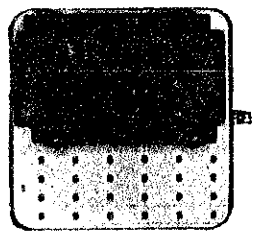
SEIKO

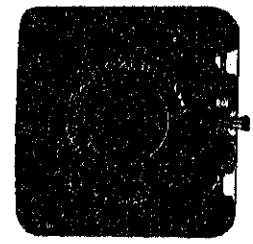
DIGITAL QUARTZ

Cal. C153A

PARTS LIST

Cal. C153A

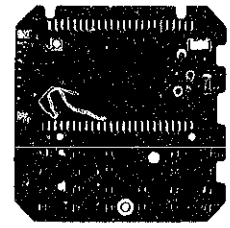




354 940

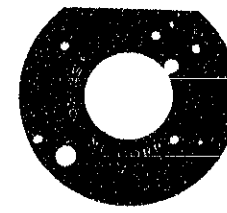
383 940

389 940



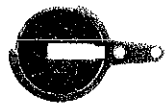
4001 611

4032 610



4050 611

4216 610



4219 610

4242 611

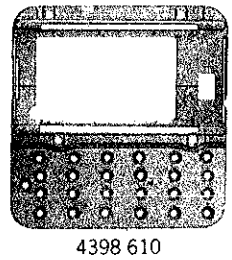
4242 620

4277 940

4282 610

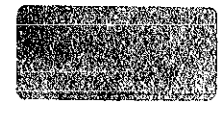
4282 611

4313 610



4398 610

4510 610



4521 520

4540 610

SEIKO SB-BU

022 257

027 003

2/1

Cal. C153A

Characteristics

Casing diameter : ϕ 29.0 mm

Maximum height : 6.7 mm

Frequency of quartz crystal oscillator : 32,768 Hz (Hz=Hertz ..... Cycles per second)

Time and calendar functions : Digital Display System showing hour, minute, second, day and date

Calculator functions : Digital Display System showing hour, minute and up to eight digits for the calculator with floating decimal point

Display medium : Single Crystal Display (Nematic Liquid Crystal, FE-Mode)

Illumination light for digital display panel : Illuminated in accordance with the button depressing.

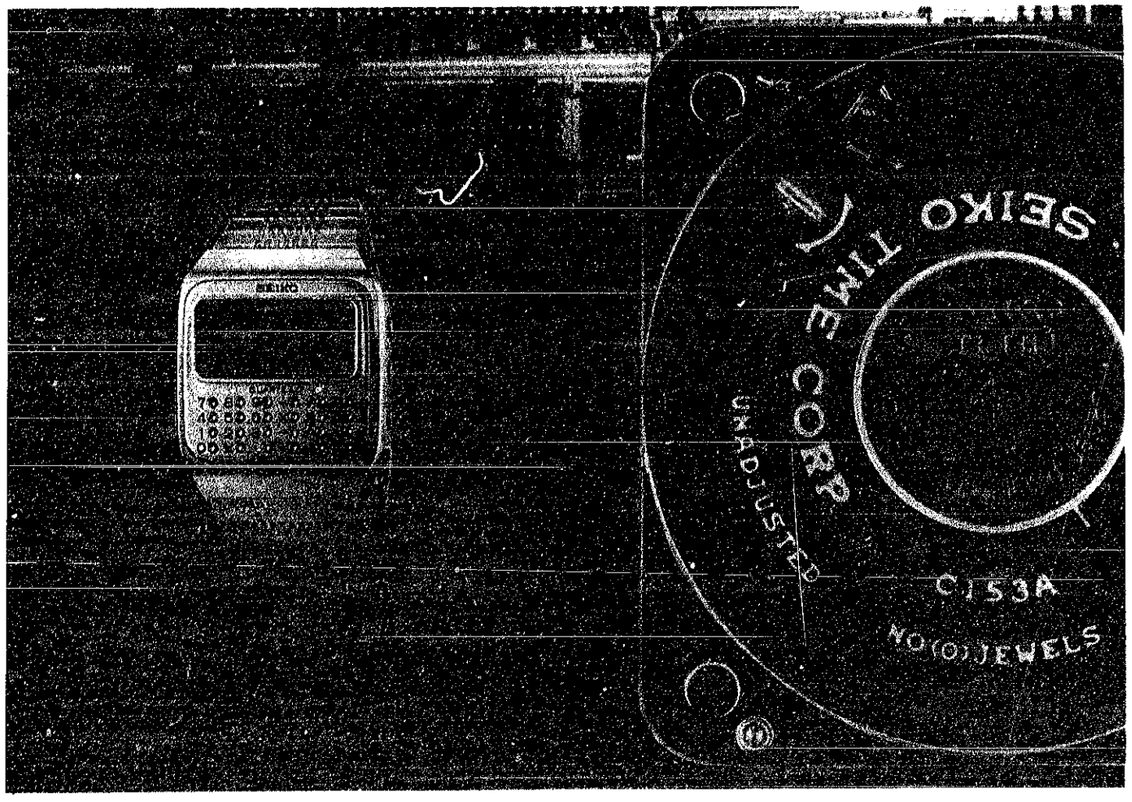
PART NO.	PART NAME	PART NO.	PART NAME
354 940	Stem		
383 940	Setting lever		
389 940	Setting lever axle spring		
4001 611	Circuit block		
4032 610	Bulb		
4050 611	Circuit bridge plate		
4216 610	Insulator for circuit		
4219 610	Insulator for battery connection		
4242 611	Battery connection		
4242 620	Plus terminal of battery connection		
4277 940	Contact lever guard		
4282 610	Contact lever A		
4282 611	Contact lever B		
4313 610	Connector		
4398 610	Liquid crystal panel frame		
4510 610	Liquid crystal panel		
4521 520	Reflecting mirror		
4540 610	Liquid crystal panel holder		
022 257	Liquid crystal panel holder screw		
022 257	Circuit block screw		
022 257	Circuit bridge plate screw		
022 257	Setting lever axle spring screw		
022 257	Contact lever guard screw		
027 003	Pin for minus terminal of battery connection		
SEIKO SB-BU	Silver oxide battery		

TECHNICAL GUIDE

SEIKO

DIGITAL QUARTZ

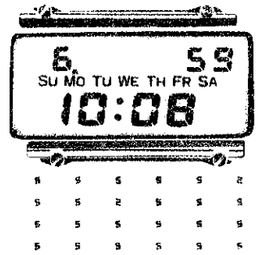
CAL. C153A



CONTENTS

Calibre C153A

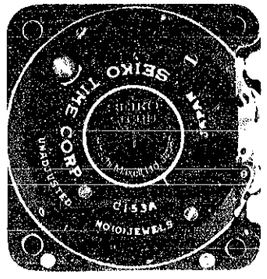
Module



Time display

Calculator display

Display panel side



Case back side

I. SPECIFICATIONS AND FEATURES

1. Specifications

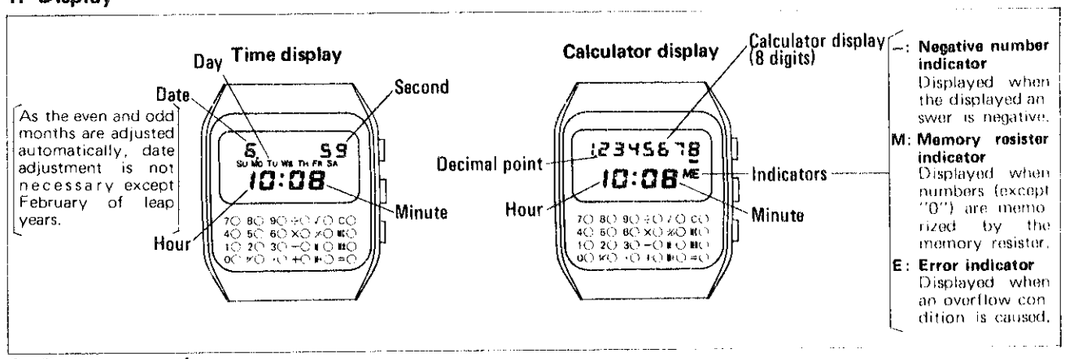
Item	Cal. No. C153A
Display medium	Nematic Liquid Crystal, FEM (Field Effect Mode)
Display system	Time display and calculator display • Time display Hour, minute, second, date, day, and (month) Month digit is displayed only in the time and calendar setting functions. • Calculator display Answers available up to 8 digits (with Floating Decimal Point) Hour and minute
Calculator function	Addition, subtraction, multiplication, division, constant calculations for multiplication and division, raising numbers to a power, reciprocals, extraction of square root, percentage, percentage added on, discount, mixed calculations using memory register (total of sum and difference, sum of products, difference between products, sum of quotients, difference between quotients, etc.) and rough calculation (from 10^8 to 10^{15})
Additional mechanism	• Automatic function changeover system (The calculator function is changed over into the time function automatically unless a key is pushed for 10 to 20 minutes.) • 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	ϕ29.0 mm
Height	6.7 mm without battery
Operational temperature range	Watch: $-10°C \sim +60°C$ ($14°F \sim 140°F$) Calculator: $0°C \sim +40°C$ ($32°F \sim 104°F$)
Regulation system	Trimmer condenser
Battery power	SEIKO SB-BU silver oxide battery Battery life is approximately one year. (If use of calculator totals 1,000 hours a year.)
IC (Integrated Circuit)	C-MOS-LSI . . . 2 units (One each for watch and calculator)

2. Features

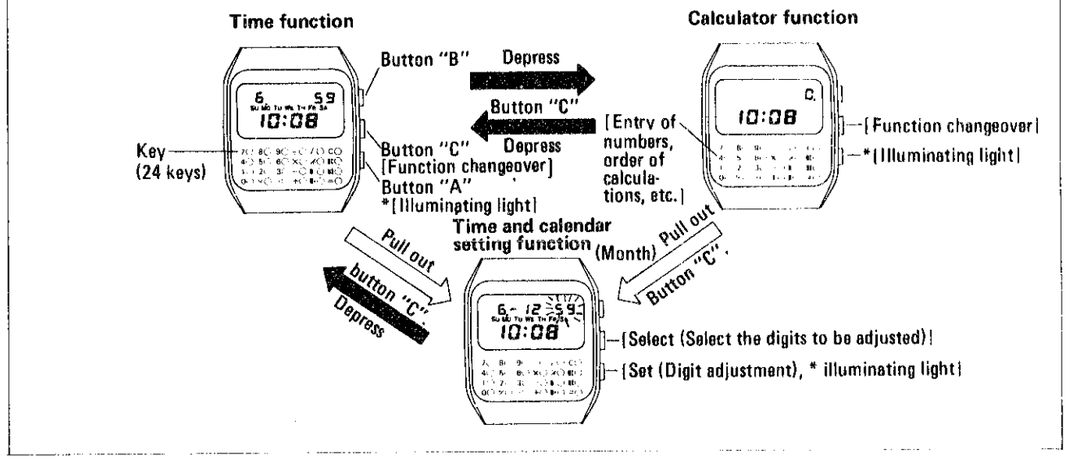
- Time (hour and minute) digits are displayed even while the watch is performing the calculator function.
- Calibre C153 is equipped with the standard type desk-top calculator and it can be operated in the same easy manner as the ordinary desk-top calculators.
- Along with addition, subtraction, multiplication and division, such calculations as extraction of square root, percentage and calculations using the memory register are possible.

II. HOW TO USE

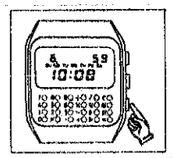
1. Display



2. Button operation

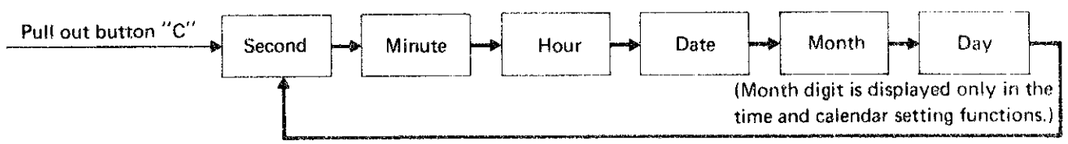


* **How to use the light**
Depress button "A" to activate the illuminating light, and the entire display can be read in the dark.



3. How to set the time and calendar

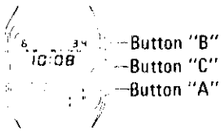
- No matter which function, the time function or the calculator function, is being operated, it is changed into the time and calendar setting function by pulling out button "C".
- Each depression of button "B" select the digits (flashing) to be adjusted in the order shown in the illustration below.
- One digit (flashing) is advanced by each depression of button "A". (The second digits are reset to "00" by simply depressing button "A".)
- No matter which digits are being adjusted, the display is changed into the time function by depressing button "C" in to the normal position. Further, as each time digit can be set independently, it is easy to adjust time differential, etc.



(See next page for further details.)

[Example]

The illustrations show that the indication of 10:08:34 A.M., Monday, December 6 is changed into 07:00:00 P.M., Friday, January 24.



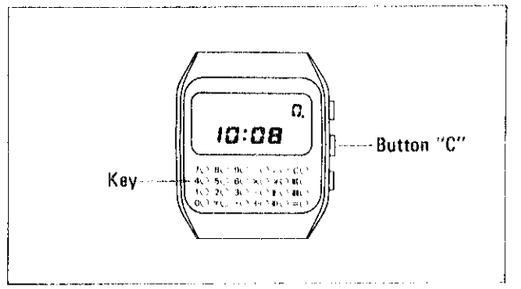
Digits to be adjusted (in the numerical order)	Button operation (Select and set)	
	SELECT (Select the digits to be adjusted)	SET (Digit adjustment)
	Depress button "B" and the selected digits start flashing.	One digit (flashing) is advanced by each depression of button "A". (The second digits are reset to "00" by depressing button "A".)
(1) Second	The second digits start flashing and the month digits are displayed. Pull out button "C".	Depress button "A" in accordance with "00" second of a time signal and the seconds are then reset to "00" and start immediately.*
(2) Minute	Depress button "B" and the minute digits start flashing.	Set the desired minute.
(3) Hour	Select and set the hour, date, month and day by following the same procedure as in "Minute". Depress button "B" and the hour digits and A.M./P.M. indication start flashing	While setting the hours, be sure that the time setting is made with the A.M. or P.M. period appropriately displayed. This will ensure the calendar changing at midnight.
(4) Date		
(5) Month		
(6) Day		If button "B" is depressed after the day digits are set, the second digits start flashing again thus beginning the entire procedure again.

After all the adjustments are completed, push button "C" in to the normal position.

* (When the seconds count any numbers from "00" to "29", the seconds are reset to "00" automatically whenever button "A" is depressed. When the seconds count any numbers from "30" to "59" and button "A" is depressed, one minute is added and the seconds immediately return to "00".)

4. How to use as a calculator

Depress button "C" and the time and calendar function is changed into the calculator function and "0" is displayed in the upper right corner of the display panel.



[1] IDENTIFICATION OF KEYS

Key	Name		Function
(0) ~ (9) (•)	Number keys Decimal point keys	Data keys	• Push and the number or the decimal point is entered.
(+) (−) (X) (÷)	Addition, subtraction, multiplication and division keys		• Push and the desired calculation is performed. • **Note:** When a wrong key is pushed by mistake, push a correct one next and the wrong key is cleared. For example, when (−) key is pushed instead of (+) key by mistake, push (+) key next and the calculation will be performed for (+).
(=)	Equal key		• Push and the answer is displayed.
(C)	Clear and clear entry key		• When a wrong number key is pushed by mistake, push (C) key and a correct number key next. Then the wrong number is cleared and the calculation can be continued without starting it all over again. ((C) key functions as clear entry key.) • When (C) key is pushed after (+) (−) (X) (÷) (M+) (M−) (%) keys and (=) key are pushed, all but the contents of the memory register are cleared. • When (C) key is pushed under the overflow condition (when the integral numbers of the answer exceed eight digits or when an impossible calculation is performed*), the overflow condition is released ("E" extinguishes) and the calculator is ready for next calculation. * Ex. • When a divisor is "0" in division (Ex. 6 ÷ 0) • When a square root of a negative number is extracted (Ex. $\sqrt{-4}$). • When pushed twice after numbers are entered, (C) key functions as a clear key and all but the contents of the memory register are cleared.
(%)	Percent key		• Push when a percentage is required.
($\sqrt{\ }$)	Square root key		• Push when a square root is required.
(+/−)	Changeover sign key		• Push and the displayed numbers are changed over to and from the positive and the negative numbers.

Key	Name	Function
(M+) (M−)	Memory plus key Memory minus key	• Push (M+) key and the displayed numbers will be added to the memory register. • Push (M−) key and the displayed numbers will be subtracted from the memory register. • Push (M+) key or (M−) key instead of (=) key when adding the displayed answer to or subtracting it from the memory register.
(MR)	Memory recall key	• Push and the contents of the memory register will be displayed.
(MC)	Memory clear key	• Push and the contents of the memory register will be cleared. **Note:** No matter which calculation is being performed, only the contents of the memory register will be cleared without affecting the calculation.

[2] REMARKS FOR USE

(1) Overflow condition

In the following cases, the overflow condition is caused and the error indicator "E" is displayed. In these cases, it is impossible to start the next calculation unless (C) key is pushed.

a. When the answer exceeds eight digits
- When the answer is between nine digits and sixteen digits, the floating decimal appears to indicate the answer in hundred million and the first eight digits of the answer will be displayed.
  Ex. Answer: 31,970,347,032
  Displayed answer: 319.70347 E.
  (See "Rough calculation" in [3] HOW TO CALCULATE on page 7.)
- When the answer exceeds sixteen digits, "0" will be displayed.

b. When a divisor is "0" in division (Ex. 6 ÷ 0)
c. When a square root of a negative number is extracted (Ex. $\sqrt{-4}$).
d. When the contents of the memory register exceed eight digits.*

} "0" will be displayed.

* The contents having been memorized by the memory register before the overflow condition was caused continue to remain in the memory register.

(2) All displays including the contents of the memory resister will be cleared when the calculator function is changed over into the time function.

(3) The calculator function is changed over into the time function automatically unless a key is pushed for 10 to 20 minutes.

(4) Use the attached key pushing tool when pushing a key. Be sure not to use a tool having a sharp metal point as it might damage a key.

(5) When entering numbers, etc., push a key slowly and surely while checking for the displayed number digits, etc.

[3] HOW TO CALCULATE

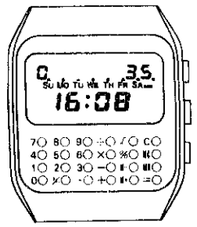
Calculation	Example	Key operation	Display
Addition, subtraction, multiplication, division	• 246 − 64.2 + 357 = 538.8 • 975 × 4 ÷ 9 = 433.33333 • (9 + 2) × 17 ÷ 5 − 17 = 20.4	246 (−) 64 (•) 2 (+) 357 (=) 975 (×) 4 (÷) 9 (=) 9 (+) 2 (×) 17 (÷) 5 (−) 17 (=)	538.8 433.33333 20.4
Constant calculations	• 975 × 7 = 6825 975 × 6 = 5850 • 1300 × 35% = 455 1300 × 30% = 390 • 86 ÷ 5 = 17.2 68 ÷ 5 = 13.6 • 119 ÷ 250 = 47.6% 191 ÷ 250 = 76.4%	975 (×) 7 (=) 6 (=) 1300 (×) 35 (%) 30 (%) 86 (÷) 5 (=) 68 (=) 119 (÷) 250 (%) 191 (%)	6825. 5850. 455. 390. 17.2 13.6 47.6 76.4
Raising numbers to a power	• 46^2 = 2116 • $3^{12} = ((3^3)^2)^2$ = 531441	46 (×) (=) 3 (×) (=) ..... = 3^2 (=) ..... = 3^3 (×) (=) ..... = $(3^3)^2$ (×) (=) ..... =	2116. 9. 27. 729. 531441.
Reciprocals	• 1 ÷ 4 = 0.25 • 1 ÷ 4 ÷ 4 = 0.0625	4 (÷) (=) 4 (÷) (=) (=)	0.25 0.0625
Extraction of square root	• $\sqrt{25}$ = 5 • $\sqrt{2 \times 722}$ = 38 • $\sqrt{25} + \sqrt{81}$ = 14	25 ($\sqrt{}$) 2 (×) 722 (=) ($\sqrt{}$) 25 ($\sqrt{}$) (+) 81 ($\sqrt{}$) (=)	5. 1444. 38. 14.
Percentage	• 5000 × 20% = 1000	5000 (×) 20 (%)	1000.
Percentage added on, Discount	• 6500 with 12% added on • 6500 with 12% discount	6500 (+) 12 (%) 6500 (−) 12 (%)	7280. 5720.
Calculations using memory resister	• 42 + 5 = 47 21 − 7 = 14 32 × 3 = 96 84 ÷ 5 = 16.8 Total = 173.8 • 8 × 5 ÷ 4 − 9 ÷ 3 × 4 = −2 • $\sqrt{3^2 + 4^2}$ = 5 • $\sqrt{5^2 - 3^2}$ = 4	(MC) 42 (+) 5 (M+) 21 (−) 7 (M+) 32 (×) 3 (M+) 84 (÷) 5 (M+) (MR) (MC) 8 (×) 5 (÷) 4 (M+) 9 (÷) 3 (×) 4 (M−) (MR) (MC) 3 (×) (M+) 4 (×) (M+) (MR) ($\sqrt{}$) (MC) 5 (×) (M+) 3 (×) (M−) (MR) ($\sqrt{}$)	47.M 14.M 96.M 16.8 M Total 173.8 M 10.M 12.M 2.M 9.M 16.M 25.M 5.M 25.M 9.M 16.M 4.M

Calculation	Example	Key operation	Display
Rough calculation	• 1,234,567 × 25,896 = 31,970,347,032	1234567 (×) 25896 (=)	3 19.70347E
		Multiply the displayed answer by 10^8 (i.e., the decimal point is moved by eight digits to the right) and the round number answer is obtained.	

5. Remarks for battery replacement

Incomplete, erroneous or flashing digital display may be indicated on the display panel after the battery is replaced. However, this is not a malfunction. Correct digital display will be indicated on the display panel by adjusting the time and calendar.

[Example]



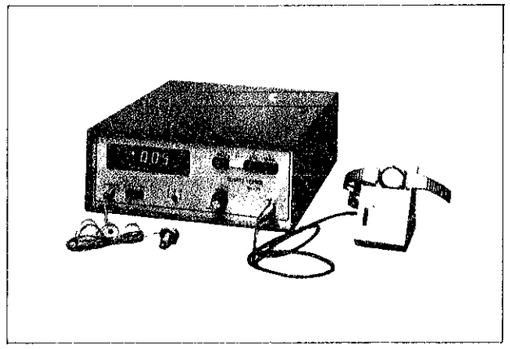
III. DISASSEMBLING AND REASSEMBLING

1. After-sale servicing instruments and materials

For after-sale servicing of SEIKO Quartz Digital Cal. C153A, the following instruction and materials are necessary.

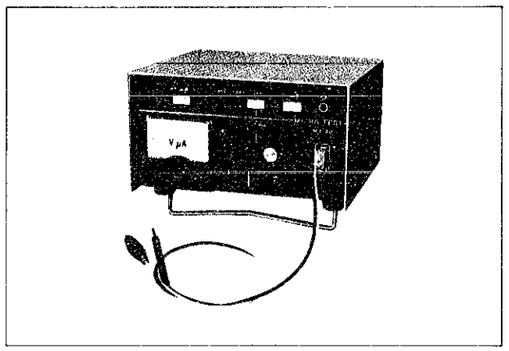
(1) Quartz Tester QT-77

Used to check time accuracy (daily rate).



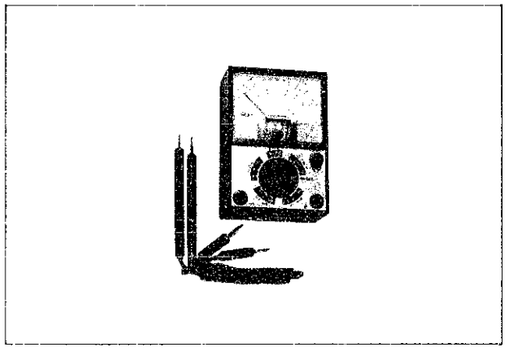
(2) Micro Test MT-10II

Used to check current consumption and to supply constant voltage power.



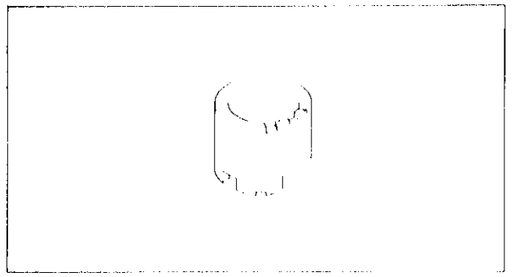
(3) Volt-ohm-meter

Used to check battery voltage and measure current consumption, etc.



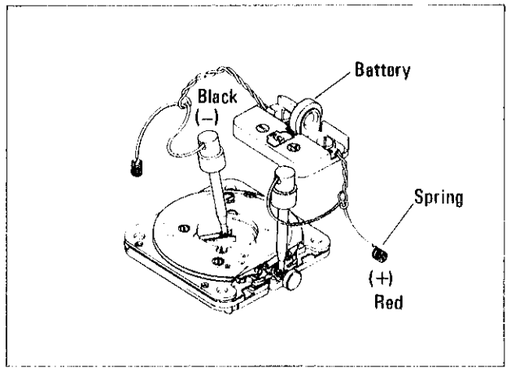
(4) Module holder (S-647)

Used for disassembling and reassembling of the module.



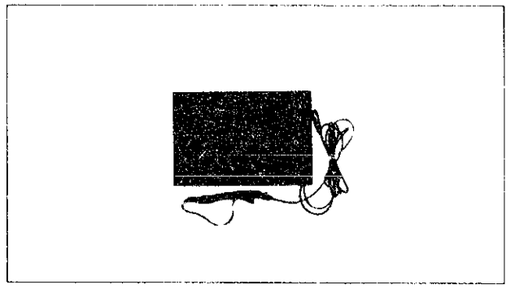
(5) Electricity supplier (when hadling module only) (S-833)

Used to operate the module.
Apply the spring tips when the liquid crystal panel side is up.



(6) Static electricity protector S-830

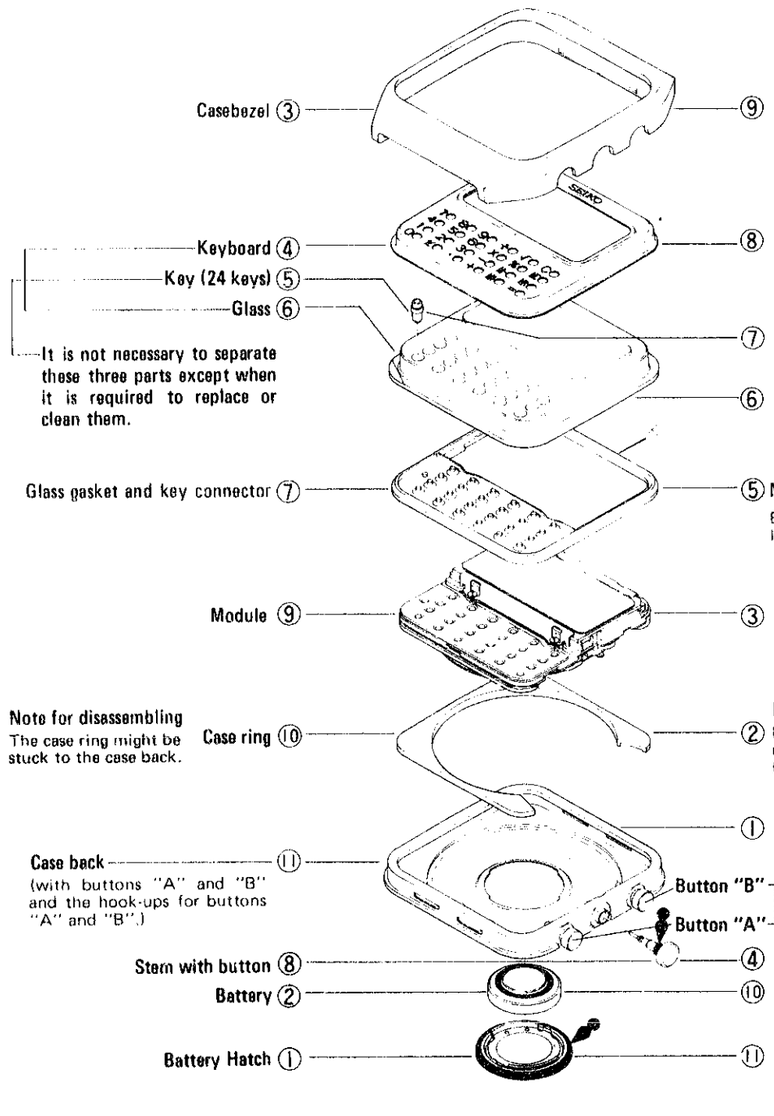
Used to protect the C-MOS-LSI of Digital Quartz from being damaged by static electricity.



2. Disassembling, reassembling and lubricating of the case

Lubricating:
- ⊶ : Silicon grease (500,000 c.s.)
  Normal quantity
- × : Never lubricate the portions with this mark.

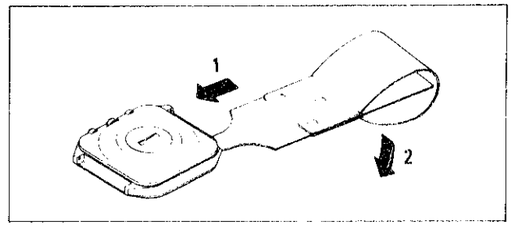
[Disassembling procedures] **[Reassembling procedures]**



[Remarks for disassembling]

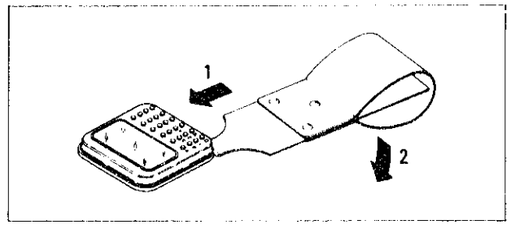
③ Casebezel

The casebezel can be disassembled by pushing the case opener into the opening notch of the case back.



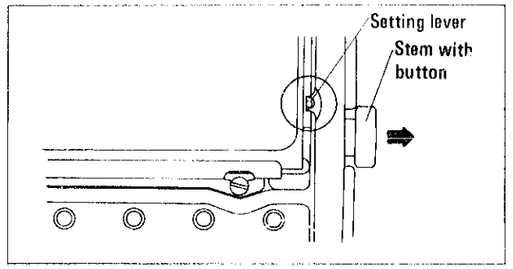
④ Keyboard

The keyboard can be disassembled by pushing the case opener into the opening notch of the glass.



⑧ Stem with button

While pushing the setting lever (marked with ○ in the illustration on the right) with tweezers, pull out the stem with button.



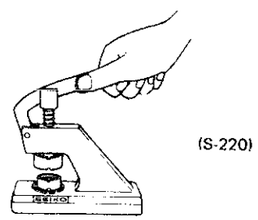
[Remarks for reassembling]

① Case back

Reassemble the case back with buttons "A" and "B" pulled out.

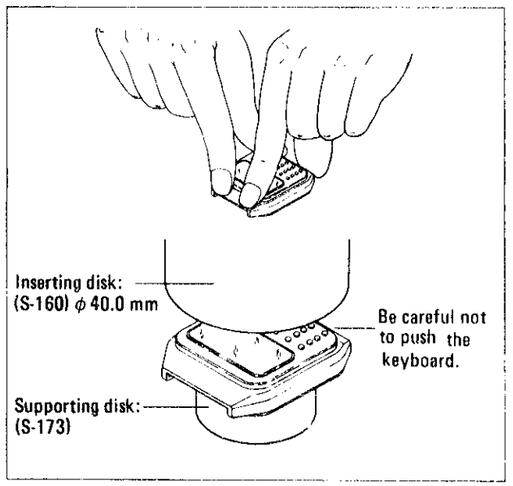
⑨ Casebezel

1. Mount the casebezel evenly on the case back while making sure that the stem with button is set into the groove for button pipe for the case back.
2. Push the casebezel hard with fingers so that the case back is snapped closed to the casebezel firmly as shown in the illustration. If it is not snapped closed with fingers, use SEIKO tightening tool.



(S-220)

3. After reassembling, check to see if the button and the keys function correctly.

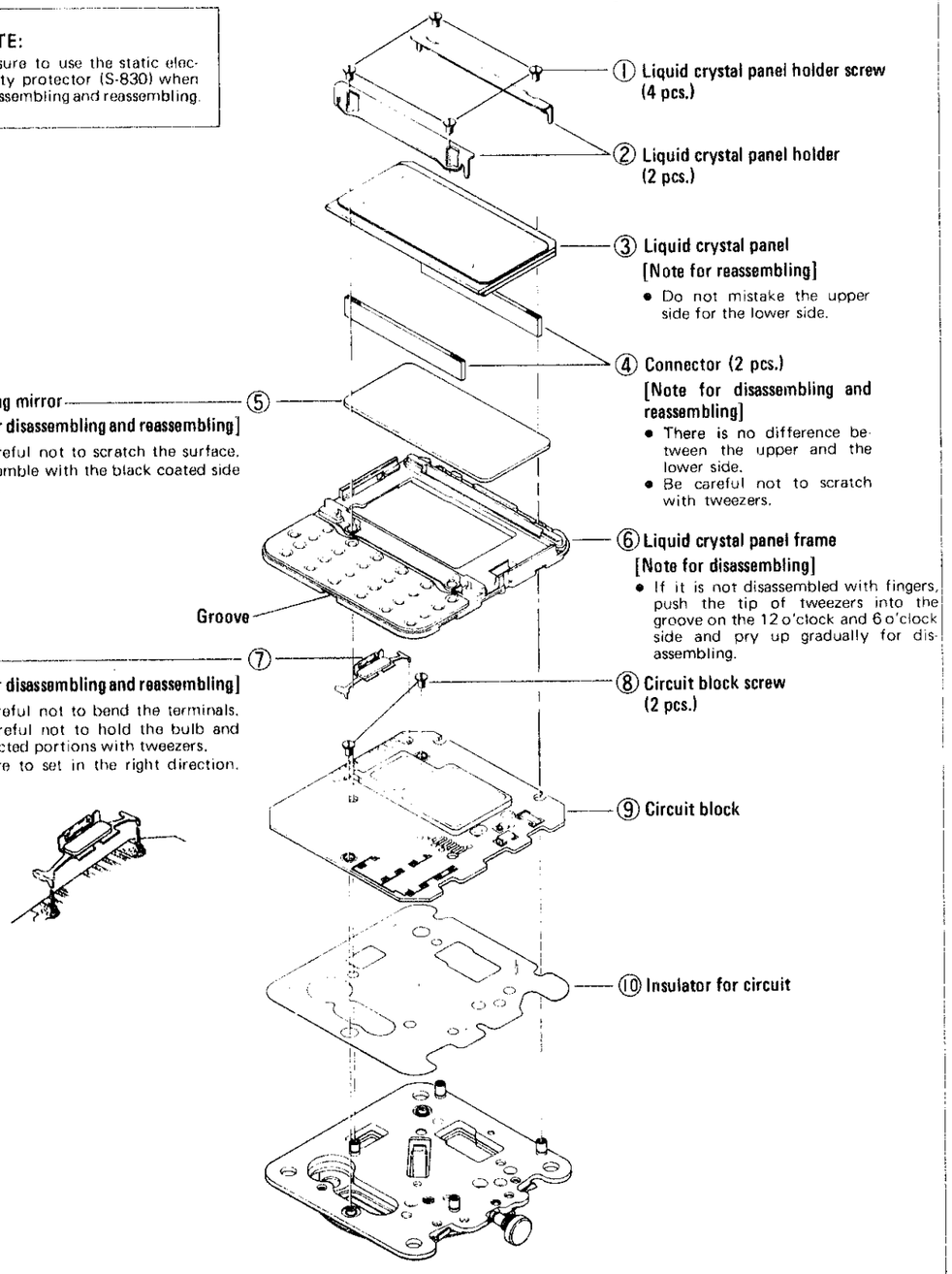


3. Disassembling, reassembling and lubricating of the module

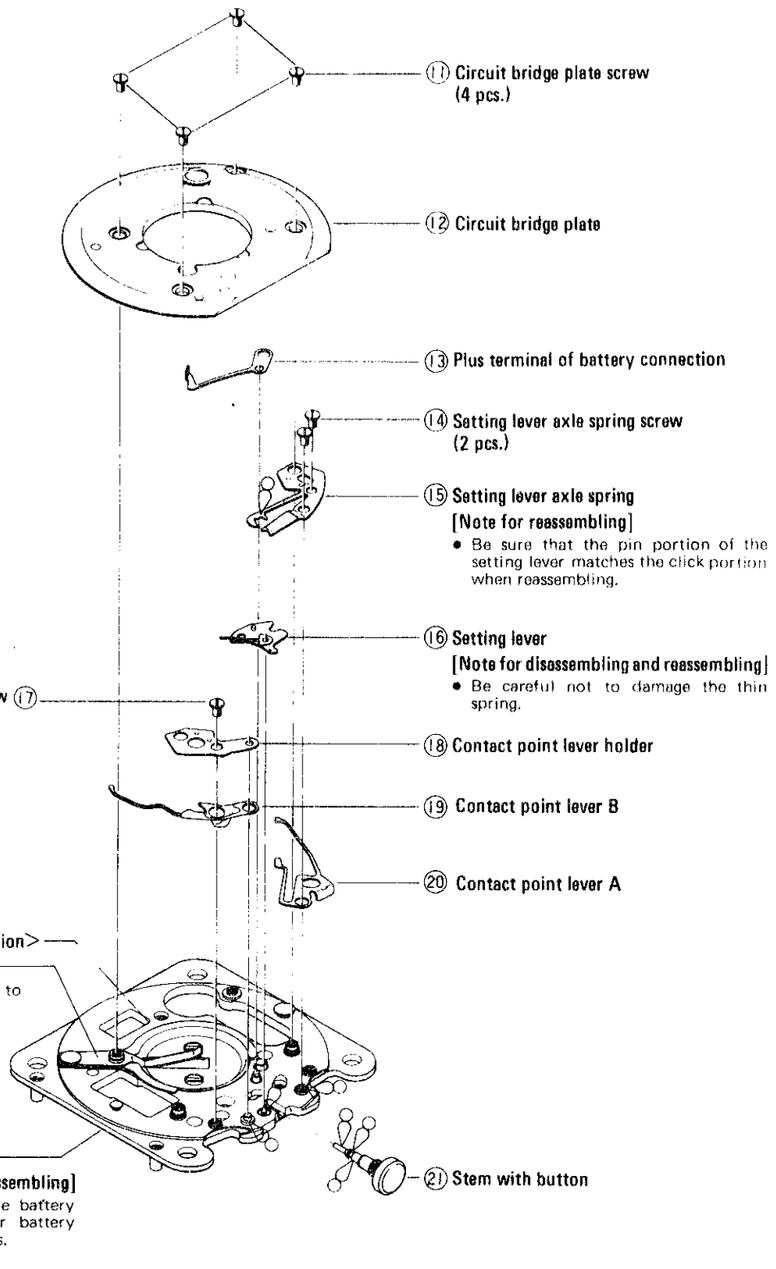
Disassembling procedures Figs.: ① → ㉑
Reassembling procedures Figs.: ㉑ → ①

[All the screws used are the same.]

NOTE:
Be sure to use the static electricity protector (S-830) when disassembling and reassembling.



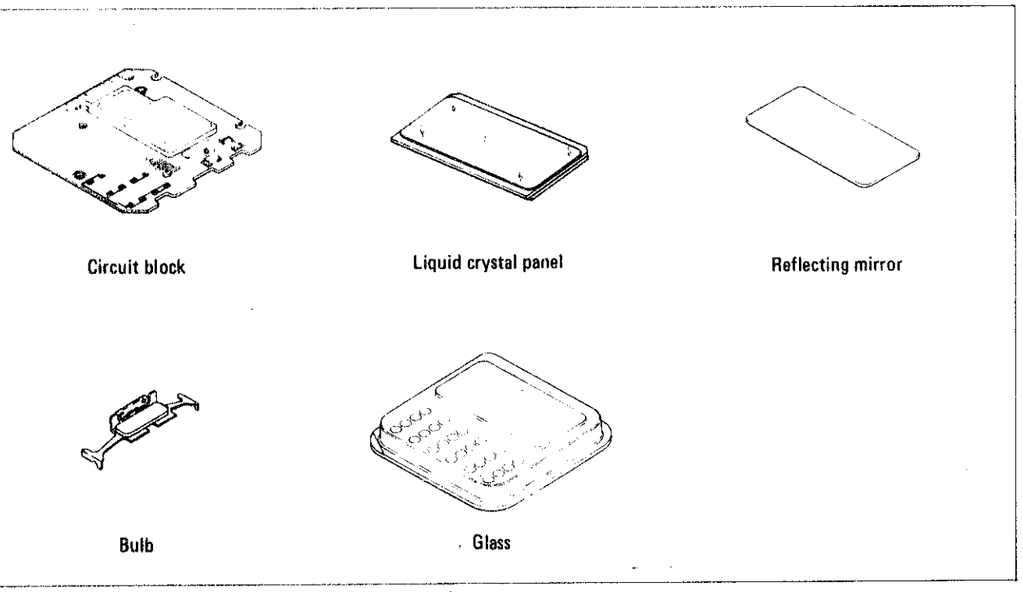
Lubricating
: SEIKO Watch Oil S-6
Normal quantity



4. Cleaning

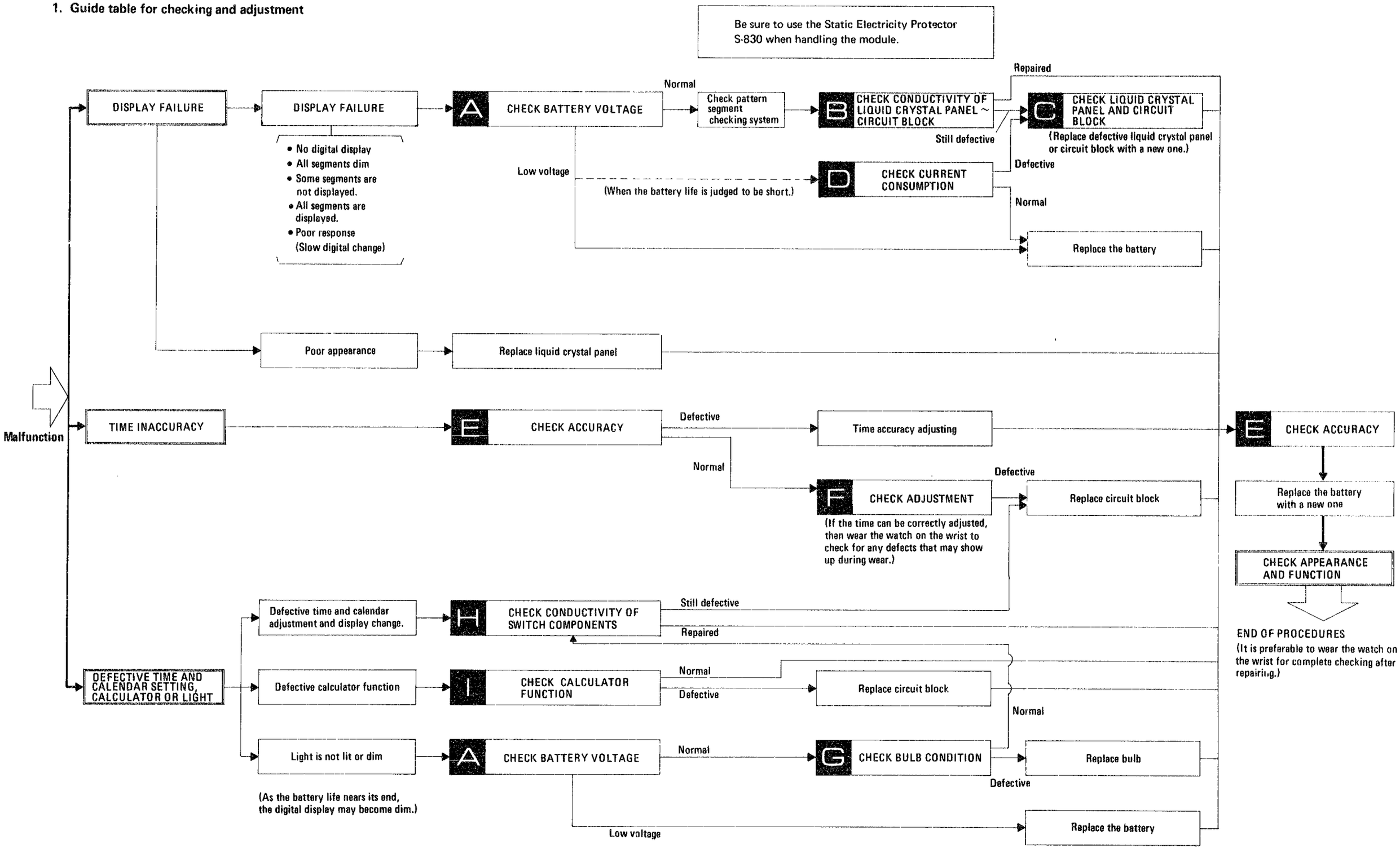
Name of parts	Cleaning	Drying	Solution	Remarks
Connector 	Rinse or wash with a soft brush	Cool air	Alcohol	• Do not use benzine or trichloroethylene. (They expand the connector.) • Be sure to reassemble after drying thoroughly.
Main plate Liquid crystal panel frame	Rinse or wash with a soft brush	Cool air	Benzine or alcohol	
Circuit bridge plate	Rinse or wash with a soft brush	Cool air	Alcohol	Do not use a solution other than alcohol.
Module parts other than above and below	Clean with cleaner, rinse or wash with a soft brush.	Cool or hot air	Trichloroethylene, benzine or alcohol	

• Parts that must not be cleaned



- Wipe dust, lint, etc. off with a soft brush.
- Remove dust stuck to the key holes of the glass by using toothpick, etc. (Do not use a metal tool such as tweezers.)
- Be sure to clean only stains on the electrodes of the liquid crystal panel and the circuit block with a cloth moistened with benzine or alcohol.

1. Guide table for checking and adjustment



2. Malfunction and checking points

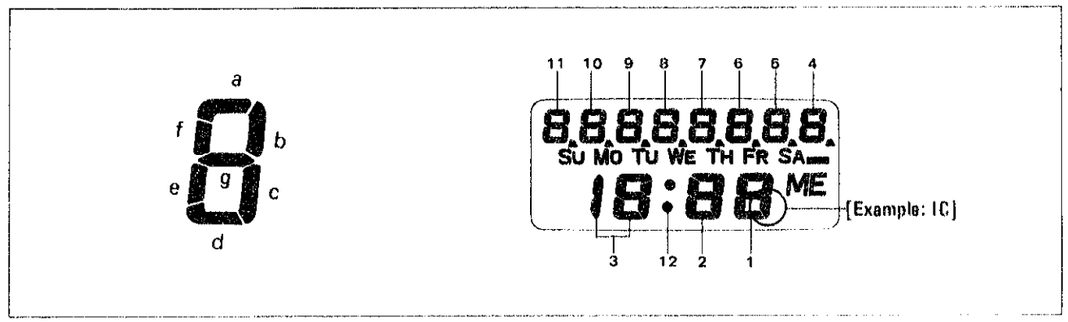
- Check in the numerical order.
- Refer to "Guide table for checking and adjustment" on page 15.

	FAULTY SYMPTOMS	CHECKING POINTS									
		A		B	C			F	G	H	I
		Battery voltage	Check displaying of all segments	Conductive portion of liquid crystal panel and circuit block	Liquid crystal panel	Circuit block	Time accuracy adjusting	Adjustment and setting conditions	Bulb	Switch components	Calculator function
DISPLAY FAILURE	No digital display, dim digital display or extremely slow response.	①		②	③	④					
	All segments are displayed.			①	②	③					
	Some segments are not displayed. 		①	②	③	④					
	(Deflection) Some or all of one segment does not show clearly depending on the direction of view. *Example:*  **(Poor appearance)** Some portions of the liquid crystal panel will have air bubbles or iridescent view. *Example:* 				①						
TIME INACCURACY	Gain or loss tested by Quartz Tester.						①				
	Though Quartz Tester indicates the normal figures, the watch gains or loses when it is worn on the wrist.							①			
DEFECTIVE AND CALENDAR SETTING, CALCULATOR OR LIGHT	Failure of time and calendar setting or changeover of time and calendar display and calculator display.									①	
	Defective calculator function.										①
	Light is not lit or light is lit but dims soon.	①							②	③	

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

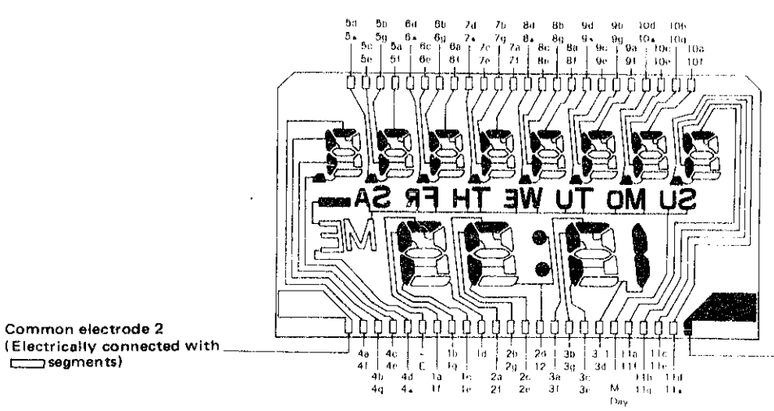
A complete knowledge of how the segment (Liquid Crystal Panel Electrode) works with the C-MOS-LSI output terminal will provide the correct procedures for checking and adjustment.

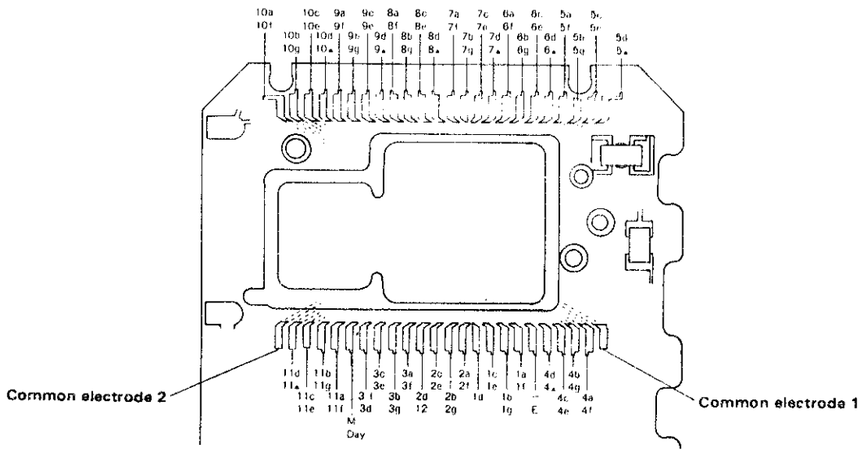
- **Designation of segment**



- **Relationship between the segment and the C-MOS-LSI output terminal.**

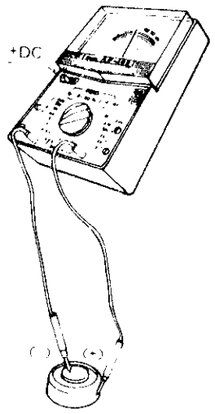
  The liquid crystal panel of Cal. C153A has a pair of common electrodes. As the checking procedures for this liquid crystal panel are different from the existing ones, follow the checking procedures on page 20).





4. Procedures for checking and adjustment

HOW TO CHECK BATTERY ELECTROLYTE LEAKAGE AND REPAIR

	Procedure	Result and Repair
A CHECK BATTERY VOLTAGE	Use the following procedures to check battery voltage. (1) Set up the volt-ohm-meter Range to be used: DC 3V (2) Measuring • Probe Red (+) . . . . Battery surface (+) • Probe Black (–) . . . Battery surface (–)  **When there is battery electrolyte leakage, refer to "HOW TO CHECK BATTERY ELECTROLYTE LEAKAGE AND REPAIR" below for repairing.**	More than 1.5V . . . Normal Less than 1.5 V . . . Defective

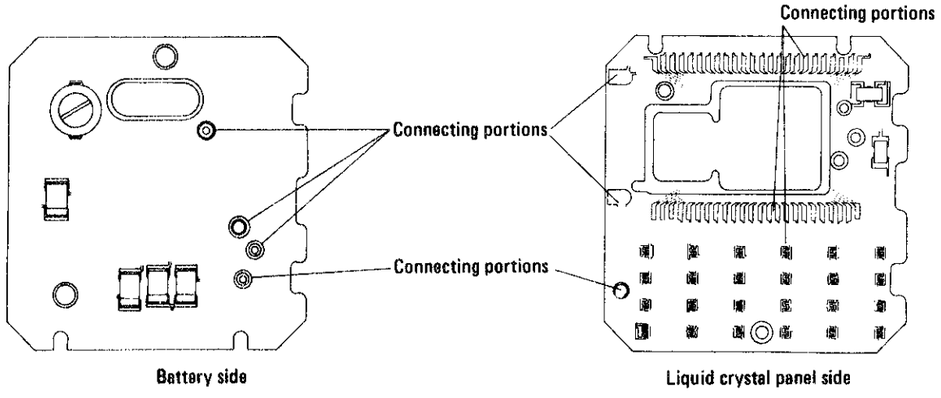
HOW TO CHECK BATTERY ELECTROLYTE LEAKAGE AND REPAIR

Procedures

1. Remove the module from the case.
2. Disassemble the module.
3. Wipe off battery electrolyte on the circuit block.
   (1) Wipe off battery electrolyte with a cloth moistened with distilled water. If distilled water is not available, use tap water.

Note:
- Do not expose the trimmer condenser to water or alcohol, and if it is exposed, there may be change in its condenser capacity and eventually in the time accuracy.
- Do not use a cloth which gives off lint such as gauze, flannel, etc.

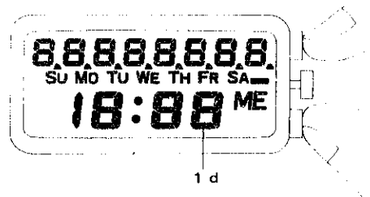
When the circuit block is cleaned, be sure to clean the connecting portions.



(2) Wipe off with a cloth moistened with alcohol.
(If the cleaned portions remain wet with water, they will corrode with rust.)
(3) Dry with cool air by using a dryer.

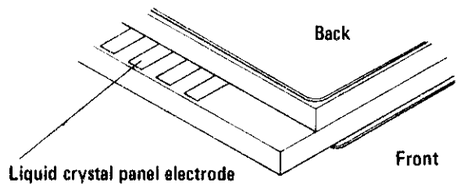
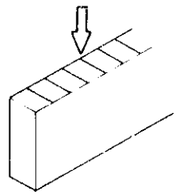
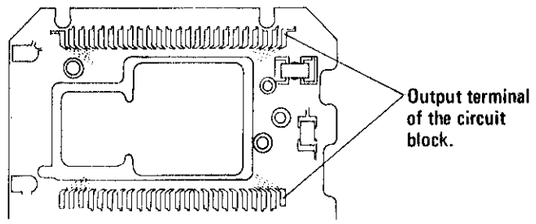
HOW TO CHECK BATTERY ELECTROLYTE LEAKAGE AND REPAIR

4. Clean the other parts. (Battery connection, circuit bridge plate, insulator for battery, etc.)
   (1) Wipe off battery electrolyte on the other parts (battery connection, circuit bridge plate, insulator for battery connection, etc.) with a soft brush moistened with distilled water.
   (If distilled water is not available, use normal water.)
   (2) Rinse them with alcohol.
   (3) Dry with cool air by using a dryer.
5. Reassemble the module. Replace the battery with a new one.
6. Check to see if the time setting function, the calculator function and the current consumption are normal.

	Procedure	Result and Repair
CHECK PATTERN SEGMENT CHECKING SYSTEM	If some segments are dead or dim, change the function into 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 will be displayed.)	One segment is not displayed (excluding 1 d) ⟶ Defective Proceed to Replace liquid crystal panel. • More than two segments are not displayed. (including 1d) • Normal ⟶ Proceed to **B**.
B CHECK CONDUCTIVITY OF LIQUID CRYSTAL PANEL ~ CIRCUIT BLOCK	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 DISPLAYING OF ALL SEGMENTS." (Refer to "Relationship between the segment and the C-MOS-LSI output terminal" on page 17.) Use a microscope for checking.	

CHECK CONDUCTIVITY OF LIQUID CRYSTAL PANEL ~ CIRCUIT BLOCK

B

Procedure	Result and Repair
(1) Check for dust, lint and other contamination on the liquid crystal panel electrode.  	Uncontaminated → Normal Proceed to B (2). Contaminated → Defective Wipe off any foreign matter.
(2) Check for any contamination, scratch, crack and break of the connecter.  Be sure to check the connecting portion with the liquid crystal panel and the circuit block carefully.	No contamination, scratch, crack or break → Normal Proceed to B (3). Contaminated → Defective Wipe off any foreign matter. (See page 14.)
(3) Check for dust, lint and other contamination on the output terminal of the circuit block.  	Scratch, crack or break → Defective Replace the connecter with a new one. Uncontaminated → Normal Proceed to C. Contaminated → Defective Wipe off any foreign matter.

CHECK LIQUID CRYSTAL PANEL AND CIRCUIT BLOCK

C

Check to see if the liquid crystal panel and the circuit block function correctly.

1. Check liquid crystal panel

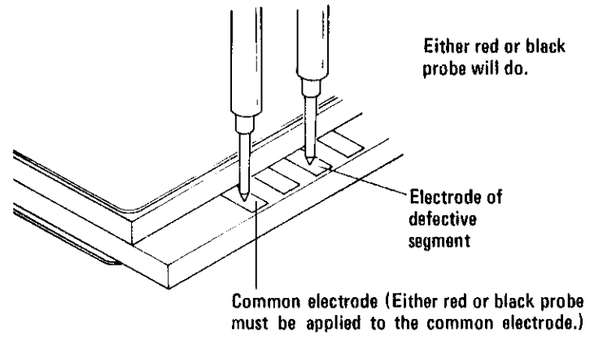
(1) Set up the volt-ohm-meter
Range to be used: OHMS R X 1 ~ R X 1K

> **Note:** 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 (R X 10K) which is higher in resistance.

(2) Remove the liquid crystal panel from the movement and turn it upside down.

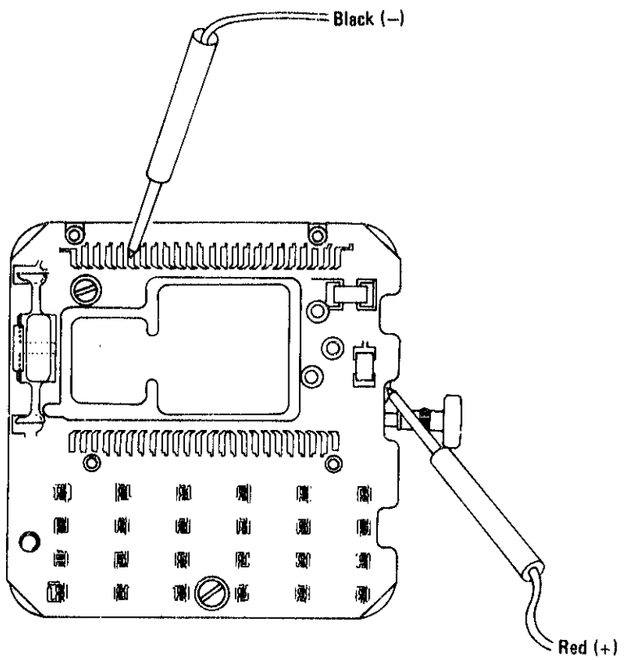
CHECK LIQUID CRYSTAL PANEL AND CIRCUIT BLOCK

C

Procedure	Result and Repair
(3) Checking  **Note:** • As shown in the illustration for "Relationship between the segment (Liquid Crystal Panel Electrode) and the C-MOS-LSI output terminal" on page 17, Cal. C153A has two common electrodes on its liquid crystal panel. Each segment is displayed by the potential difference between the segment electrode and one of the two common electrodes. • As shown in the illustration on page 17, the relationship between the segment and the common electrodes 1 and 2 are; Common electrode 1 . . . . . ■ Common electrode 2 . . . . . □ Check by referring to the above. [Example of checking] When segments 5a and 5f are not displayed. • By referring to the illustration on page 17, make sure that the segment 5a is connected with common electrode 1 and the the segment 5f with common electrode 2. • Be sure to locate the electrodes of segments 5a and 5f, and turn upside down the liquid crystal panel. Apply the probe of the volt-ohm-meter to the electrodes of the 5a and the 5f and the common electrode 1 to check to see if the 5a is displayed. Then apply the probe to the electrodes of the 5a and 5f and the common electrode 2 to check to see if the 5f is displayed.	Displayed → Normal Proceed to C (2). Not displayed → Defective Proceed to Replace liquid crystal panel.

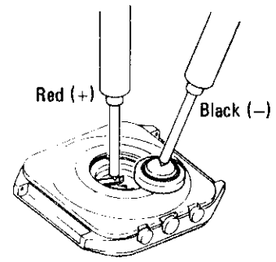
CHECK LIQUID CRYSTAL PANEL AND CIRCUIT BLOCK

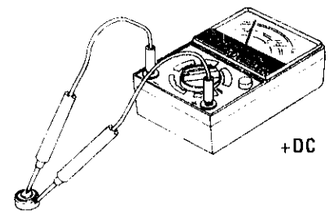
	Procedure	Result and Repair
C	**2. Check output voltage of the circuit block** 1) Set up the volt-ohm-meter Range to be used: DC 3V 2) Attach the current supplier to the movement and remove all the parts from the liquid crystal panel holder screw (1) to the panel frame (6). 3) Measuring Probe Red (+) . . . Main plate Probe Black (–) . . One 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.)	More than 0.8 V ⟶ Normal (All the terminals must be more than 0.8 V.) Return to B. Less than 0.8 V ⟶ Defective Proceed to Replace circuit block.

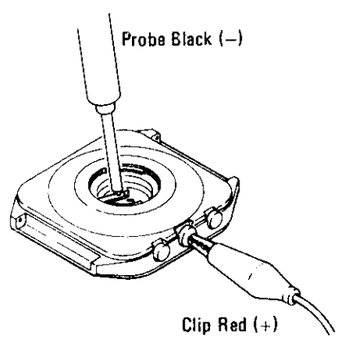


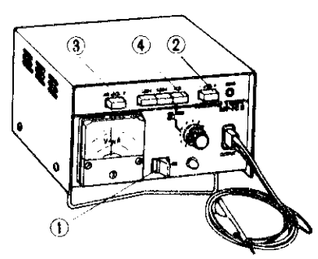
CHECK CURRENT CONSUMPTION

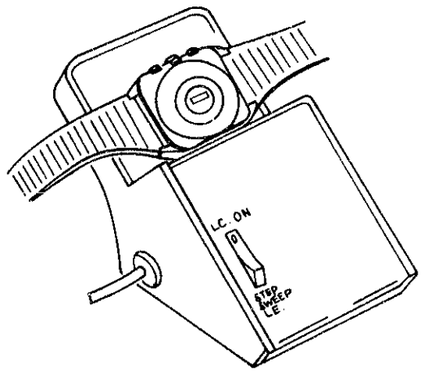
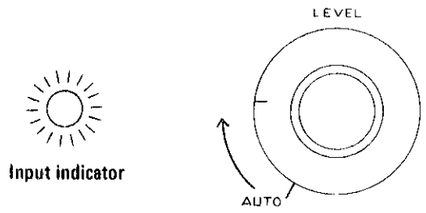
	Procedure	Result and Repair
D	Check to see if the current consumption is normal. Check in the time function, calculator function and in the hour and calendar setting function. **Measuring** 1) Volt-ohm-meter Range to be used: DC 0.03 mA (30 μA)* Probe Red (+) . . . . . Battery connection Probe Black (–) . . . . Battery surface (–) **Note:** If it is impossible to measure (Current does not flow from case to the module), place the battery surface (+) to the stem with button so that it touches, and proceed to measure. 2) Micro Test Set up the Micro Test (1) Power switch . . . ON (2) Polarity changeover button . . . + (3) Current consumption/Voltage indication button . . . μA (4) Voltage selection button . . . 1.55 V Clip Red (+) . . . . . Stem with button Probe Black (–) . . Battery connection	* **Note:** If the pointer of the volt-ohm-meter swings over the maximum value when DC 0.03 mA (30 μA) is used, change the range to a greater one where the pointer does not run over the maximum value while applying the probes to the respective portions. Then, after two or three seconds, return the range to DC 0.03 mA (30 μA) again for measuring. • Time function and hour and calendar setting function Less than . . . 4.5 μA • Calculator function Less than . . . 30 μA Normal Proceed to Replace the battery. • Time function and hour and calendar setting function More than . . . 4.5 μA • Calculator function More than . . . 30 μA Defective Proceed to C.

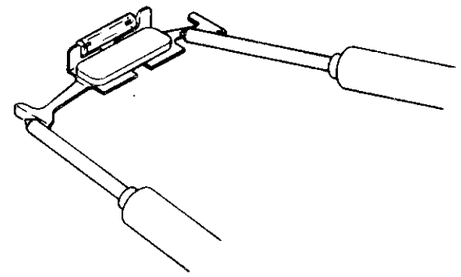








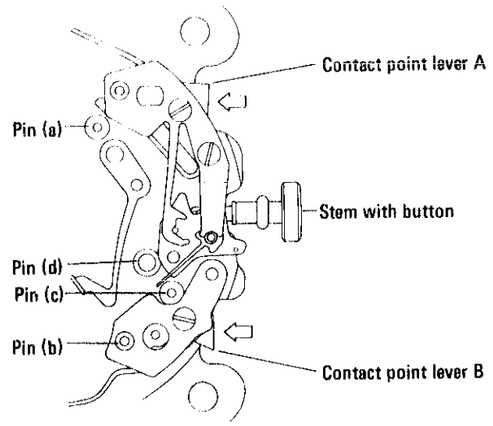
	Procedure	Result and Repair
E CHECK ACCURACY	Check gain and loss of time. Check while paying attention to the following. 1) Place the watch on the microphone with the watch in the time function while making sure that only the second digit portion is not positioned against the mark for placing watch.  (Place the watch in the same way when the electric-field detection microphone is used.) 2) Turn the level adjuster of the Quartz Tester clockwise slowly from the AUTO position. Stop turning the level adjuster when the input indicator is lit continuously (the input indicator is lit regularly or constantly according to the type of Quartz Tester and the microphone used.) (Be careful not to turn the level adjuster excessively.)  Input indicator **Note:** • The accuracy can be measured with the measuring time selection switch in any position, "4 second", "6 second" or "10 second" position. Generally, however, the longer the measuring time is, the more accurate the measurement becomes.	Normal: According to the checking procedures of "Guide table for checking and adjustment" on page 15, proceed to the next checking items of the guide table. Defective → Proceed to Time accuracy adjusting. Time accuracy is adjusted by turning the trimmer condenser.

	Procedure	Result and Repair
F CHECK FUNCTIONING AND ADJUSTMENT	Check to see if the digit adjustment can be made correctly by the button operation by following the procedures on page 4. • Check adjustment by changing all digits and indications cyclically.	Function correctly and can be adjusted → Normal Wear the watch on the wrist to check time accuracy. Does not function correctly or cannot be adjusted → Defective Proceed to Replace circuit block.
G CHECK BULB CONDITION	Check to see if the bulb functions correctly. Check with the volt-ohm-meter. 1) Remove the bulb. 2) Set up the volt-ohm-meter. Range to be used: OHMS R X 1 3) Measuring Check to see if there is a broken filament in the bulb and if there is any break in the welded portion of the terminal. Probe Red (+) Probe Black (–) Apply to either side of the bulb. (Any probe will do.) 	Lights up → Normal Proceed to H. Does not light up → Defective Replace bulb.

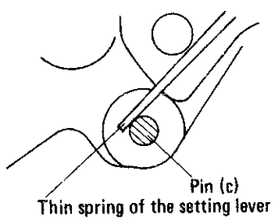
CHECK CONDUCTIVITY OF SWITCH COMPONENTS

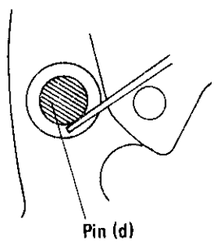
H

Procedure	Result and Repair
Check to see if the switch components function correctly. Check by using a microscope after disassembling the circuit bridge plate. **1. Check functioning of the contact point levers A and B.** Check to see if the contact point levers A and B touch the pins (a) and (b) when the arrow-marked portions of the contact point levers A and B are depressed by tweezers and if they do not touch the pins (a) and (b) when the arrow-marked portions of the contact point levers A and B are released.	Function correctly → Normal Proceed to H (2). Does not function correctly → Defective Adjust the contact point levers. (If adjustment is impossible, replace the contact point levers with new ones.)



2. Check functioning of the setting lever 1) Check to see if the thin spring of the setting lever touches the pin (c) when the stem with button is depressed and if it does not touch the pin (c) when the stem with button is released. 2) Check to see if the thin spring of the setting lever touches the pin (d) when the stem with button is pulled out and if it does not touch the pin (d) when the stem with button is depressed in. **3. Check for dust, lint or other contamination on the conductive portions of the parts above.**	Functions correctly → Normal Proceed to H (3). Does not function correctly → Defective Adjust the thin spring. (If adjustment is impossible replace the setting lever with a new one.) Uncontaminated → Normal Proceed to Replace circuit block. Contaminated → Defective Wipe off any foreign matter.



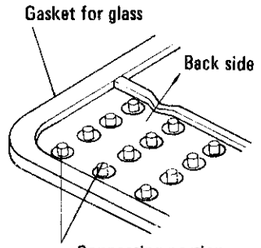


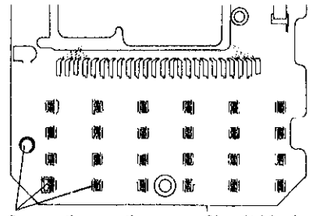
When there is battery electrolyte leakage, refer to "HOW TO CHECK BATTERY ELECTROLYTE LEAKAGE AND REPAIR" on page 18 for repairing.

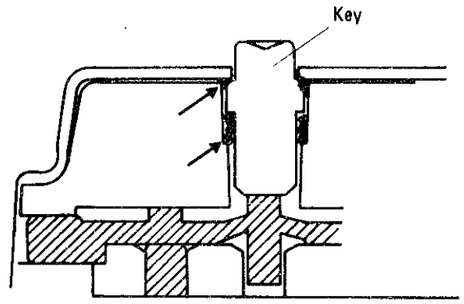
CHECK CALCULATOR FUNCTION

I

Procedure	Result and Repair
Check to see if the calculator functions correctly. 1. Perform the calculations below and check to see if the displays are identical with those shown below. Display 2 (C) 8 1 (√) (M−) ..... 9.M Successively 3 (−) 4 (−) (MR) ..... 9.$\bar{M}$ Successively (÷) 9 (MC) (M+) ..... 0.8888888M Successively 7 (−) 2 0 (%) (+) (•) ..... 0.M Successively 65 (X) (MR) (+/−) (=) ..... 5.555555$\bar{M}$	Identical → Normal Not identical → Defective Proceed to I (2).
2. Check for dust, lint and other contamination on the connecting portions between the gasket for glass and the circuit block, and check for dust, lint and other contamination between the glass and the keys.	No dust, lint or other contamination → Normal If the calculator is still defective after the glass and the gasket for glass are replaced, replace the circuit block with a new one. Dust, lint or contamination → Defective Wipe off any foreign matter.



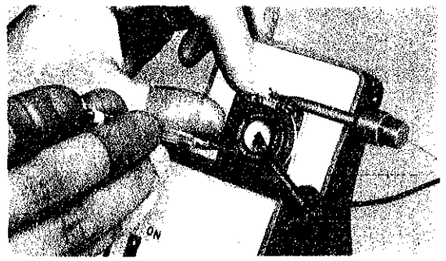




When there is battery electrolyte leakage, refer to "HOW TO CHECK BATTERY ELECTROLYTE LEAKAGE AND REPAIR" on page 18 for repairing.

TIME ACCURACY ADJUSTING

Time accuracy of Cal. C153A is adjusted by turning the trimmer condenser.



- **Adjusting method**

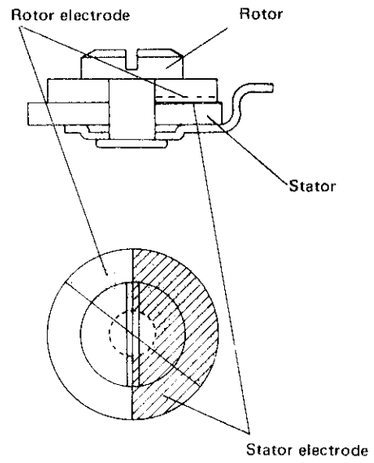
  The watch will gain or lose according to the direction in which the trimmer condenser is turned.
  Adjustment should therefore be made after ascertaining with the Quartz Tester whether the watch tends to gain or lose.

- **Note for handling the trimmer condenser.**

  Avoid excessive depressing and turning of the trimmer condenser.

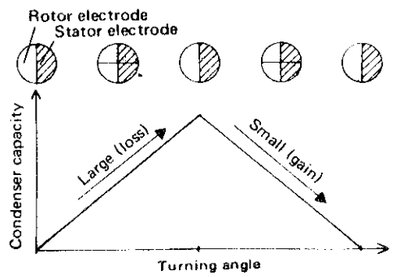
- **Function of the Trimmer Condenser**

  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.