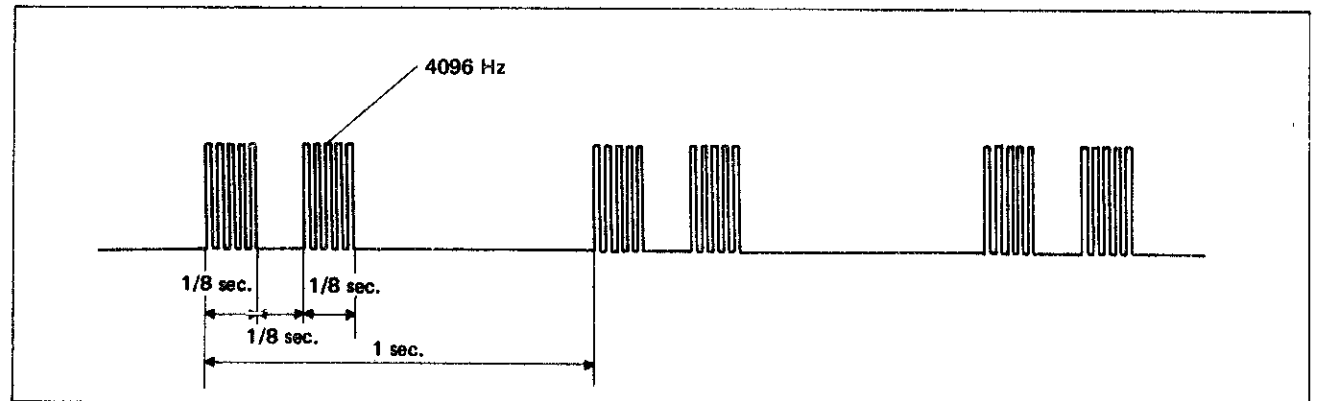


2. Sounding principle of the speaker

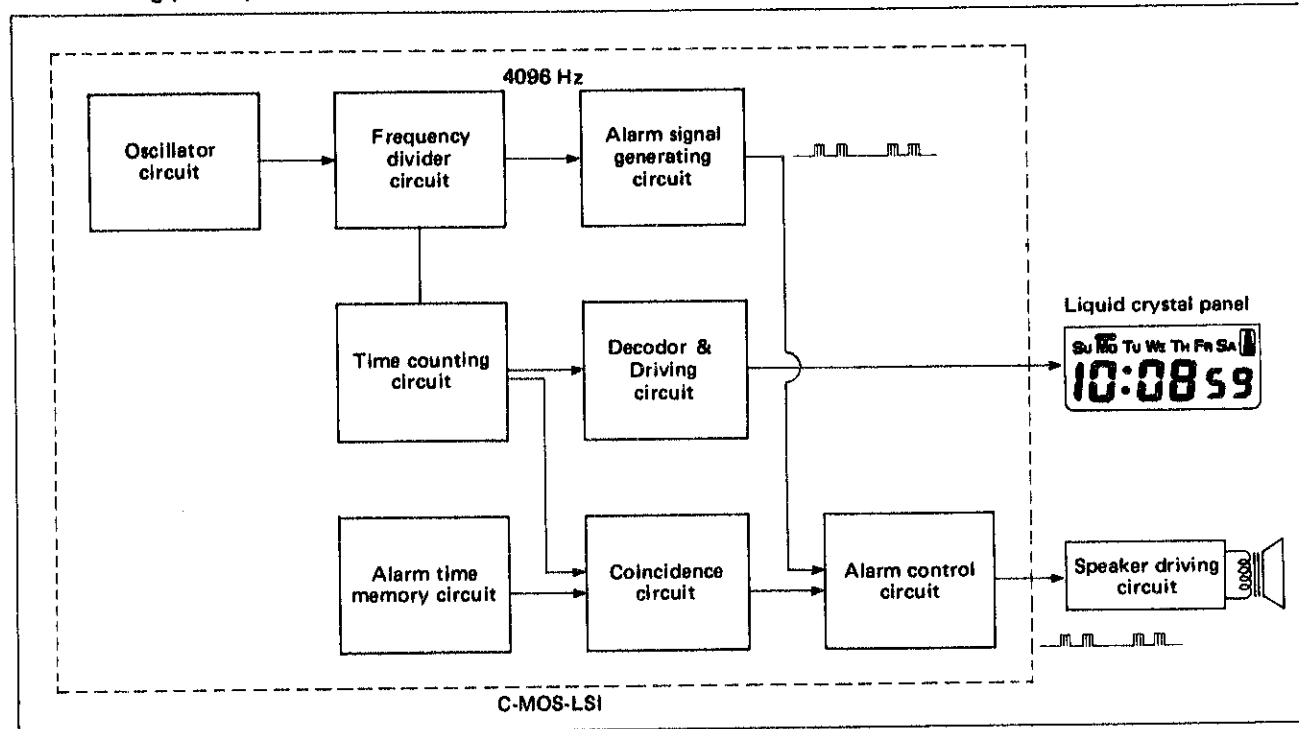
1. C-MOS-LSI transmits a 4096 Hz signal to the speaker coil.
2. The alternative magnetic field of 4096 Hz is generated in the speaker coil.
3. Accordingly, the core of the coil becomes magnetized with the same oscillation frequency and draws the armature.
4. As the armature is combined with the vibrating plate, the vibrating plate also vibrates with the same oscillation frequency and produces a sound.

As the resonance point of the speaker is 4096 Hz, the same as that of driving signal, enough volume of sound can be produced even if the current consumption is very low.

The signal transmitted to the speaker from the C-MOS-LSI is as shown in the illustration below.



3. Working principle of the alarm circuit



- (1) The alarm time memory circuit memorizes the time set for the alarm.
- (2) The coincidence circuit checks the time in the time counting circuit with the time set for the alarm memorized by the alarm time memory circuit to see if both times coincide with each other.
- (3) The alarm signal generating circuit transforms the signal received from the frequency divider circuit, into the signal shown in the illustration on the previous page.
- (4) The alarm control circuit decides whether to operate the speaker or not according to the output from the coincidence circuit. Also, it is the control circuit that starts or stops the alarm. The output of the control circuit during alarm operation takes the pattern shown in the illustration on the previous page.
- (5) The speaker driving circuit amplifies the signal received from the alarm control circuit and operates the speaker.

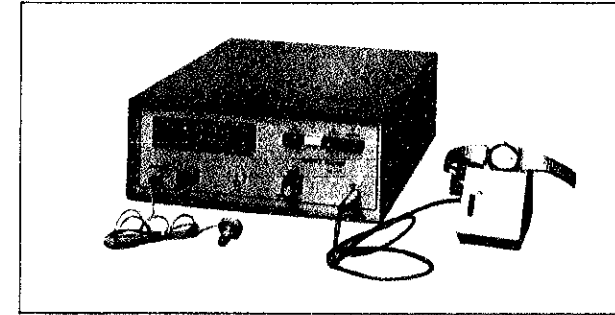
IV. DISASSEMBLING AND REASSEMBLING

1. After-sale servicing instruments and materials

For after-sale servicing of SEIKO Quartz Digital Cal. A159A, the following instruments and materials are necessary.

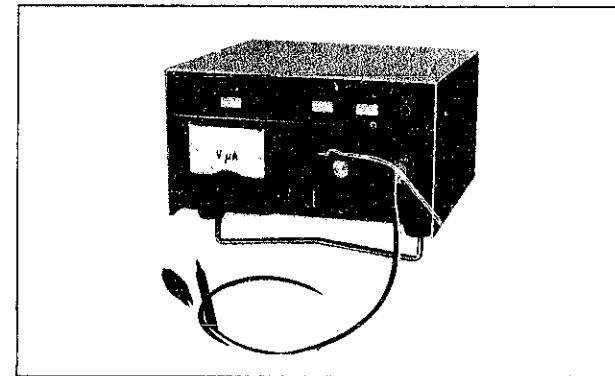
(1) Quartz Tester

Used to check time accuracy (Daily rate).



(2) MICRO TEST MT-10II

Used to check the current consumption and supplies a constant flow of voltage power.



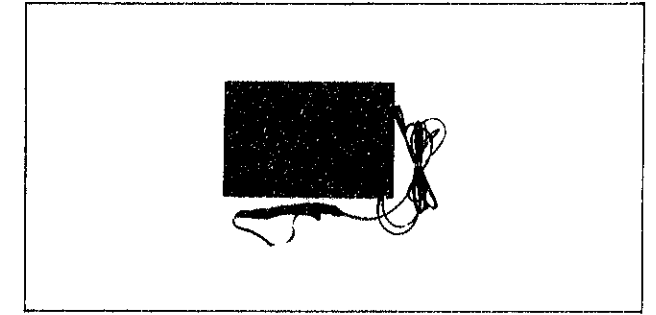
(3) Volt-ohm-meter

Used to check battery voltage and measure current consumption.



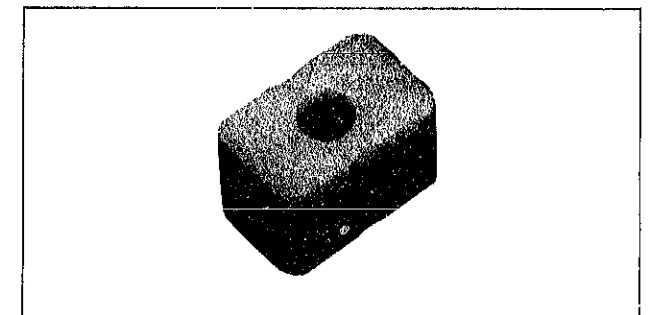
(4) Static electricity protector S-830

Used to protect the electronic circuit block of Digital Quartz from being damaged by static electricity.



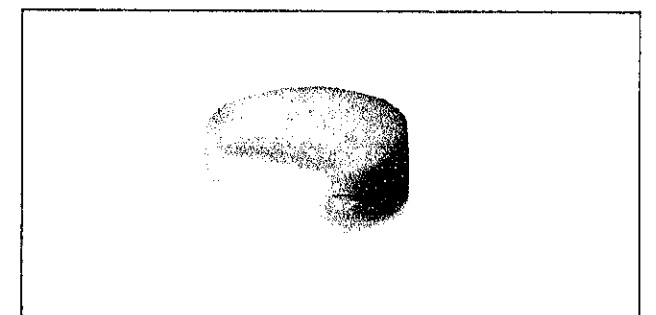
(5) Inserting disk (S-161)

Used to disassemble the glass.



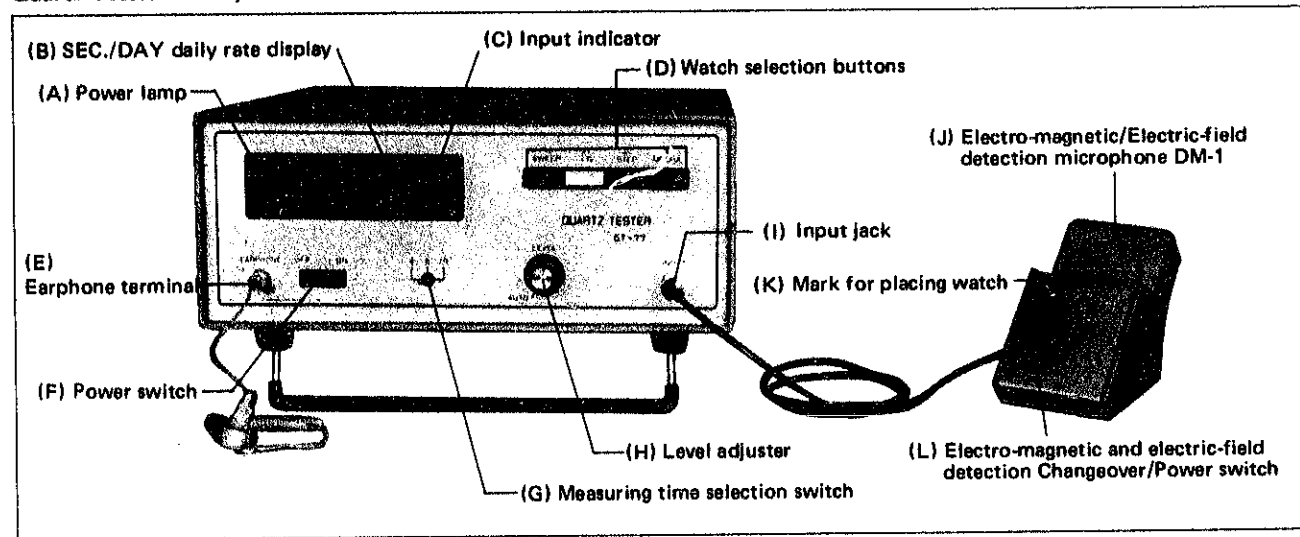
(6) Plastic supporting disk (S-173)

Used to reassemble the glass.



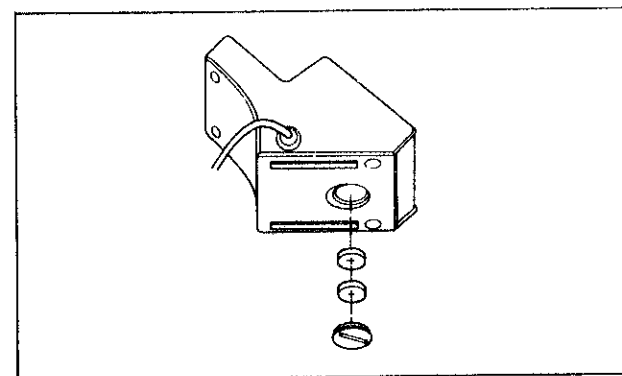
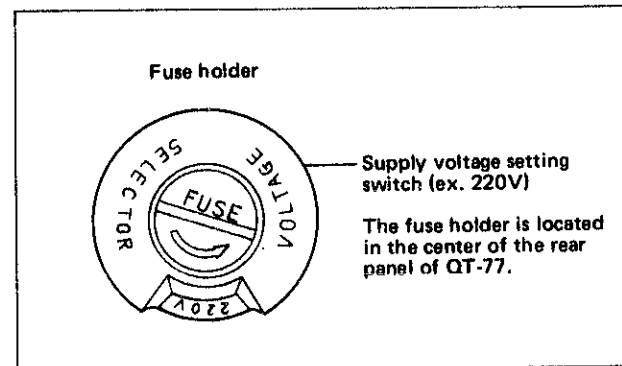
HOW TO USE QUARTZ TESTER QT-77

K. Hattori & Co., Ltd. has put on sale its new Quartz Tester QT-77. When measuring the watch accuracy by the new Quartz Tester QT-77, be sure to follow the instructions below.



Preparations before measurement

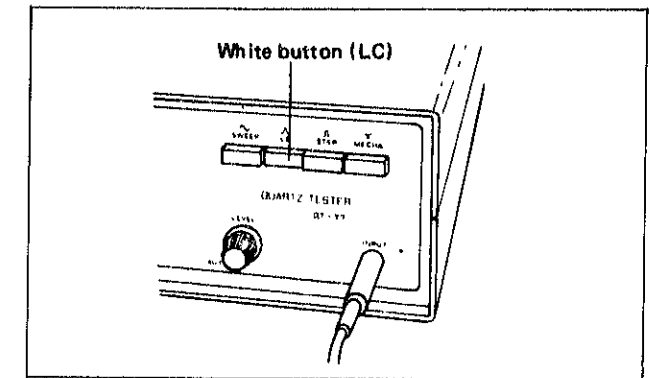
- Make sure that the voltage indicated by the supply voltage setting switch is the same as the voltage rating of your household power supply. If it isn't, turn the fuse holder counterclockwise (arrow-marked direction) and remove the fuse. Pull out the supply voltage setting switch and adjust it to the voltage rating of your power supply, and set the fuse back in position.
- Battery for Electro-magnetic/electric-field detection microphone DM-1
If the microphone is to be used for the first time, insert the battery (supplied along with the microphone) into the microphone. It is recommended to check the battery voltage periodically. (The voltage of each battery should be at least 1.5V.) When the microphone is not used turn the electro-magnetic and electric-field detection Changeover/Power switch to "STEP, SWEEP, LE" side, to preserve the battery life.



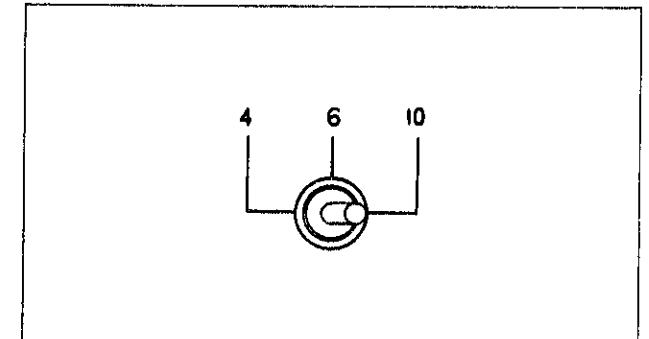
Measurement of time accuracy (daily rate)

1. With the power switch (F) off, insert the power supply cord plug into the power cord connector. Leave the Quartz Tester (QT-77) to stand for approximately 20 minutes.
2. Turn on the power switch (F). The power lamp (A) will light up.
3. Put the plug of the electro-magnetic/electric-field detection microphone DM-1 (J) all the way into the input jack (I).

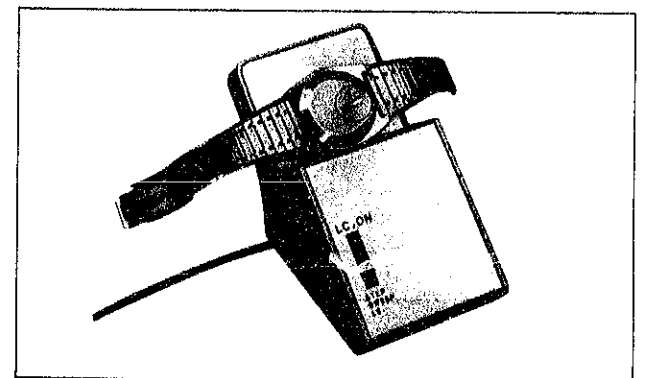
4. Depress white button (LC) of the watch selection button.



5. Set the measuring time selection switch (G) at "4 sec.", "6 sec." or "10 sec."
The daily rate can be measured at any position 4 sec., 6 sec. or 10 sec.
It is generally accepted, however, that the longer the measuring time is the more accurate will be the measurement.



6. Insert the earphone cord plug into earphone terminal (E).
7. Turn the level adjuster (H) to AUTO position (turn it counterclockwise until a click is heard).
8. Push the switch (L) of the microphone (J) to the LC. ON position (electric-field detection function).
9. Place the watch on the microphone.
Place the watch with its liquid crystal display facing the mark (k) in the center of the microphone.

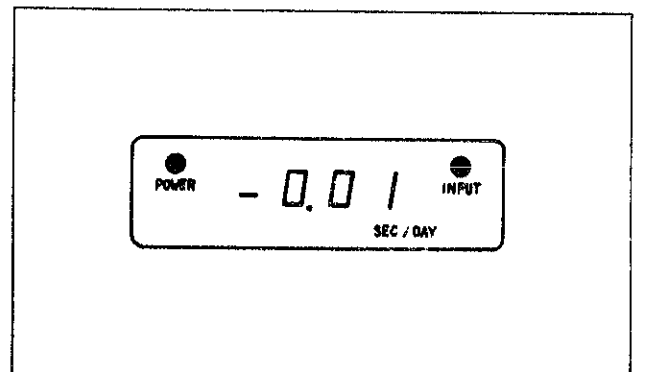


Put on the earphone, and move the watch on the microphone in various ways, for example by changing its position and angle, and the volume will change. Determine the watch position and direction where the earphone sound becomes loudest. At this time, the input indicator (C) will remain lit.

Note: In almost all cases, all the above procedure will do for the measuring the daily rate. If the input indicator flashes or does not light up at all, turn the level adjuster to keep the input indicator lit during measurement.

10. Read the daily rate on the display panel (B). If the daily rate of the watch exceeds the measurable range, it is not displayed on the panel.

Note: If there is any perspiration or oil on the glass of the watch, the Quartz Tester QT-77 does not pick up the signal.
Be sure not to put the watch in a vinyl bag when it is measured.



2. Disassembling and reassembling of the case

Disassembling procedures Figs.: ① - ⑦

① - ⑦

Reassembling procedures Figs.: ⑦ - ①

⑦ - ①

Lubricating:

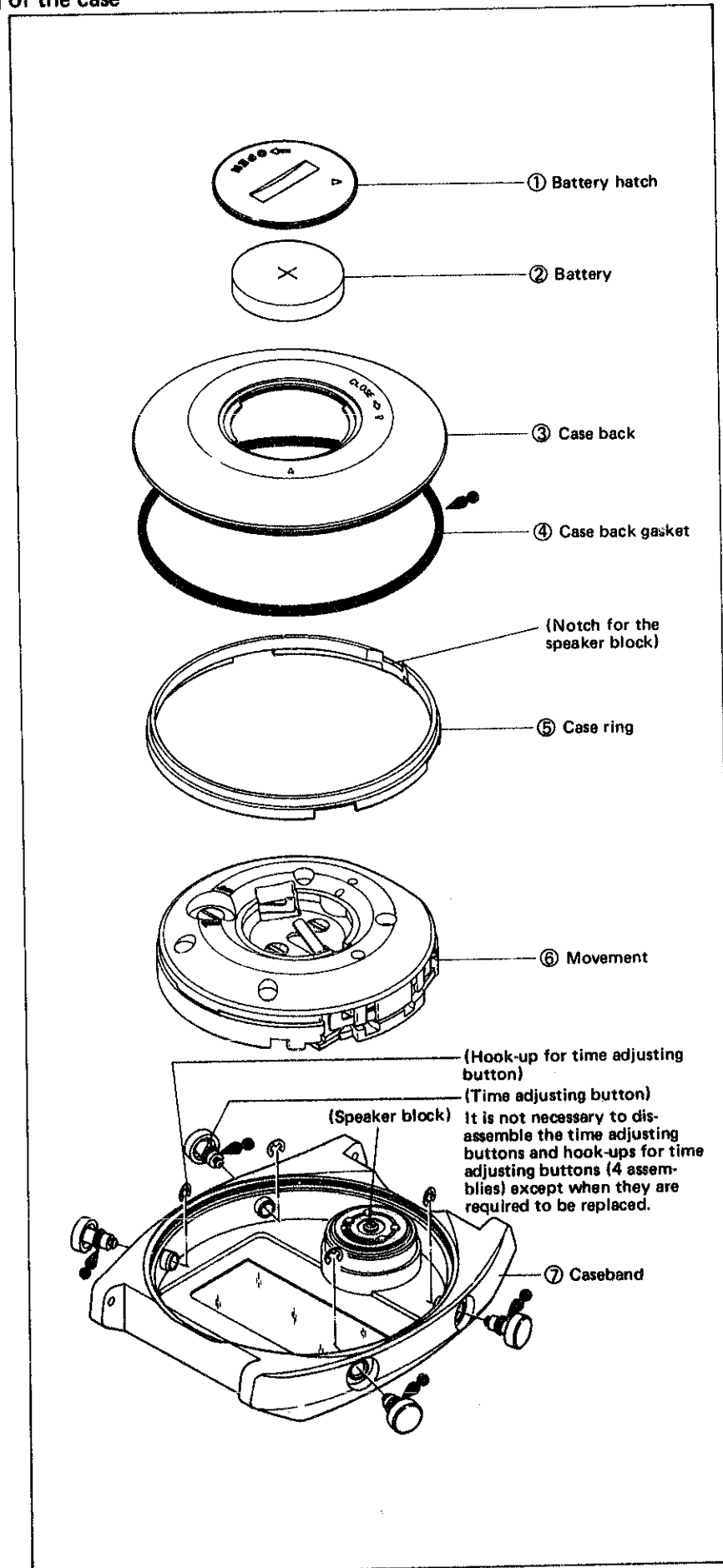
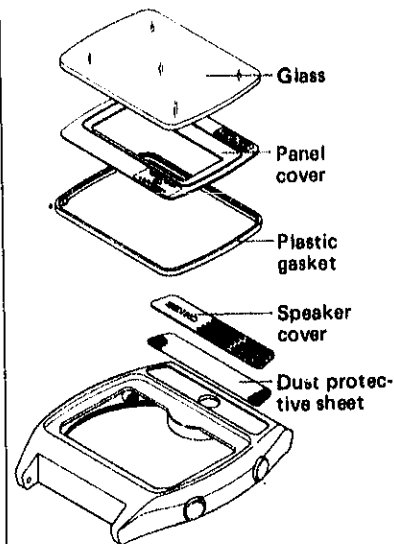
Silicon grease 500,000 c.s.

Normal quantity

Example: A159 - 4019

Glass and speaker portions

It is not necessary to disassemble the glass and the speaker cover except when they are required to be replaced.



Remarks for disassembling and reassembling

③ Case back

Note for disassembling

- Use the case opener with a narrow tip for easy opening of the case back.

Note for reassembling

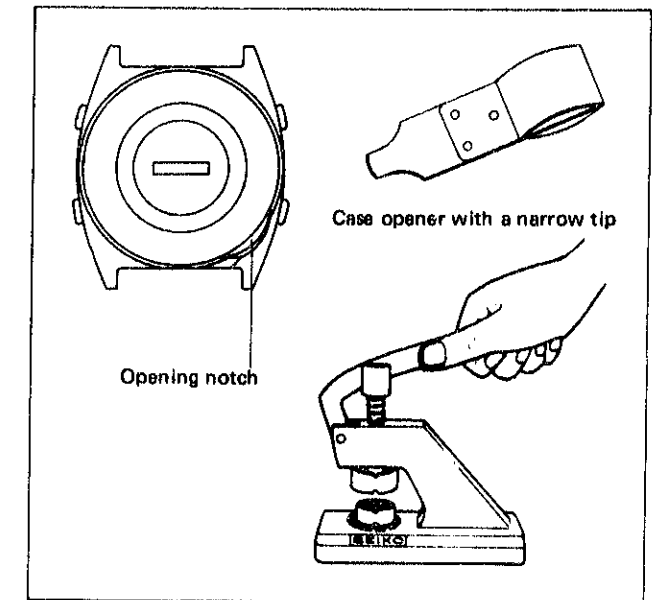
- Reassemble the case back by using an inserting disk whose outside diameter matches that of the case back.

Depress the brim of the case back.

Inserting disk: $\phi 29.0$ or $\phi 29.5$ mm

Supporting disk: Flat disk S-173

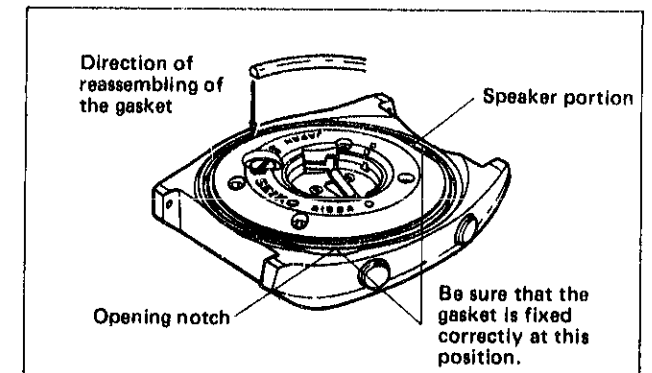
- Before reassembling, place the case in such a way that its center comes under the center of the inserting disk.



④ Case back gasket

Note for reassembling

- Be sure to reassemble the case back gasket firmly.
- Make sure specially that the gasket is fixed correctly at the opening notch and the speaker portions.



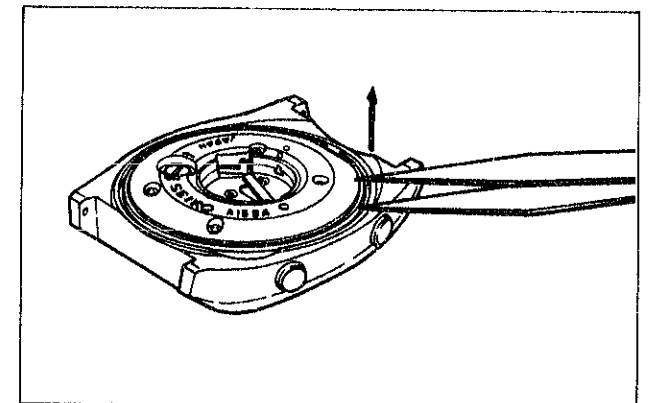
⑤ Case ring

Note for disassembling

- Pry up the case ring with tweezers as shown in the illustration on the right.
- The movement is disassembled together with the case ring.

Note for reassembling

- Reassemble the case ring in such a way that the notch of the speaker block comes to the speaker block and that the notch of the button pipes come to the button portions.
- Be careful not to depress any button before reassembling the case back.



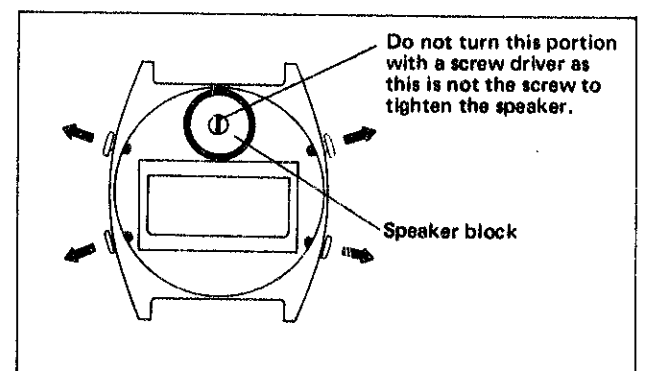
⑦ Caseband

Note for disassembling

- The speaker block is set in the caseband. (See page 16 for disassembling procedures.)

Note for reassembling

- Before reassembling the movement, pull out all buttons so that the switch spring does not prevent the movement from being reassembled. (Push the buttons from the inside with the tips of tweezers.)

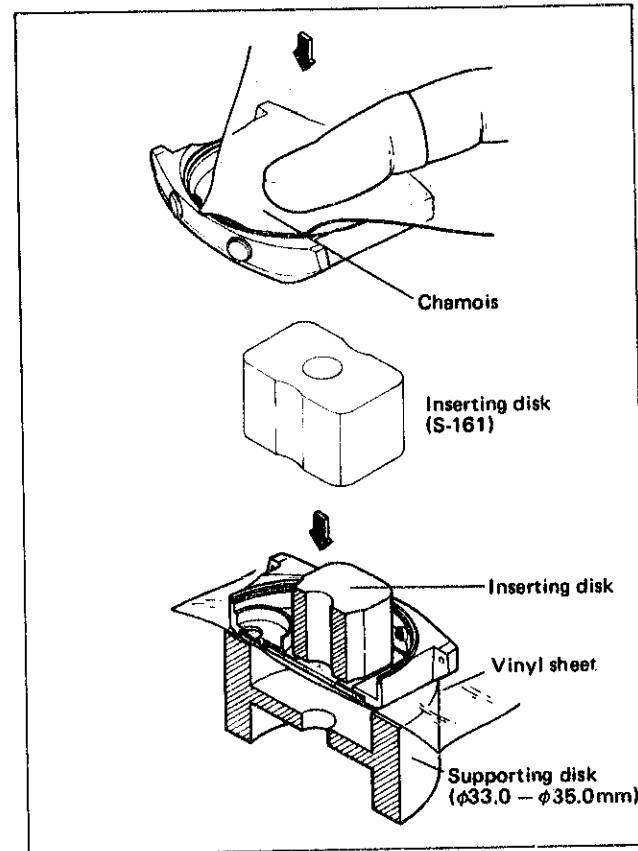


How to replace the glass

(Do not disassemble the glass except when the replacement of the glass and the panel cover is necessary.)

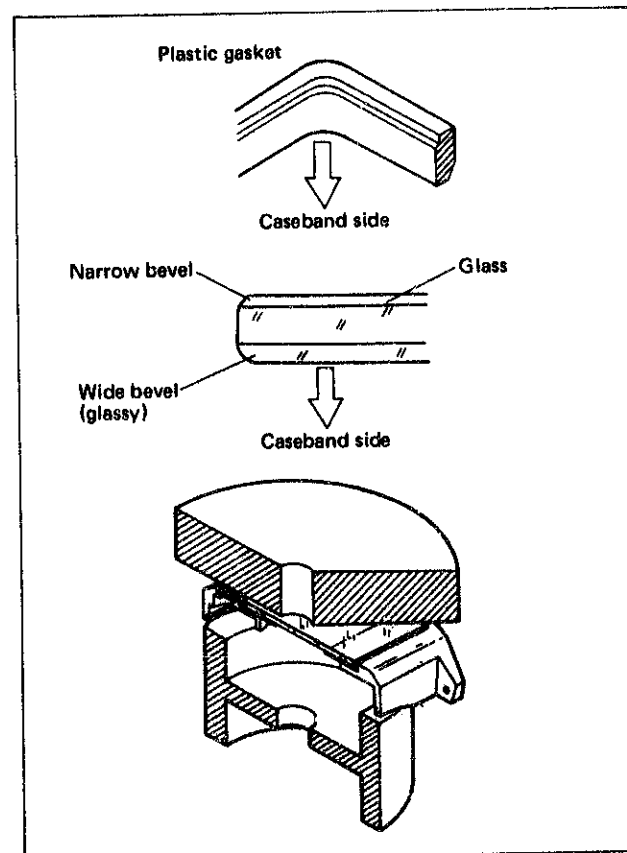
● How to remove the glass

- Place a chamois sheet on the inside of the caseband and push the glass outward with a finger for disassembling.
- Use S-220 if it is impossible to remove the glass by pushing it with a finger.
Inserting disk: S-161
Supporting disk: $\phi 33.0 - \phi 35.0$ mm
- Place a vinyl sheet between the glass and the supporting disk as shown in the illustration.
- Remove the glass together with the panel cover.



● Reassembling of the glass

- (i) Set the plastic gasket.
 - Be sure to replace the plastic gasket with a new one.
 - Be careful not to mistake the upper side for the lower side.
- (ii) Reassemble the panel cover.
 - Be sure to set the back side of the panel cover in position of the caseband firmly.
 - Make sure that the space between the caseband and the edge of the panel cover is uniform in width.
- (iii) Place the glass.
 - Be careful not to mistake the upper side for the lower side.
- (iv) Fix the glass (use S-220)
Inserting disk: Flat disk (S-173)
Supporting disk: $\phi 28.0$ or $\phi 28.5$ mm

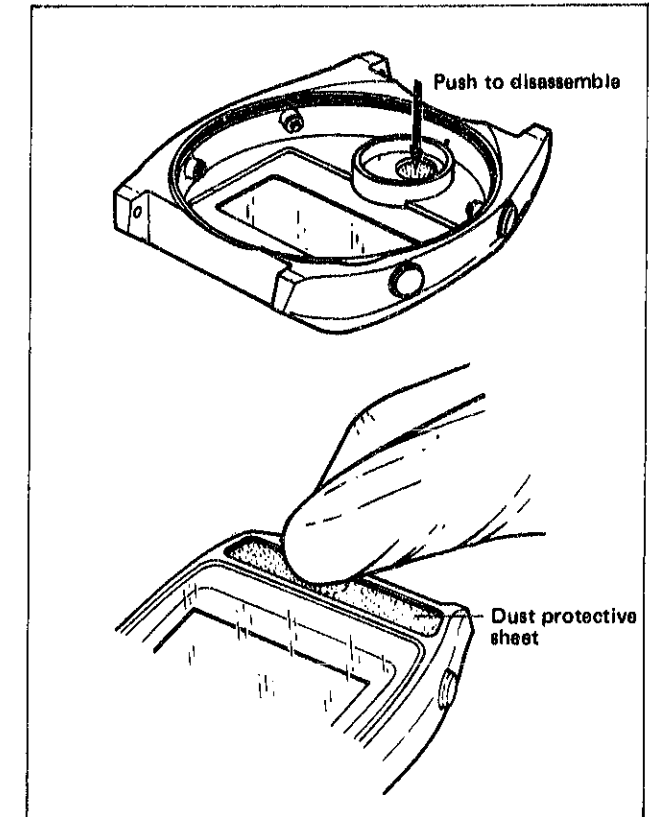


How to replace the speaker cover

The speaker cover and the dust protective sheet are attached by an adhesive to the caseband. It is not necessary to disassemble the speaker cover and the dust protective sheet except when they are required to be replaced. But be sure to replace the dust protective sheet with a new one when replacing the speaker cover.

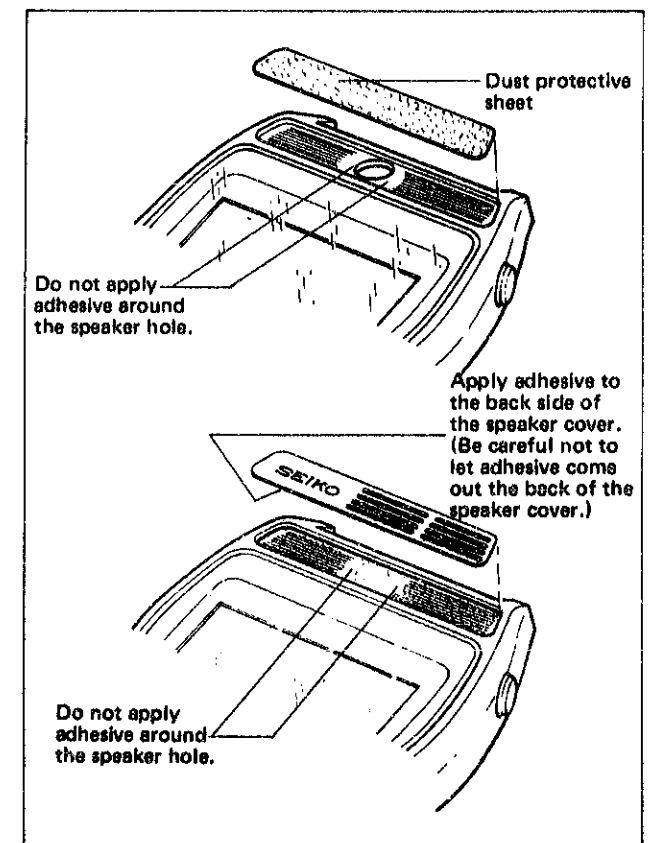
● Disassembling of the speaker cover

- (i) Disassemble the speaker
(See page 16 for the disassembling procedures of the speaker.)
- (ii) Disassemble the speaker cover by pushing it through the speaker hole inside the caseband.
(Use the stake of the staking tool for disassembling.)
- (iii) Remove the dust protective sheet attached to the caseband with a cloth moistened with alcohol. Remove the adhesive on the caseband by the tip of a large screw driver if it is difficult to remove it with a cloth moistened with alcohol.



● Reassembling the speaker cover

- (i) Apply adhesive to the speaker cover portion of the caseband. (Do not use instant adhesive.)
Be careful not to apply adhesive to the areas close around the speaker hole.
- (ii) Stick the dust protective sheet on to the caseband.
- (iii) Apply adhesive over the dust protective sheet attached to the caseband.
Be careful not to apply adhesive to the areas close around the speaker hole.
- (iv) Apply adhesive to the back side of the speaker cover, while making sure not to apply it around the speaker hole. Be careful not to let adhesive come out the back of the speaker cover.
- (v) Stick the speaker cover on to the caseband. Fix the speaker cover by holding it with a clip.



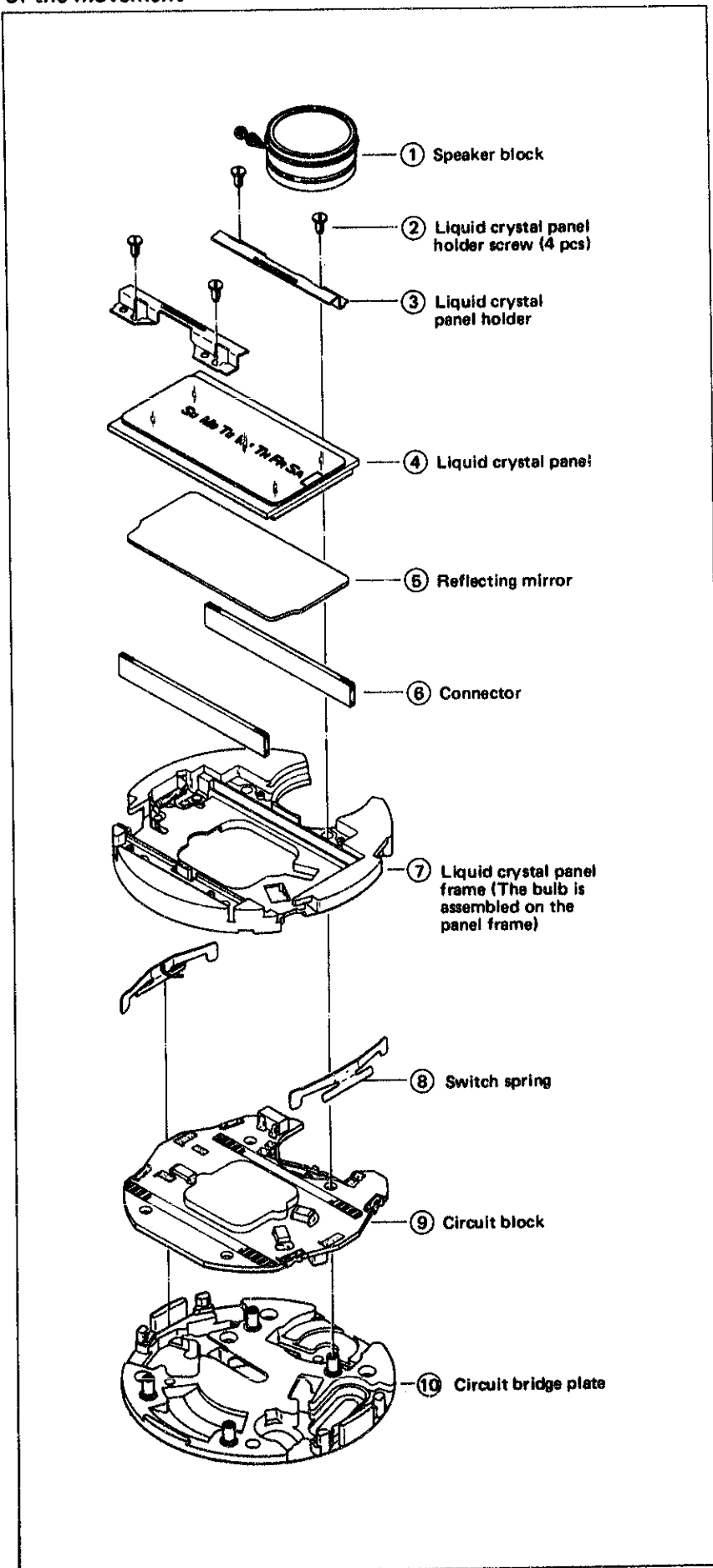
3. Disassembling and reassembling of the movement

Disassembling procedures Figs.: ①-⑩

Reassembling procedures Figs.: ⑩-①

Lubricating:

Silicon grease 500,000 c.s.
Normal quantity

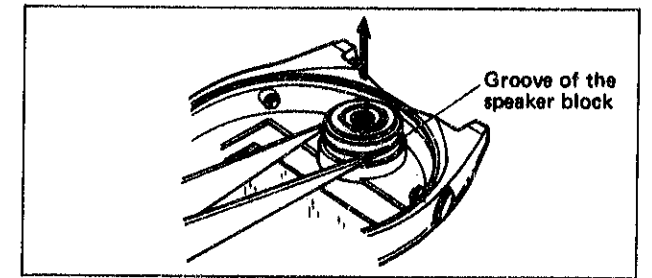


Remarks for disassembling and reassembling

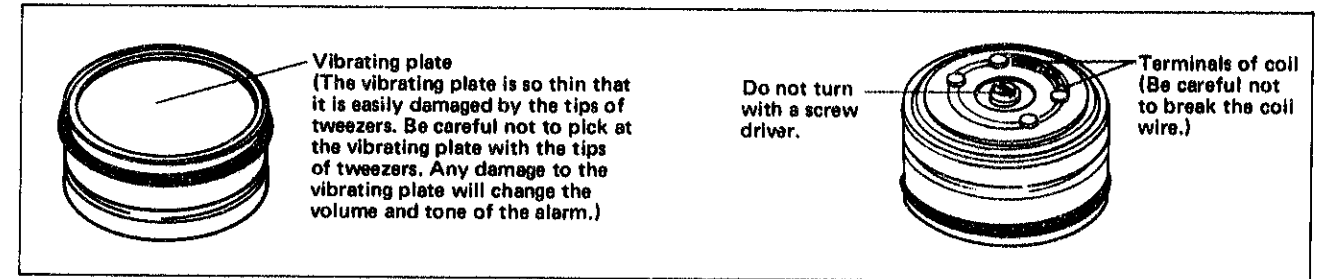
① Speaker block

Note for disassembling

- Hold the speaker block at its groove by the tips of the tweezers and pull out the speaker block from the caseband as shown in the illustration.
- Or pry out the speaker block by pushing up on its outer edge evenly with a tip of a screw driver.



Note for handling



⑤ Reflecting mirror

Note for disassembling and reassembling

- Be careful not to scratch or contaminate the reflecting mirror.

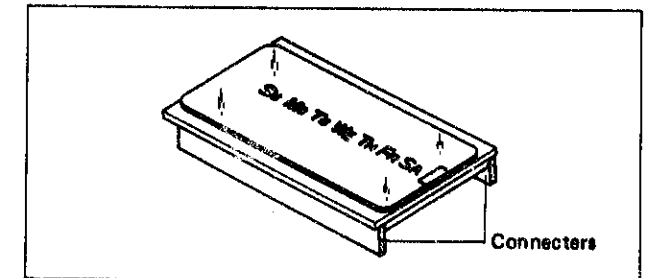
⑥ Connector

Note for disassembling

- The connectors may be disassembled together with the liquid crystal panel.

Note for disassembling and reassembling

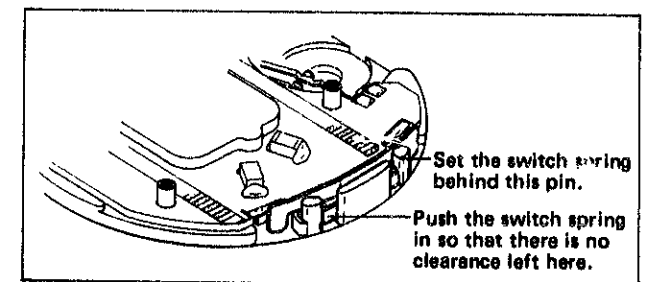
- There is no difference between the upper and the lower side.
- Be careful not to scratch the connectors with tweezers.



⑧ Switch spring

Note for reassembling

- Set the switch spring vertically in its position.



⑨ Circuit block

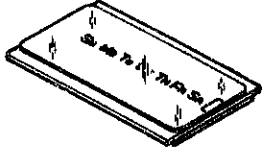

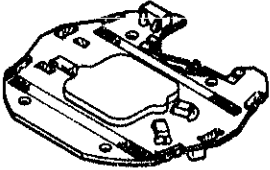

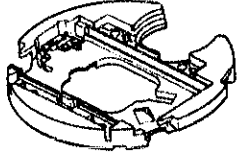


Note for disassembling and reassembling

- Be careful not to touch the electronic parts except when necessary.

4. Cleaning

Since several parts of Cal. A159A differ from those of conventional mechanical watches, use the following method when cleaning.

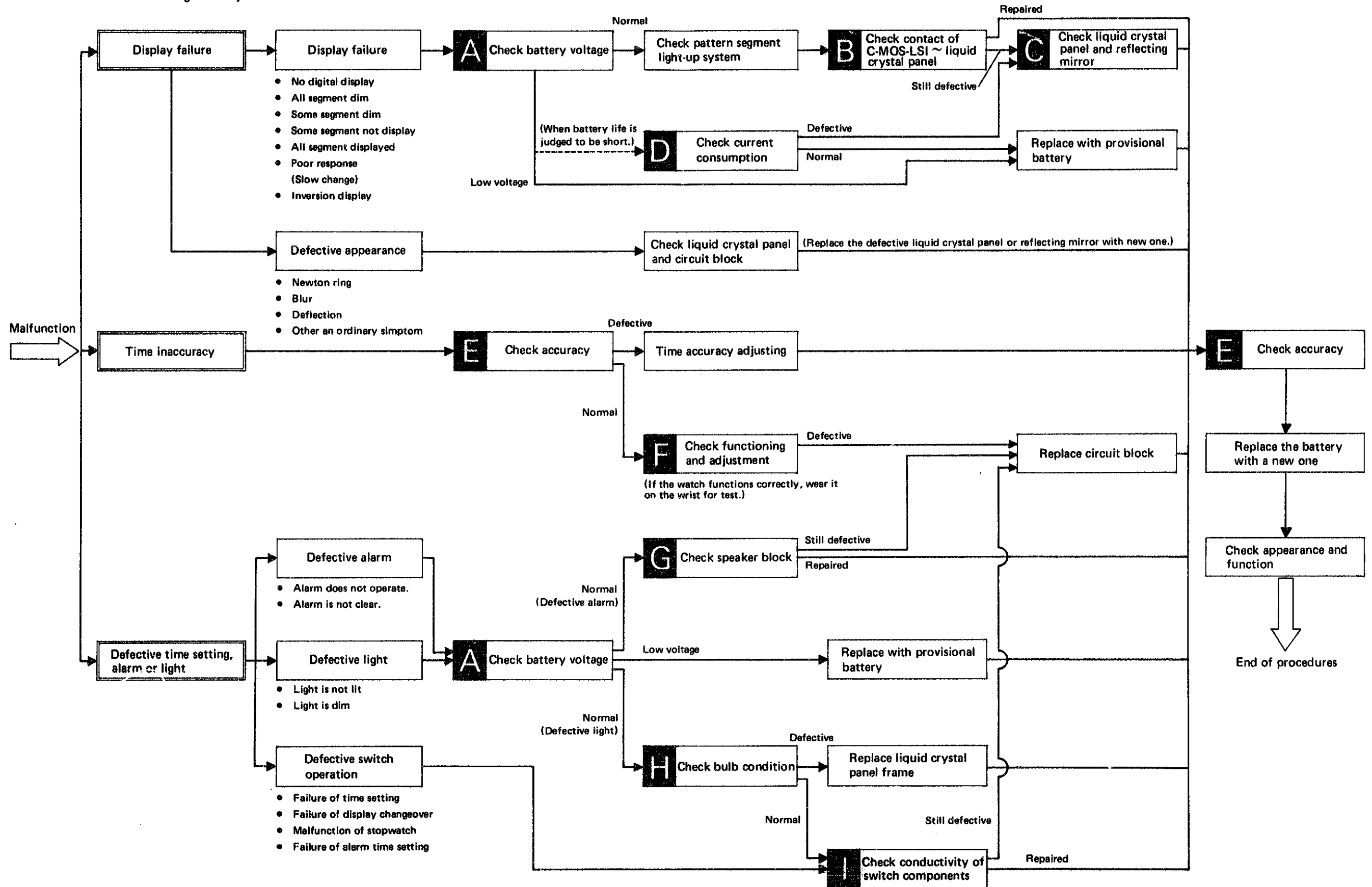
HOW TO CLEAN

Name of parts	Cleaning	Drying	Solution	Remarks
1. Liquid crystal panel  Reflecting mirror  Circuit block  Speaker block 	DO NOT CLEAN			Wipe dust and lint off with a soft brush. Wipe the electrodes of the liquid crystal panel and the vibrating plate of the speaker block softly with a cloth moistened with benzene or alcohol. (Be sure to remove the gasket for the speaker block before cleaning.)
2. Panel frame (with bulb) 	Rinse	Cool air	Benzine or alcohol	
3. Connector 	Rinse	Cool air	Alcohol	Be sure to reassemble after drying thoroughly. Do not use benzine or trichloroethylene.
4. Circuit bridge plate 	Rinse or clean with a brush	Cool air	Alcohol	Do not use a solution other than alcohol.
5. Other parts (Switch spring, liquid crystal panel holder, liquid crystal panel holder screw).	Clean or rinse with a cleaner or a brush	Cool or hot air drying	Trichloroethylene, benzine or alcohol	

V. CHECKING AND ADJUSTMENT


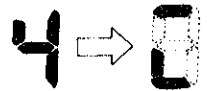


Be sure to use the Static electricity protector (S-830) when repairing the movement.

1. Guide table for checking and adjustment



2. Malfunction and checking points

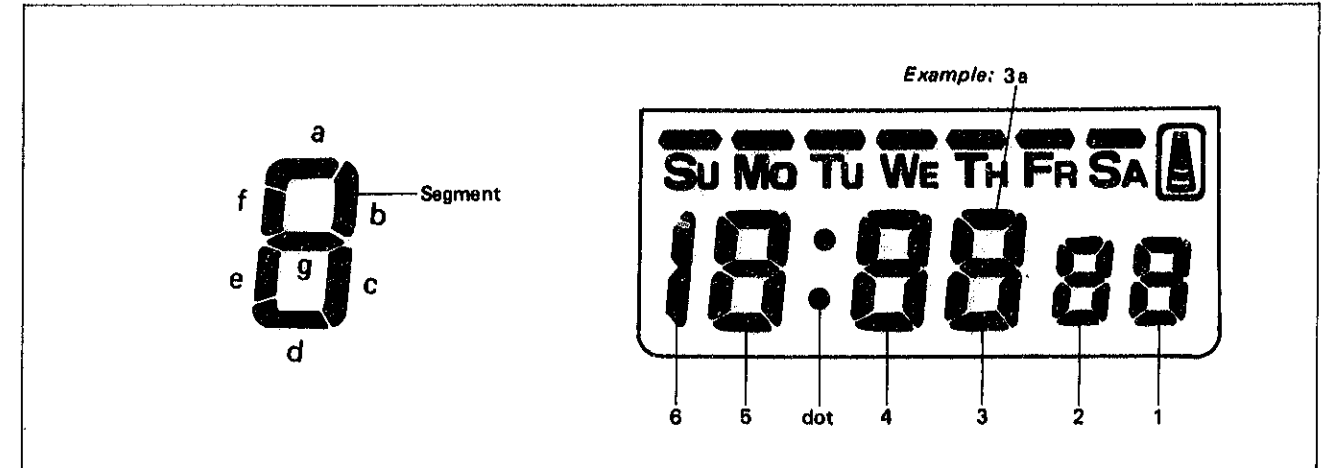
- Check in the numerical order.
- Refer to "Guide table for checking and adjustment" on page 18.

FAULTY SYMPTOMS		CHECKING POINTS									
		A		B	C			F	G	H	I
		Battery voltage	Check pattern segment light-up system	Contact of C-MOS-LSI~ liquid crystal panel	Liquid crystal panel	Circuit block	Time accuracy adjusting	Functioning and adjustment	Speaker block	Bulb	Switch components
DISPLAY FAILURE	No digital display, dim digital display or extremely slow response.	①		②	③	④					
	All segments displayed.			①	②	③					
	Some segments not displayed.  Inversion of display. 		①	②	③	④					
	(Deflection) Some or all of one segment show different contrast depending on the direction of view. 										
	(Poor appearance) Some portions of the liquid crystal panel will have air bubbles or iridescent view. 				①						
TIME INACCURACY	Gain or loss tested by Quartz tester.						①				
	Though Quartz tester indicates the normal figures, a watch gains or loses when it is worn on the wrist.							①			
DEFECTIVE ALARM, LIGHT OR TIME AND CALENDAR SETTING	Alarm does not operate or alarm operates but is not clear.	①							②		
	Light is not lit or light is lit but dims soon.	①								②	③
	Failure of time setting and display changeover, malfunction of stopwatch or failure of alarm time setting.										①

3. Relationship between the segment (Liquid Crystal Panel Electrode) and the C-MOS-LSI output terminal

A complete knowledge of how the segment (Liquid Crystal Panel Electrode) works with the C-MOS-LSI Output Terminal will provide the proper procedures for checking and adjustment.

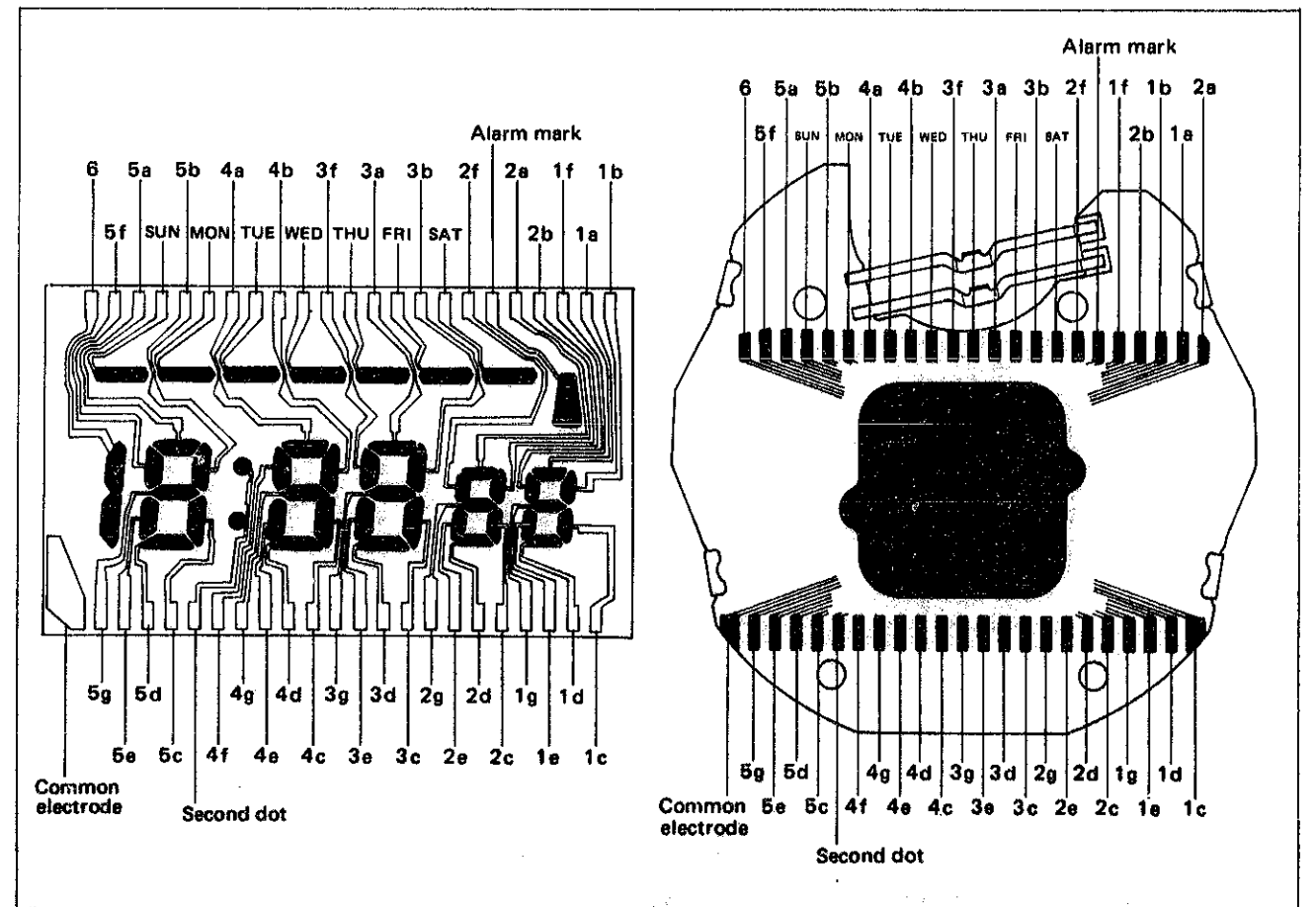
• Identification of segment



• Relationship between the segment and the C-MOS-LSI output terminal

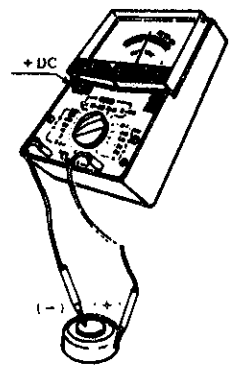
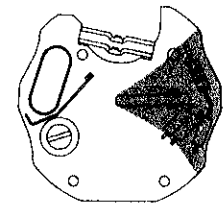
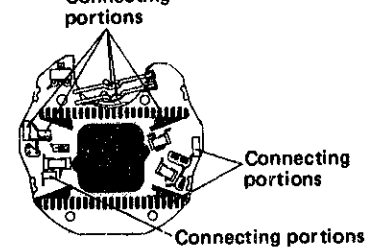
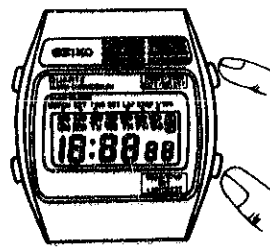
The liquid crystal panel electrode is connected electrically with each segment which forms a digital figure as shown in the illustration of the panel pattern below. (The panel pattern can be seen if the panel is slightly tilted and looked at in an angular position.)

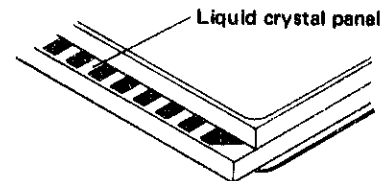
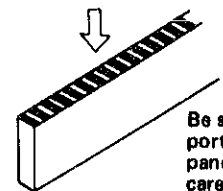
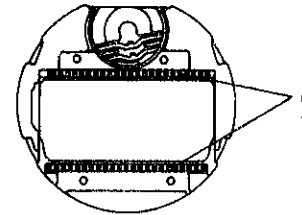
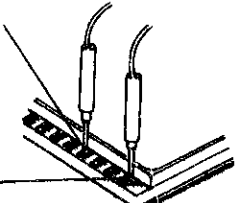
Also, the liquid crystal panel electrode is connected electrically with the C-MOS-LSI output terminal by the connector.

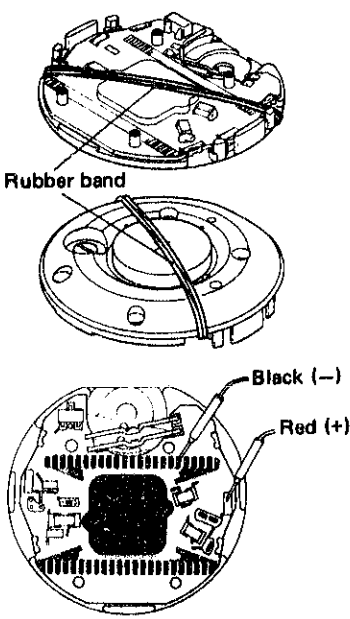
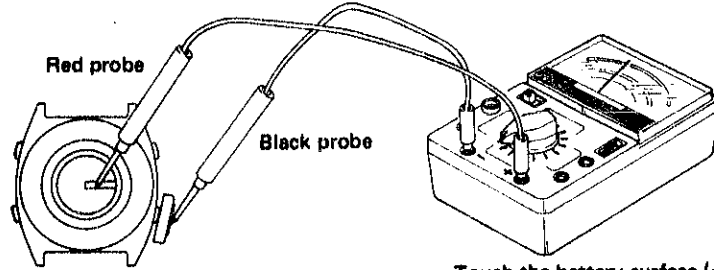
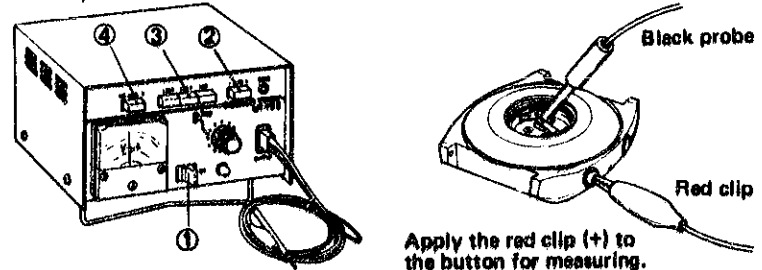


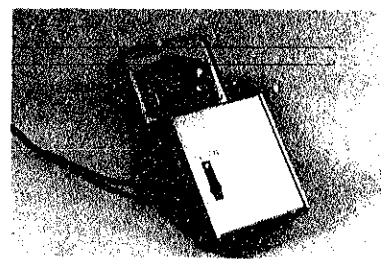
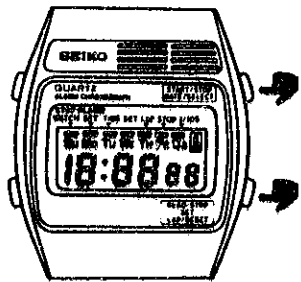
Note: Poor conductivity of the common electrode causes the lighting of all segments or inversion of the display.

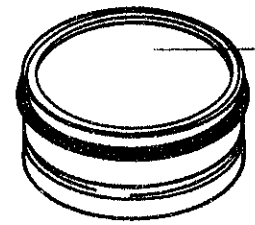
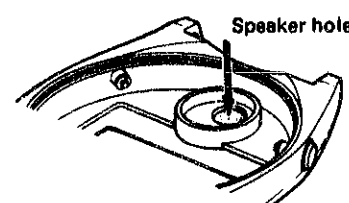
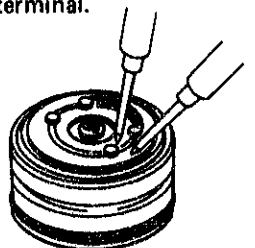
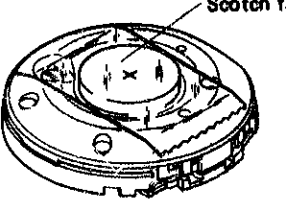
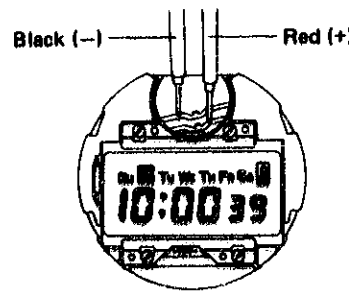
4. Procedures for checking and adjustment

	Procedure	Results
A CHECK BATTERY VOLTAGE	<p>Use the following procedures to check battery voltage.</p> <p>(1) Set up the volt-ohm-meter. Range to be used: DC 3V</p> <p>(2) Measuring. Probe red (+) Battery surface (+) Probe Black (-) . . . Battery surface (-)</p> <p>When there is battery electrolyte leakage, refer to "HOW TO CHECK AND REPAIR WHEN THERE IS BATTERY ELECTROLYTE LEAKAGE" below for repairing.</p> 	<p>More than 1.5V . . . Normal Less than 1.5V . . . Defective</p>
HOW TO CHECK AND REPAIR WHEN THERE IS BATTERY ELECTROLYTE LEAKAGE	<p>(1) Remove the movement from the case.</p> <p>(2) Disassemble the movement.</p> <p>(3) Wipe off battery electrolyte on the circuit block.</p> <p>1. Wipe off battery electrolyte with a cloth moistened with distilled water. If distilled water is not available, use ordinary water.</p> <p><i>Note:</i></p> <ul style="list-style-type: none"> Do not use a cloth which gives off lint as gauze, flannel, etc. Do not expose the trimmer condenser to water or alcohol, and if it is exposed, there may be a change in its condenser capacity and eventually in the time accuracy. When the circuit block is cleaned, be sure to clean the shaded portions shown on the right and the connecting portions.   <p>Case back side Display panel side</p> <p>2. Wipe the shaded portions and the connecting portions again with a cloth moistened with alcohol. (If the cleaned portions remain wet with water, they will corrode with rust.)</p> <p>3. Dry with cool air by using a dryer.</p> <p>(4) Wipe off battery electrolyte on the other parts (circuit bridge plate, switch spring, etc.).</p> <p>1. Wipe off battery electrolyte on the each portion with a soft brush moistened with distilled water. (If distilled water is not available, use ordinary water.)</p> <p>2. Rinse with alcohol.</p> <p>3. Dry with cool air by using a dryer.</p> <p>(5) Reassemble the movement. Replace the battery with a new one.</p> <p>(6) Check if the time and calendar function, the stopwatch function, the calendar function and the current consumption are normal.</p>	<p>Connecting portions</p> <p>Connecting portions</p> <p>Connecting portions</p>
CHECK PATTERN SEGMENT CHECKING SYSTEM	<p>If some segments are dead or dim, set the mode for the time and calendar setting functions. Then depress buttons A and B together to find the defective segments. (If there is no defective segment, all segments light up.)</p> <p><i>Note:</i> The alarm will start sounding when buttons A and B are depressed at the same time.</p> 	<p>Proceed to B.</p>

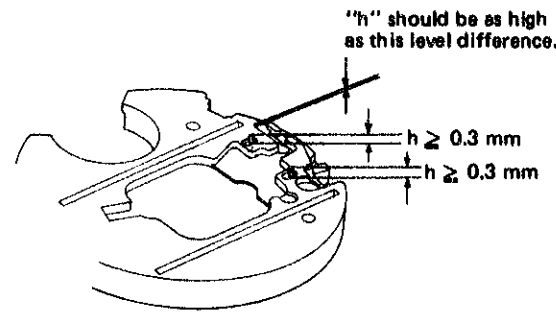
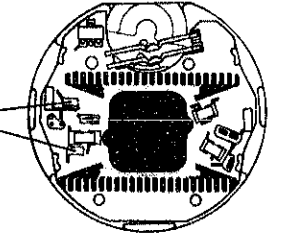
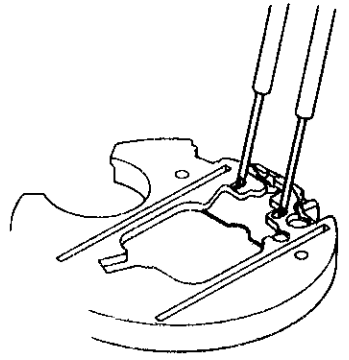
	Procedure	Results
B CHECK CONTACT OF C-MOS-LSI ~ LIQUID CRYSTAL PANEL	<p>After removing the liquid crystal panel, check for poor conductivity of the liquid crystal panel, connector and C-MOS-LSI output terminal whose segments are found to be defective in "CHECK PATTERN SEGMENT CHECKING SYSTEM". (Refer to "Relationship between the segment and the C-MOS-LSI output terminal" on page 20.) Use a microscope for checking.</p> <p>(1) Check for dust, lint and other contamination on the liquid crystal panel electrode.</p>  <p>Liquid crystal panel electrode</p> <p>(2) Check for any contamination, scratch, crack and break of the connector.</p>  <p>Be sure to check the connecting portion of the liquid crystal panel and the circuit block carefully.</p> <p>(3) Check for dust, lint and other contamination on the output terminal of the circuit block.</p>  <p>Output terminal of the circuit block.</p>	<p>Uncontaminated: Normal Proceed to B₂. Contaminated: Defective Wipe off any foreign matter.</p> <p>No contamination, scratch, crack or break: Normal Proceed to B₃. Contaminated: Defective Cleaning (See page 17) Scratched, cracked or broken: Defective Replace the connector with a new one.</p> <p>Uncontaminated: Normal Proceed to C. Contaminated: Defective Wipe off any foreign matter.</p>
C CHECK LIQUID CRYSTAL PANEL AND CIRCUIT BLOCK	<p>Check to see if the liquid crystal panel and the circuit block function correctly. (Refer to "Relationship between the segment and the C-MOS-LSI output terminal" on page 20).</p> <p>(1) Check liquid crystal panel</p> <p>1. Set up the volt-ohm-meter. Range to be used: OHMS R x 1 ~ R x 1K</p> <p><i>Note:</i></p> <ul style="list-style-type: none"> Any range will do if more than 3V is applied to the terminal of the volt-ohm-meter. If the output voltage of the volt-ohm-meter is less than 3V in measuring, all segments may not be lit. If any segment does not light, change the range to the one which is higher in resistance. <p>2. Remove the liquid crystal panel from the movement and turn it upside down.</p> <p>3. Measuring (Check to see if the corresponding segment lights up.)</p> <p><i>Note:</i> Either red or black probe will do.</p> <p>Common electrode (Either red or black probe must be applied to the common electrode.)</p>  <p>Electrode of defective segment</p>	<p>Lights up: Normal Proceed to C₂. Does not light up: Defective Replace the liquid crystal panel with a new one.</p>

	Procedure	Results
CHECK LIQUID CRYSTAL PANEL, AND CIRCUIT BLOCK	<p>(2) Check the circuit block output voltage.</p> <ol style="list-style-type: none"> Set up the volt-ohm-meter. Range to be used: DC 3V After reassembling the movement from the case, hold the circuit bridge, circuit block and battery together with a rubber band and as shown in the illustration on the right. Measuring Probe Red (+): Connecting portions of the switch spring of the circuit block. Probe Black (-): Each portion of the output terminals of the C-MOS-LSI. (If some displays are defective, apply to the corresponding output terminals of the C-MOS-LSI.) 	<p>More than 0.8V: Normal (All the terminals must be more than this range of voltage.)</p> <p>Return to B.</p> <p>Less than 0.8V: Defective Replace the circuit block, with a new one and check to see if it functions correctly.</p>
CHECK CURRENT CONSUMPTION	<p>Check to see if the current consumption is normal. (Can be checked no matter in which function the watch may be performing.)</p> <ul style="list-style-type: none"> Volt-ohm-meter Range to be used: 0.03mA or 12 μA Probe Red(+): Battery connection Probe Black (-): Battery surface (-)  <p>Touch the battery surface (+) to the button (except the light button) for measuring.</p> <ul style="list-style-type: none"> Micro Test MT-10II Set up the Micro Test MT-10II. <ol style="list-style-type: none"> Power switch: ON Polarity changeover button: + Current consumption/ Voltage indication button: μA Voltage selection button: 1.55V <p>Probe Black (-): Battery connection Clip Red (+): Button (except the light button)</p>  <p>Apply the red clip (+) to the button for measuring.</p> 	<p>Less than 3.5 μA: Normal Replace with provisional battery.</p> <p>More than 3.5 μA: Defective Proceed to C.</p> <p>Remarks: If the alarm starts sounding while measuring current consumption, follow the procedures below.</p> <ul style="list-style-type: none"> When Volt-ohm-meter is used: Turn the switch to over 300 mA position and while the probes are being applied as shown in the illustration, depress button "A" to stop the alarm. Then turn the switch to the correct range and measure current consumption. When Micro Test MT-10II is used: Depress the Current consumption/voltage indication button to the V (μA) position, and while the black probe and the red clip are being applied as shown in the illustration, depress button "A" to stop the alarm. Then depress the current consumption/voltage indication button to the μA (μA) position for measuring current consumption.

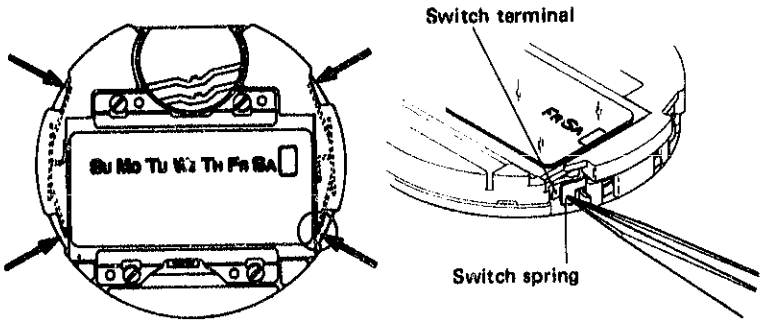
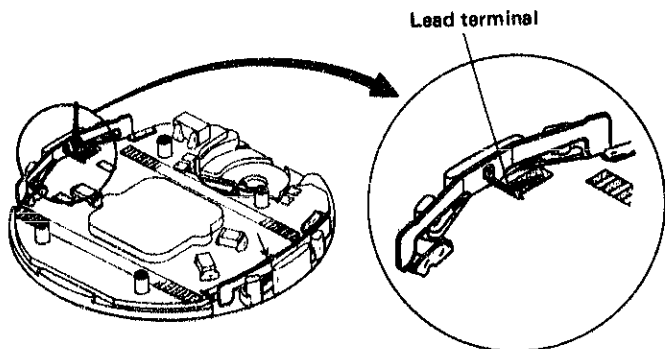
	Procedures	Results
CHECK ACCURACY	<p>Check gain and loss of time.</p> <ol style="list-style-type: none"> Set up the Quartz Tester. As there are several types of Quartz Testers, refer to the respective instruction manual. Measuring 	<p>If the watch tends to gain or lose, proceed to Time accuracy adjusting. Time accuracy is adjusted by turning the trimmer condenser. (See page 28.)</p>
CHECK FUNCTIONING AND ADJUSTMENT	<p>See "HOW TO USE" on page 2 to check the functioning and adjustment.</p> <ol style="list-style-type: none"> Check the stopwatch function. Check to see if "start", "stop", "lap", "lap release" and "reset" function correctly. Check the alarm time setting function. Set the hour and minute more than one cycle and check to see if the digits are advancing correctly. Check the time and calendar setting function. Set the time and calendar digits more than one cycle for each unit and check to see if each digit is advancing correctly. 	<p>Function correctly and can be adjusted: Normal Wear the watch on the wrist to check time accuracy.</p> <p>Does not function correctly or cannot be adjusted: Defective Proceed to Replace circuit block.</p>
CHECK SPEAKER BLOCK	<p>(1) Check to see if the speaker sounds the alarm correctly. Check to see if the speaker sounds when the timepiece is in the time and calendar setting function mode and when the two buttons on the right side are depressed together. <i>Note:</i> All segments light up when the two buttons are depressed together.</p> 	<p>Speaker sounds: Normal Set the alarm time and if the alarm does not operate at the required time, proceed to Replace circuit block.</p> <p>Speaker does not sound or it sounds but not clear: Defective Proceed to C.</p>

	Procedure	Results
G	<p>(2) Check for any dust and scratches on the metal diaphragm of the speaker block.</p>  <p><i>Note:</i> Check to see if the speaker hole is clogged with dust.</p> 	<p>No dust or scratches: Normal Proceed to G₃.</p> <p>Dust: Defective Wipe off any foreign matter softly with a cloth moistened with cleaning solution. (Benzine or alcohol)</p> <p>Scratched: Defective Replace speaker block.</p>
	<p>(3) Check for any broken coil wire and short-circuit of the coil of the speaker block.</p> <p>1. Set up the volt-ohm-meter Range to be used: OHMS R x 1</p> <p>2. Measuring Apply the probes of the volt-ohm-meter to the lead terminal of the speaker block.</p> <p><i>Note:</i> Be careful not to break the coil wire when the probes are applied to the coil terminal.</p> 	<p>Resistance: 30Ω ~ 150Ω: Normal Proceed to G₄.</p> <p>Less than 30Ω or more than 150Ω: Defective Replace circuit block.</p>
	<p>(4) Check to see if the output signal of the circuit block is transmitted to operate the speaker block.</p> <p>1. Set up the volt-ohm-meter. Range to be used: DC 3V</p> <p>2. Place the movement on the movement holder.</p> <ul style="list-style-type: none"> Insert the battery in the movement and hold it with scotch tape. Make the alarm ready for sounding by adjusting the switch spring. 	<p>Swings: Normal Replace speaker block.</p> <p>Does not swing: Defective Replace circuit block.</p>
	<p>3. Measuring Apply the probes of the volt-ohm-meter to the output terminals for speaker of the circuit block as shown in the illustration on the right. Check to see if the pointer of the volt-ohm-meter swings twice every second.</p> 	

CHECK SPEAKER BLOCK

	Procedure	Result
H	<p>(1) Check to see if the bulb lead terminals touch the lead terminal of the circuit block.</p> <p>1. Check to see if the two bulb lead terminals protrude by more than 0.3 mm from the back side of the panel frame. And check for any dust, lint and other contamination of the bulb lead terminal.</p> 	<p>Protrudes by more than 0.3 mm: Normal</p> <p>Protrudes by less than 0.3 mm: Defective Pull out by using tweezers.</p>
	<p>2. Check for any contamination on the bulb lead terminal of the circuit block.</p> 	<p>No dust, lint or uncontaminated: Normal Proceed to H₂.</p> <p>Dust, lint or contaminated: Defective Wipe off any foreign matter.</p>
	<p>(2) Check to see if there is a broken filament in the bulb and if there is any break in the welded portion of the bulb lead terminal.</p> <p>1. Set up the volt-ohm-meter. Range to be used: OHMS R x 1</p> <p>2. Measuring Apply the two probes of the volt-ohm-meter to the bulb lead terminals as shown in the illustration.</p> <p><i>Note:</i> Either red and black probe will do.</p> 	<p>Bulb lights up: Normal Proceed to H₃.</p> <p>Bulb does not light up: Defective Replace panel frame.</p>

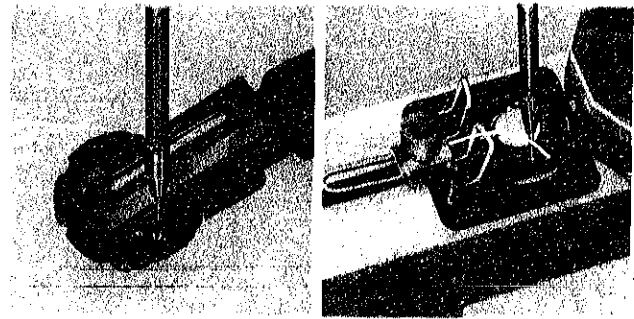
CHECK BULB CONDITION

Procedure	Result
<p>Check to see if the switch spring functions correctly.</p> <p>(1) Check to see if the switch springs (four arrow-marked portions shown in the illustration below) function correctly when they are pushed in.</p> <p>1. Check to see if the four arrow-marked springs touch the switch terminals of the circuit block when they are pushed in by the tips of tweezers and if they do not touch the switch terminals of the circuit block when released.</p>  <p>2. Check for dust, lint and other contamination on the contacting portions.</p> <p>(2) Check to see if the lead terminal of the switch spring touches the lead terminal of the circuit block.</p> <p>1. Check to see if the two arrow-marked portions touch correctly when the panel frame is removed.</p>  <p>2. Check for dust, lint and other contamination on the contacting portions.</p> <p>When there is battery electrolyte leakage, refer to "HOW TO CHECK AND REPAIR WHEN THERE IS BATTERY ELECTROLYTE LEAKAGE" for repairing.</p>	<p>Functions correctly: Normal</p> <p>Does not function correctly: Defective If the switch springs do not function correctly after the switch springs are adjusted, replace the switch springs with new ones.</p> <p>No dust, lint or contaminated: Normal Proceed to 2.</p> <p>Dust, lint or contaminated: Defective Wipe off any foreign matter.</p> <p>Touch: Normal</p> <p>Do not touch: Defective Adjust by using tweezers so that the lead terminal of the panel frame touches the lead terminal.</p> <p>No dust, lint or contaminated: Normal Replace circuit block.</p> <p>Dust, lint or contaminated: Defective Wipe off any foreign matter.</p>

TIME ACCURACY ADJUSTING

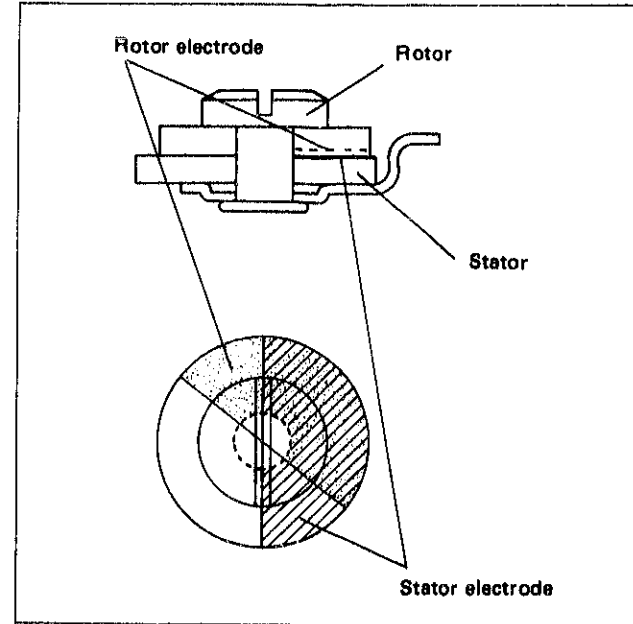
Time accuracy of Cal. A159A is adjusted by turning the trimmer condenser.

- **Adjusting method**
The watch will gain or lose according to the direction in which the trimmer condenser is turned. Adjustment should therefore be made after ascertaining with the Quartz Tester whether the watch tends to gain or lose.

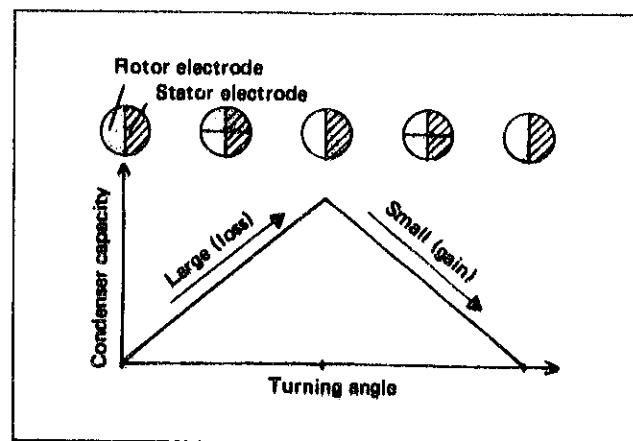


- **Note for handling the trimmer condenser**
Avoid excessive depressing and turning of the trimmer condenser.

- **Function of the Trimmer Condenser**
The trimmer condenser consists of a rotor electrode and a stator electrode as shown in the diagram. Turning the shaft fixed to the rotor changes the overlapped area between the stator electrode and rotor electrode, which in turn changes the capacity of the trimmer condenser.



- **Change in the capacity of trimmer condenser and the adjusting accuracy rate.**
Turning the trimmer condenser changes its capacity as shown in the diagram. The trimmer condenser has been so adjusted at the factory so as to let the watch gain when it is turned clockwise and vice versa. Whenever adjustment is needed, however, turn the trimmer condenser while examining the gain and loss by the Quartz Tester.



All procedures of Disassembling, Reassembling, Checking and Adjustment are completed.