

**SEIKO**

QUARTZ *LC*

**Cal.M158A**

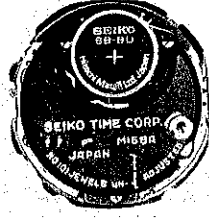
**PARTS LIST**

Calibre No.

**M158A**

Style Name

**QUARTZ LC  
WORLD TIMER**



**Characteristics :**

Casing diameter :  $\phi$  27.0 mm  
Maximum height : 6.1 mm  
Frequency of quartz crystal oscillator : 32,768 Hz  
(Hz=Hertz . . . . Cycle per second)

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

Calendar functions : Digital Display System showing day and date

Remarks : Year and month digits are indicated only in the day setting function. (Greenwich mean time digits (hour, minute, second, day and date) are displayed by simple depressing a button.)

World time and calendar functions :

24-hour Digital Display System showing hour, minute, second, day and date of the 29 different time zones throughout the world.

Display medium : Nematic Liquid Crystal, FE-Mode

Time micro-adjustor : Trimmer condenser system

Illumination light for digital display panel :

Illuminated in coordination with the button depressing



354 940



354 941



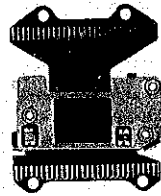
383 940



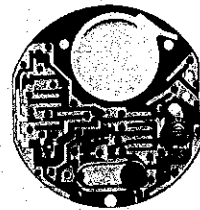
389 940



782 940



4007 944



4009 940



4032 940



4050 948



4219 940



4242 941



4256 940



4270 940



4277 940



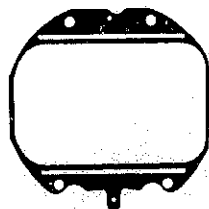
4282 940



4282 941



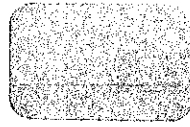
4313 940



4398 940



4510 950



4521 500

4521 501



4540 940



4540 941



SEIKO SB-BU



022 256



023 061



023 067

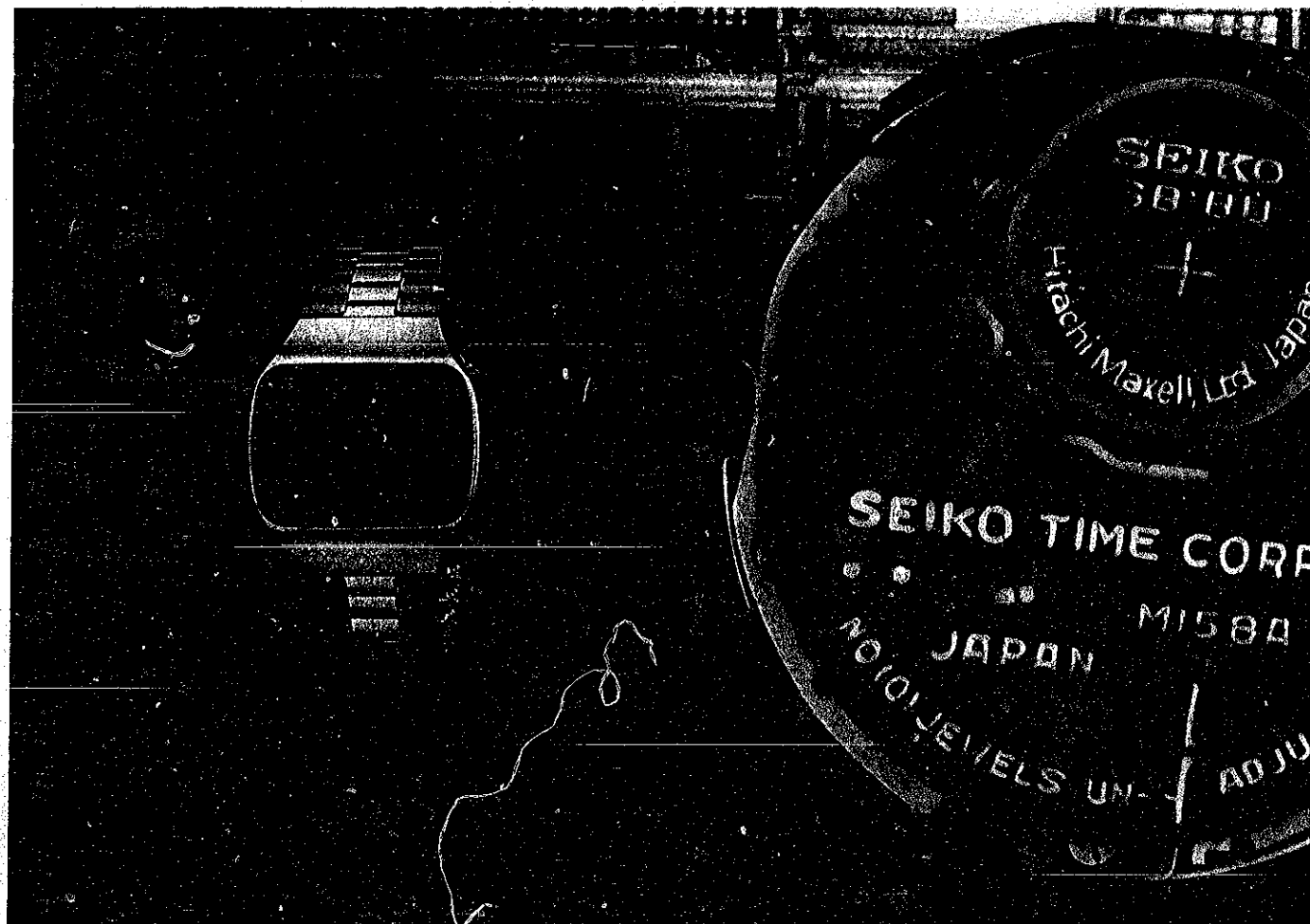
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Calibre No.		Style Name	
<b>M158A</b>			
PART NO.	PART NAME	PART NO.	PART NAME
354 940	Stem (Short)		
354 941	Stem (Long)		
383 940	Setting lever		
389 940	Setting lever axle spring		
782 940	Setting lever spring		
4007 944	LSI block		
4009 940	Crystal oscillator block		
4032 940	Bulb		
4050 948	Circuit bridge plate		
4219 940	Insulator for battery connection		
4242 941	Plus terminal of battery connection		
4256 940	Crystal holding spring		
4270 940	Battery connection		
4277 940	Contact lever guard		
4282 940	Contact lever A		
4282 941	Contact lever B		
4313 940	Connector		
4398 940	Liquid crystal panel frame		
4510 950	Liquid crystal panel		
4521 500	Reflecting mirror (Silver)		
4521 501	Reflecting mirror (Gold)		
4540 940	Spring for liquid crystal panel A		
4540 941	Spring for liquid crystal panel B		
022 256	LSI block screw		
022 256	Bulb holding screw		
022 256	Liquid crystal panel holder screw		
022 256	Circuit bridge plate screw		
022 256	Setting lever axle spring screw		
022 256	Contact lever guard screw		
022 256	Crystal oscillator block screw		
023 061	Battery connection pin		
023 067	Pin for plus terminal of battery connection		
SEIKO SB-BU	Silver oxide battery		

# TECHNICAL GUIDE

## SEIKO DIGITAL QUARTZ

CAL.M158A

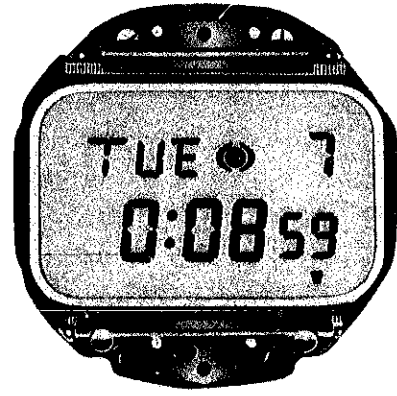


### CONTENTS

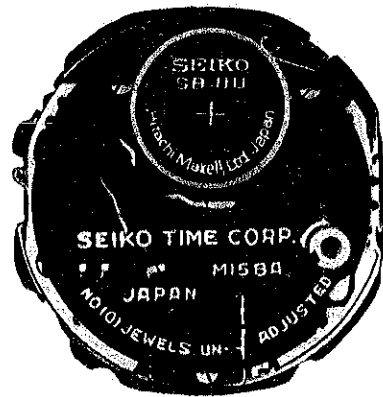
I. SPECIFICATIONS AND FEATURES .....	1
1. Specifications .....	1
2. Features .....	1
II. HOW TO USE .....	2
1. Display .....	2
2. Button operation .....	2
3. How to set the time and calendar .....	5
III. DISASSEMBLING AND REASSEMBLING .....	7
1. After-sale servicing instruments and materials .....	7
2. Disassembling and reassembling of the case .....	10
3. Disassembling and reassembling of the movement and lubricating of the switch components .....	13
4. Cleaning .....	16
IV. CHECKING AND ADJUSTMENT .....	17
1. Guide table for checking and adjustment .....	17
2. Malfunction and checking points .....	18
3. Relationship between the segment (Liquid Crystal Panel Electrode) and the C-MOS-LSI output terminal .....	19
4. Multiplex drive .....	20
5. Procedures for checking and adjustment .....	21
A. Check battery voltage .....	21
• Check pattern segment checking system .....	21
B. Check conductivity of liquid crystal panel ~ LSI block ~ crystal oscillator block .....	22
C. Check liquid crystal panel, LSI block and crystal oscillator block .....	23
D. Check current consumption .....	24
E. Check accuracy .....	25
F. Check adjustment and functioning .....	26
G. Check bulb condition .....	26
H. Check conductivity of switch components .....	27
• Time accuracy adjusting .....	28

Movement  
Display panel side

Home time function



World time function



Case back side

## I. SPECIFICATIONS AND FEATURES

## 1. Specifications

Item	Calibre No. M158A
Display medium	Nematic Liquid Crystal, FEM (Field Effect Mode)
Liquid crystal driving system	Multiplex driving system
Display system	Two function changeover system <ul style="list-style-type: none"> <li>• Home time function: 24-hour digital display system showing the hour, minute, second, date and day. [Greenwich mean time (hour, minute, second, date and day) is displayed by simply depressing a button.]</li> <li>• World time function (World time mark indicated): 24-hour digital display system showing the hour, minute, second, date and day of the 29 different time zones around the world. (Time setting of a single time zone automatically and simultaneously sets the time of all the other zones.)</li> </ul>
Additional mechanism	<ul style="list-style-type: none"> <li>• Illuminating light</li> <li>• Pattern segment checking system</li> </ul> Remarks: This function is added to check to see if all digits and other indicators are displayed perfectly by depressing the two side-buttons with the crown in a pulled out position.
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	φ27.0 mm
Height	6.1 mm
Operational temperature range	-10°C ~ +60°C (14°F ~ 140°F)
Regulation system	Trimmer condenser
Battery power	SEIKO SB-BU silver oxide battery Battery life is approximately one year. (If the light is used five times daily.)
IC (Integrated Circuit)	C-MOS-LSI . . . . 1 piece

## 2. Features

## (1) 29 time zones throughout the world are automatically set simultaneously.

The 29 different time zones [24 time zones (time differential/one hour) plus 5 time zones (time differential/thirty minutes)] that cover almost all time zones of the world, can be set simultaneously and automatically, including date and day, by simply setting the home time (in the home time function). The digital display for each time zone indicates "hour", "minute", "second", "date" and "day" at the same time.

## (2) Perpetual calendar system is included.

The perpetual calendar system, which displays the year digits up to 2009, automatically adjusts even and odd months including February of leap years both in the home time function and the world time function.

## (3) Digital display by multiplex driving system

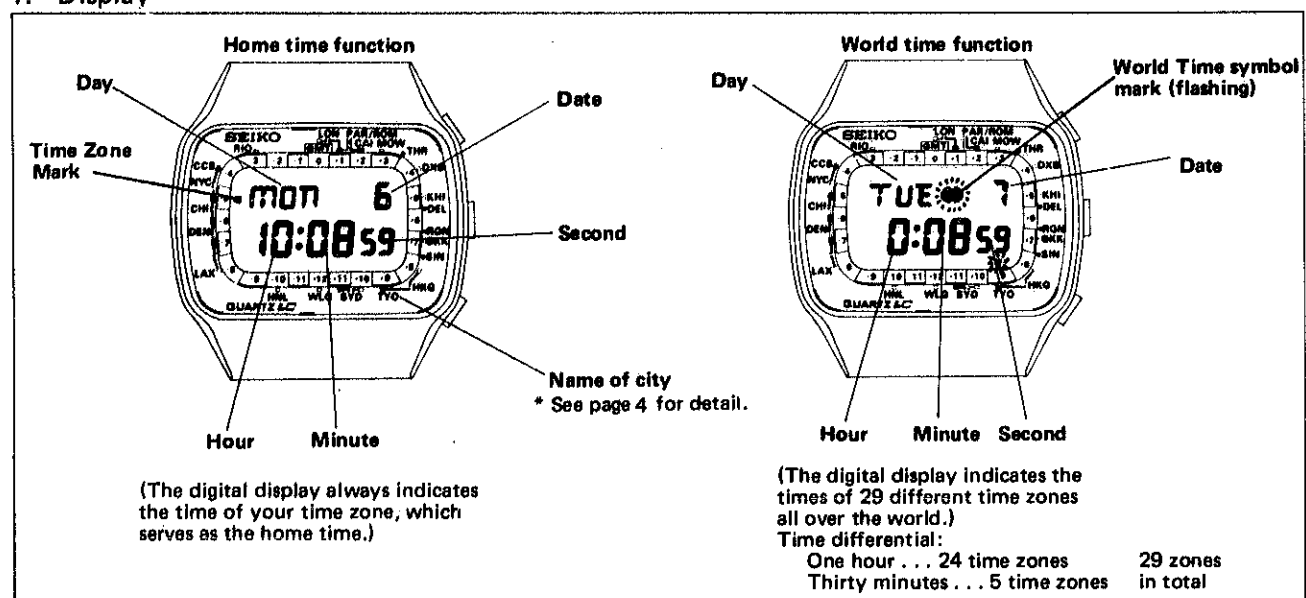
With the multiplex driving system being successfully adopted, the number of segments available is increased by as much as three times that of the direct driving system.

## (4) Thin design and easy to use

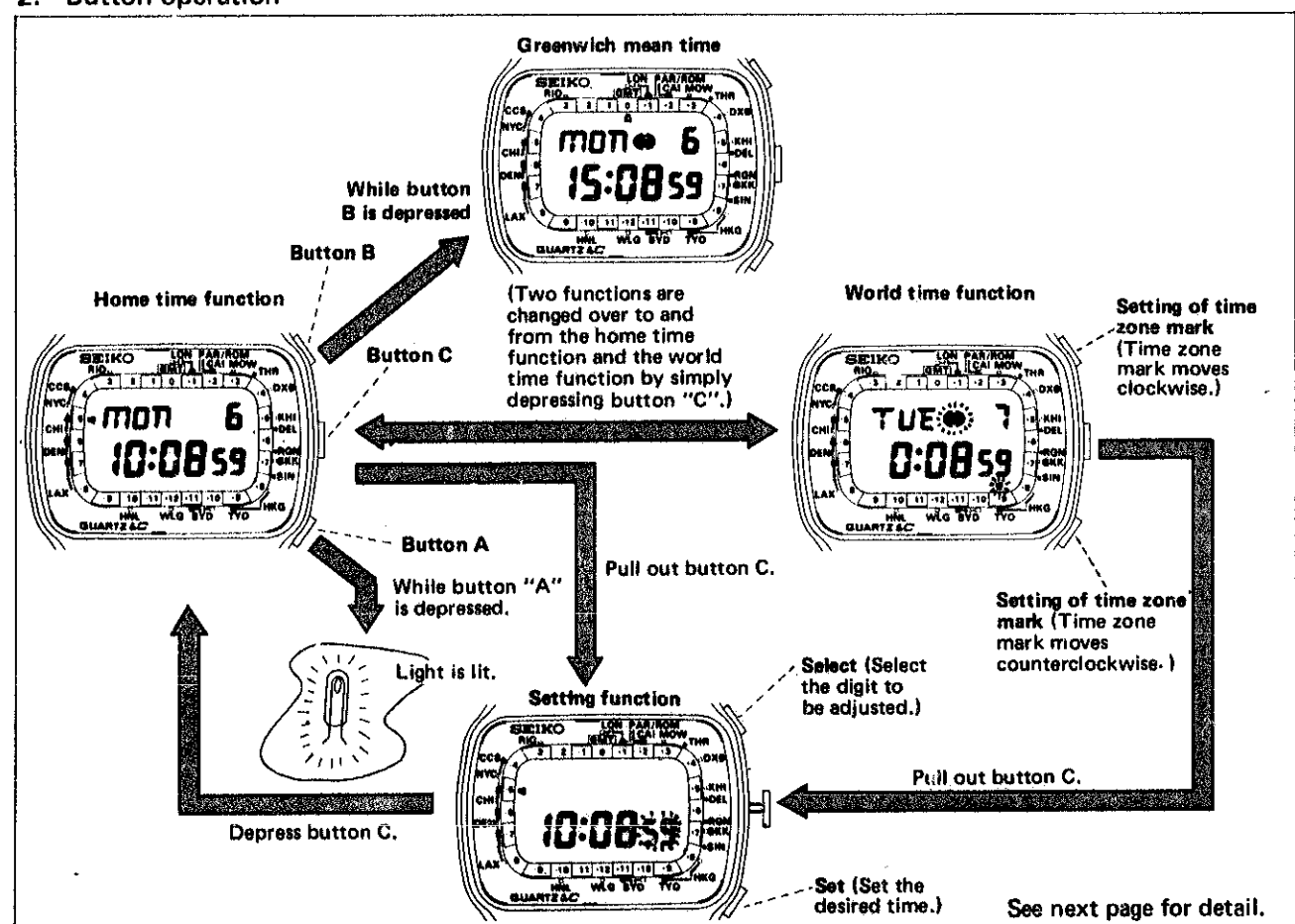
In spite of having such a variety of functions, Cal. M158A is thin and easy to use.

## II. HOW TO USE

### 1. Display



### 2. Button operation

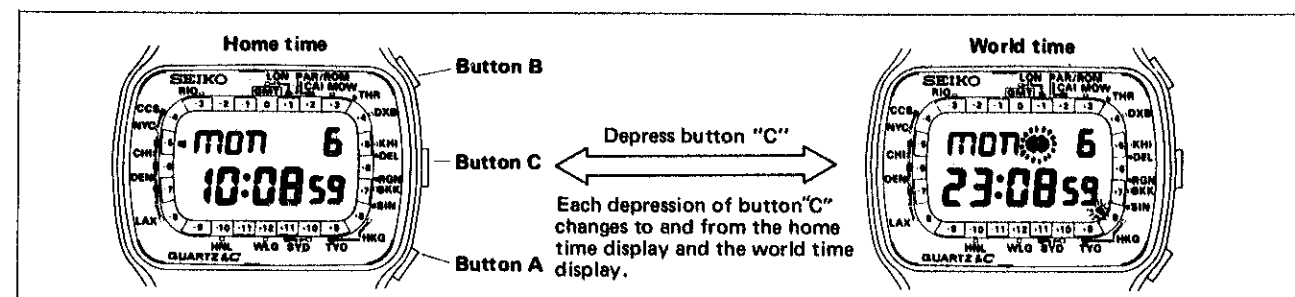


#### Remarks:

- This watch is so designed that not only the home time (time of your time zone) but the world time (time of a different time zone) also is displayed. Based on the home time, the world time is displayed in such a way that the time differential is either added to or reduced from the home time. Set the home time correctly, and the world time is readily available. Before setting the home time, make sure that the time zone mark is set at your time zone.
- When the watch is in the world time function, pull out button "C", and the time digits are ready to be adjusted at the time zone mark. As, however, the adjusted time serves as the home time when depressing button "C" in to the normal position, be sure to set the time zone mark at your time zone before adjusting the time digits.

How to read the home time and the world time digits, and to change over to and from the home time and the world time.

In the following example, the home time has been set for New York and the world time for Hong Kong.



- When the time of other time zones than Hong Kong time is required.

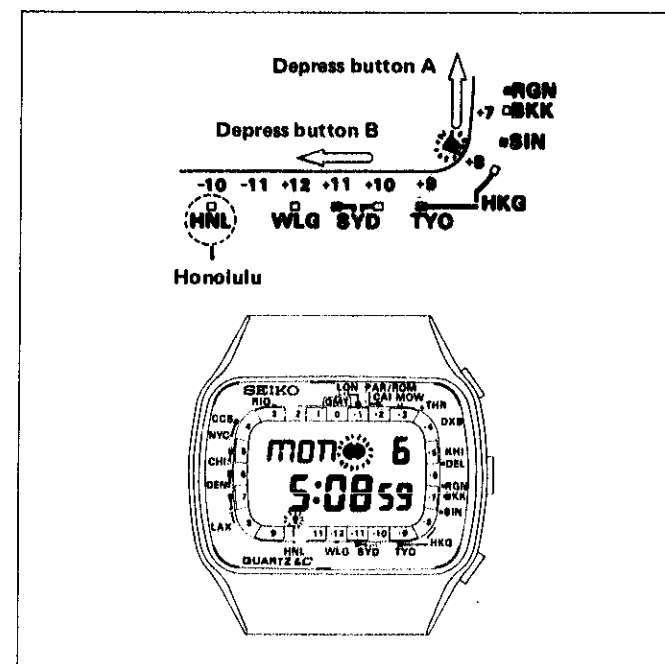
(Example: When Honolulu time is required.)

While in the world time function, the time zone mark moves clockwise by each depression of button "B" and it moves counterclockwise by each depression of button "A". And the digital display is changed accordingly.

Depress button "B" six times, and the time digits for Honolulu are displayed.

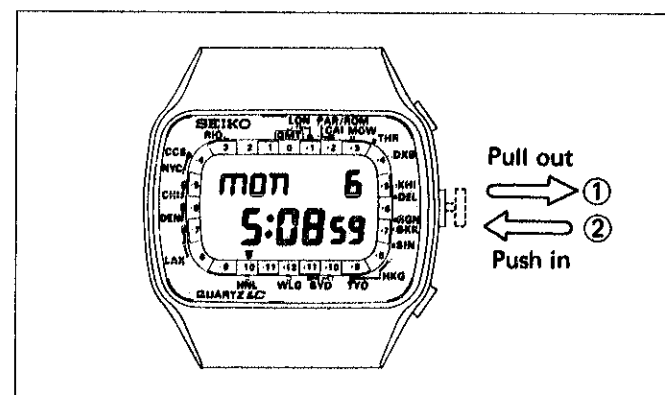
With Honolulu time displayed, depress button "C", and the New York time is displayed as the home time.

With the New York time displayed, depress button "C", and the Honolulu time is displayed as the world time.



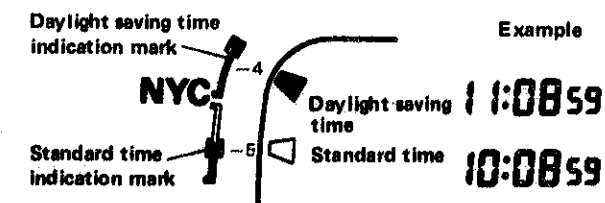
- When it is desired to make other time zones the home time.

(Example: Make Honolulu time the home time.) With the Honolulu time being displayed in the world time function, pull out button "C" and then depress it back to the normal position. The Honolulu time is changed into the home time. Then, the New York time that has been the home time, is automatically changed into the world time.



- How to read daylight saving time (summer time)

(Example: New York daylight saving time) Daylight saving time is available instantaneously without adjusting the time display. Depress either button "A" or button "B" to set the time zone mark at the daylight saving time indication mark, which is identified by the color difference as shown in the illustration on the right.



	Daylight saving time	Standard time
①	Blue	Gray
②	Red	Black

Note: The daylight saving and standard time indication marks are identified by two different colors depending upon the model of the watch used. When daylight saving time is used in your time zone, depress button "C" to change the home time function into the world time function. Then depress either button "A" or button "B" to set the time zone mark to the daylight saving time indication mark of your time zone. Pull out button "C" and depress it in to the normal position. Now, your home time is indicated in the daylight saving time.

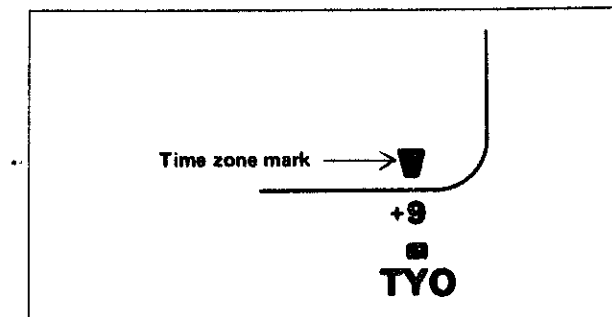
List of time differential among the cities

GMT: Greenwich mean time  
 +: Gain over GMT - : Loss from GMT

Gain/Loss	Name of City (Country or time zone)	City Code (abbreviation of city name)	Daylight saving time (Summer time)	Other cities (for reference)
0 hour	LONDON (United Kingdom/GMT)	LON	Present	Casablanca, Dakar
+1	PARIS (Europe)	PAR	Present	Rome, Berlin, Amsterdam
+2	CAIRO (Egypt)	CAI		Athens, Istanbul, Cape Town
+3	MOSCOW (USSR Zone II)	MOW		Kiev, Nairobi, Mecca
+3½	TEHERAN (Iran)	THR		
+4	DUBAI (United Arab Emirates)	DXB		
+4½				Kabul (Afghanistan)
+5	KARACHI (Pakistan)	KHI		
+5½	DELHI (India)	DEL		Calcutta, Bombay
+6				Dacca (Bangladesh), Tashkent
+6½	RANGOON (Burma)	RGN		
+7	BANGKOK (Thailand)	BKK		Phnom-penh, Djakarta
+7½	SINGAPORE (Singapore)	SIN		Kuala Lumpur
+8	HONGKONG (Hong Kong)	HKG	Present	Peking, Manila
+9	TOKYO (Japan)	TYO		Seoul, Pyongyang
+10	SYDNEY (Australia—New South Wales)	SYD	Present	Guam, Khabarovsk
+11				Nouméa (New Caledonia), Solomon Islands
+12	WELLINGTON (New Zealand)	WLG		Fiji Islands
-11				Samoa, Phoenix Islands
-10	HONOLULU (Hawaiian Islands)	HNL		Anchorage
-9				Dawson (Canada)
-8	LOS ANGELES (USA—Pacific Time)	LAX	Present	San Francisco, Vancouver
-7	DENVER (USA—Mountain Time)	DEN	Present	Edmonton (Canada)
-6	CHICAGO (USA—Central Time)	CHI	Present	Houston, Mexico
-5	NEW YORK (USA—Eastern Time)	NYC	Present	Washington, Montreal
-4	CARACAS (Venezuela)	CCS		Santiago (Chile)
-3	RIO DE JANEIRO (Brazil)	RIO		Buenos Aires
-2				Cape verde Islands
-1				Azores Islands

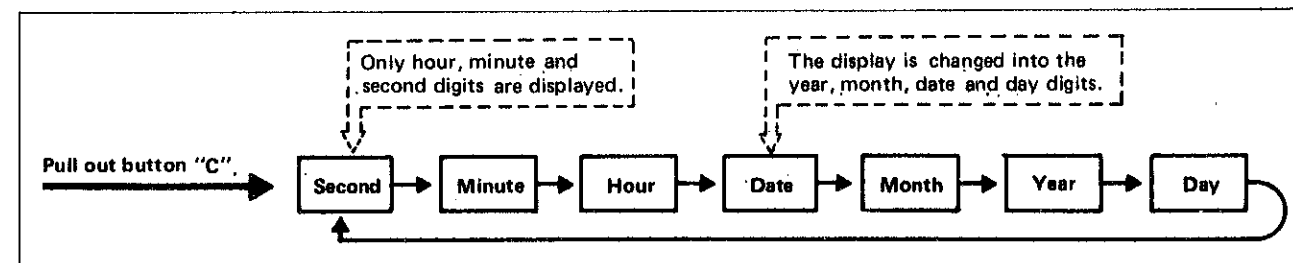
3. How to set the time and calendar

- Be sure to set the time zone mark at the required time zone before setting the time. If the time zone mark is not set the required time zone, depress button "C" to change the home time function into the world time function and depress either button "A" or button "B" to set the time zone mark at the required time zone.



- Pull out button "C" to prepare the time and calendar digits for adjusting.
- Each depression of button "B" selects 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 home time function by depressing button "C" to the normal position.

Remarks: The month and year digits are not displayed usually. They are displayed only in the calendar setting function so that the date digits can be correctly indicated in the even and the odd months.

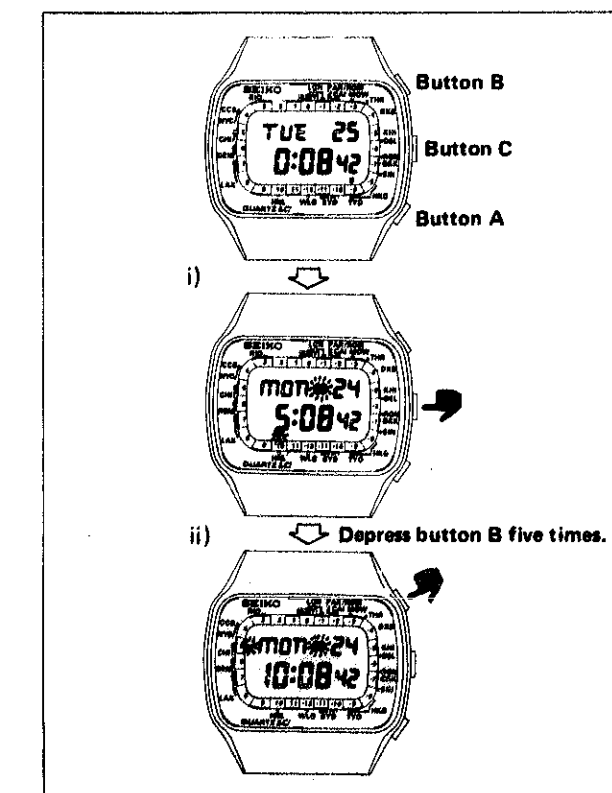


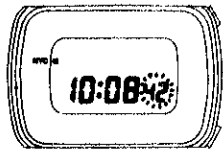
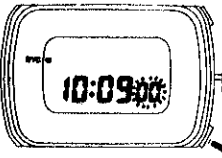






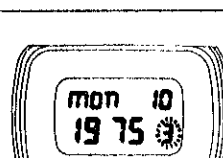
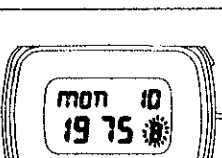
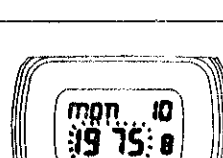
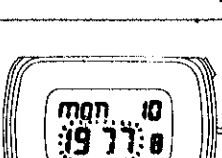
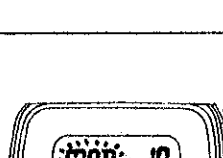

(Example)  
 How to change the indication (the time zone mark set at Tokyo) of 00:08:42 AM of March 25 (Tuesday), 1975 into 07:00:00 AM of August 10 (Wednesday), 1977, New York time. (When the world time is set at Honolulu time.)

Refer to the illustration on the right.

- Depress button "C" to change the home time function into the world time function.
- As the world time is set at the Honolulu time, depress button "B" five times to set the time zone mark at the New York time position.

Set the time and calendar digits according to the procedures shown on the following page.



	Select (Select the digits to be adjusted.)	Set (Set the desired digits.)
<b>Digits and mark to be adjusted (Adjust in numerical order.)</b>	Each depression of button "B" selects the digits (flashing) to be adjusted in numerical order.	One digit is advanced by each depression of button "A". (The second digits are reset to "00" by simply depressing button "A".)
① Second	<p>The digital display is changed into hour, minute and second digits.</p>  <p>Pull out button "C".</p>	<p>Depress button "A" in accordance with "00" second of a time signal and the seconds are then reset to "00" and start immediately.</p> <p>(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".)</p> 
② Minute	 <p>Depress button "B" after setting the second digits, and the minute digits start flashing.</p>	 <p>Depress button "A" to set the minute digits.</p>
③ Hour		
④ Date	 <p>The digital display is changed into year, month, date and day digits, and the date digits start flashing.</p>	
⑤ Month		
⑥ Year		 <p>After "2009" is displayed, the year digits will return to "1970".</p>
⑦ Day		 <p>After all the adjustments are completed, depress button "C".</p> <p>Remarks: If button "B" is depressed while the day indicator is flashing, the second digits start flashing again indicating that they are ready to be adjusted.</p>

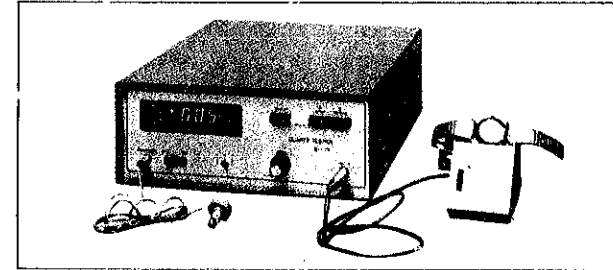
### III. DISASSEMBLING AND REASSEMBLING

#### 1. After-sale servicing instruments and materials

For after-sale servicing of SEIKO Quartz Digital Cal. M158A, the following instruments and materials are necessary.

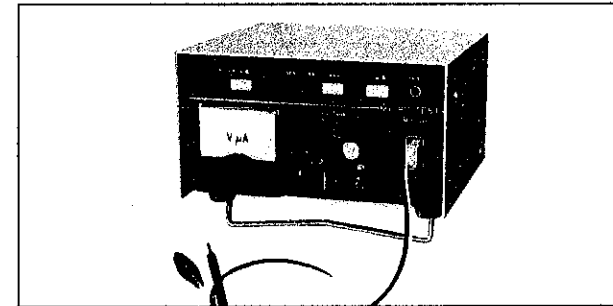
##### (1) Quartz Tester

Used to check time accuracy (daily rate).



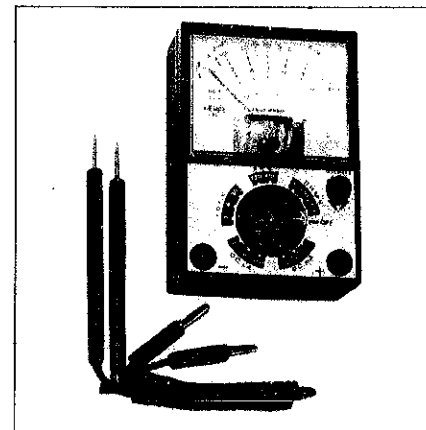
##### (2) Microtest MT-10II

Used to check current consumption and to flow voltage power constantly.



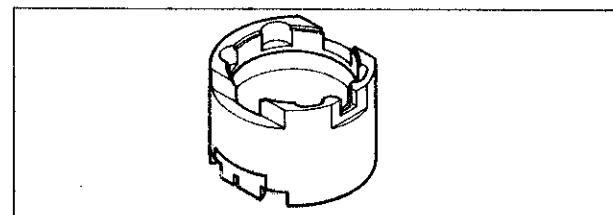
##### (3) Volt-ohm-meter (S-831)

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



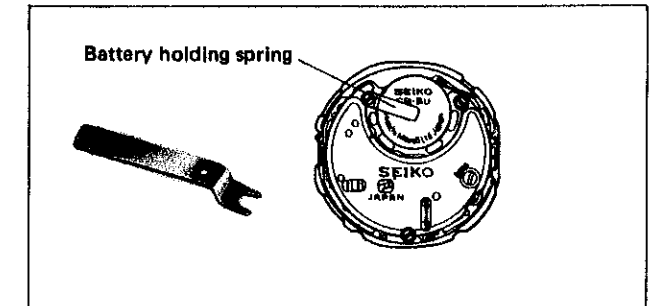
##### (4) Movement holder (S-644)

Used for disassembling and reassembling of the movement.  
Can be used also for Cal. 0139, A031, M154 and M159.



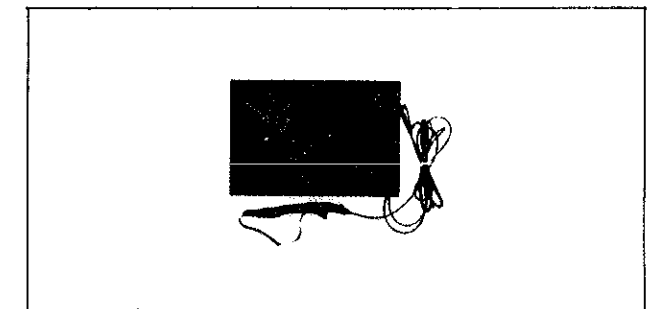
##### (5) Battery holding spring (S-815)

Used for securing battery and flowing current when the movement is removed from the case.  
Can be used also for 0439, M158 and M159.



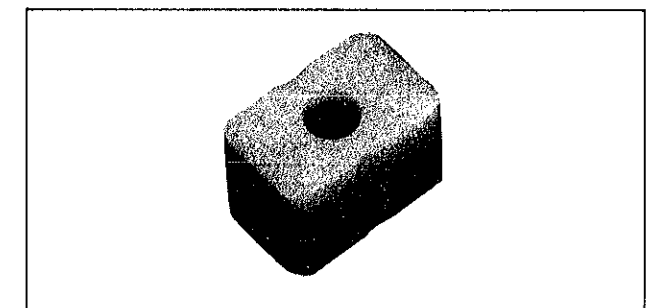
##### (6) Static electricity protector (S-830)

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



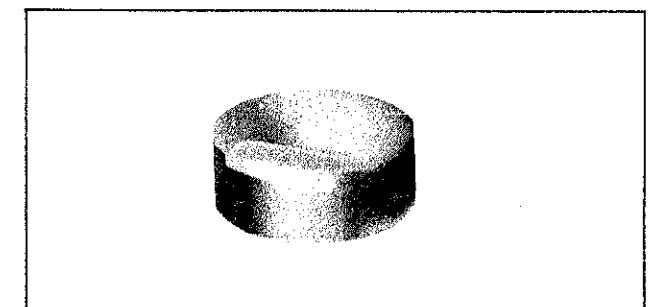
##### (7) Inserting disk (S-161)

Used to remove the glass.



##### (8) Plastic supporting disk (S-173)

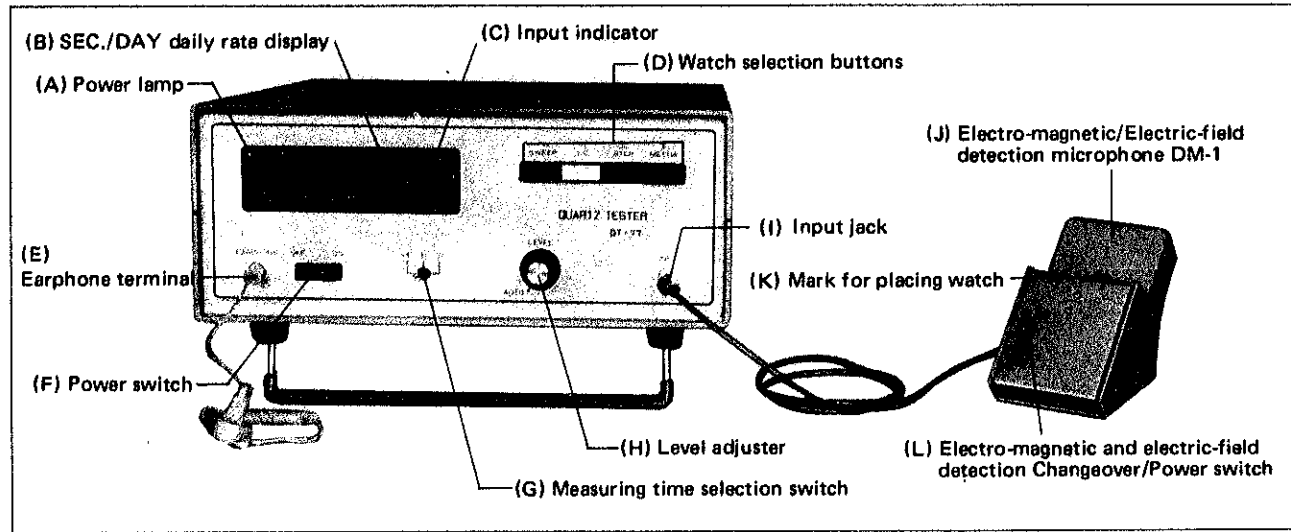
Used to reassemble the glass.





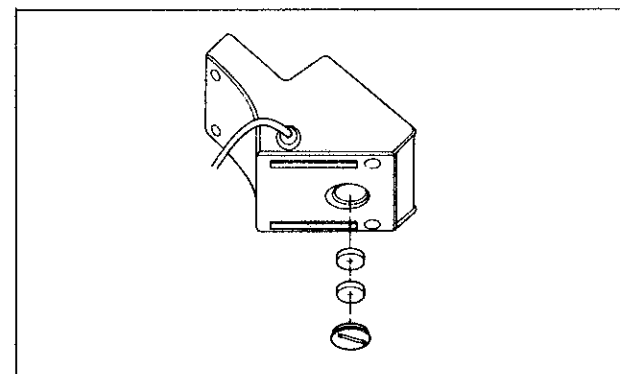
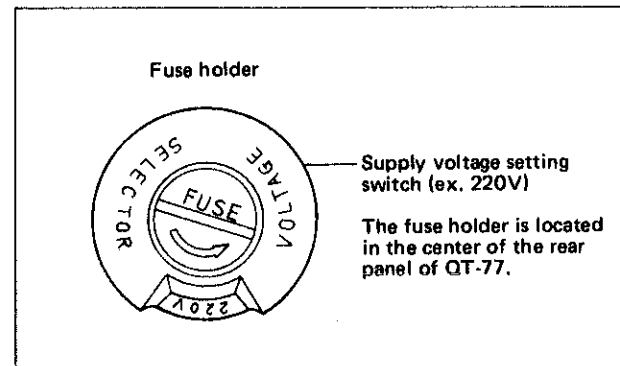
## HOW TO USE QUARTZ TESTER QT-77

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

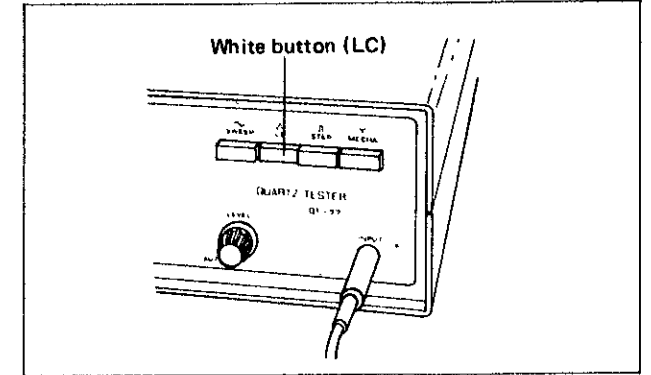
- Make sure that the voltage indicated by the supply voltage setting switch is the same as the voltage rating of your household power supply. If it isn't, turn the fuse holder counterclockwise (arrow-marked direction) and remove the fuse. Pull out the supply voltage setting switch and adjust it to the 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.



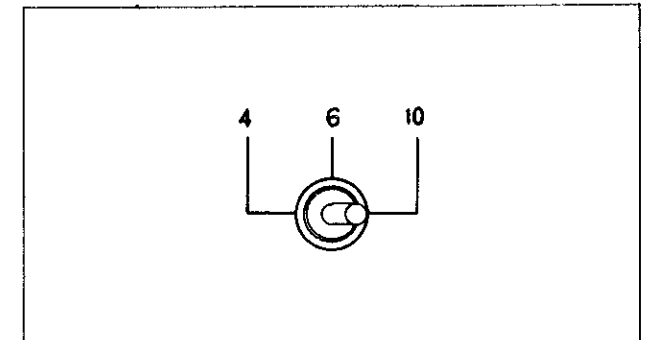
### Measurement of time accuracy (daily rate)

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.

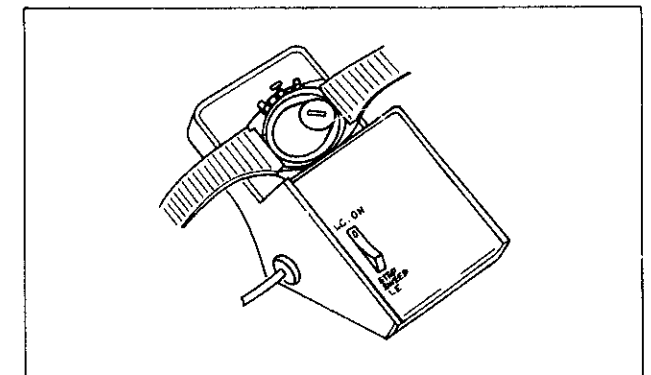


5. Set the measuring time selection switch (G) at "4 sec.", "6 sec." or "10 sec."  
The daily rate can be measured at any position 4 sec., 6 sec. or 10 sec.  
It is generally accepted, however, that the longer the measuring time is the more accurate will be the measurement.



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.



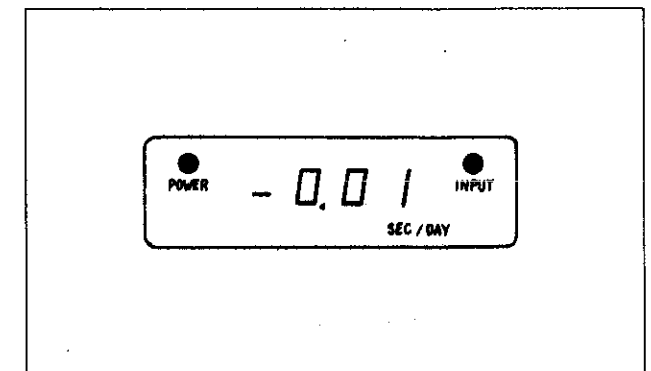
Put on the earphone, and move the watch on the microphone in various ways, for example by changing its position and angle, and the volume will change. Determine the watch position and direction where the earphone sound becomes loudest. At this time, the input indicator (C) will remain lit.

**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.

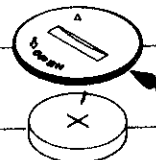


## 2. Disassembling and reassembling of the case

Lubricating  : Silicon grease 500,000 c.s.,  
Normal quantity (Lubricate gaskets)

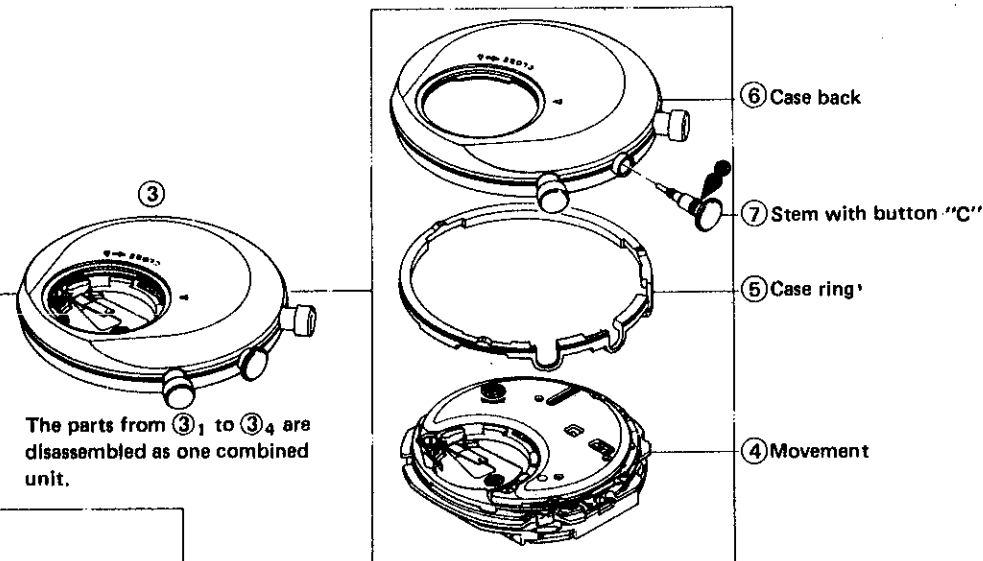
### Disassembling procedures

- ①
- ②



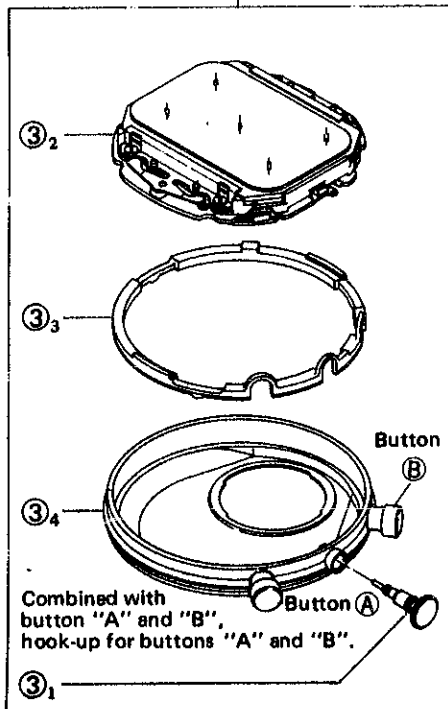
### Reassembling procedures

- ⑨ Battery hatch
- ⑧ Battery

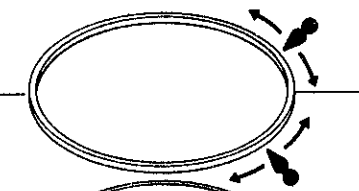


Turn the combined unit upside down for disassembling.

The parts from ③<sub>1</sub> to ③<sub>4</sub> are disassembled as one combined unit.

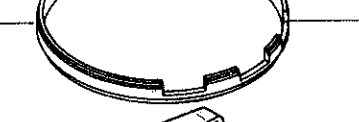


- ⑤
- ④



- ③ Case back gasket
- ② Holding ring for gasket

- ④
- ③



- ① Caseband  
(With glass, plastic gasket and panel cover.)
- ⑥

Combined with button "A" and "B", hook-up for buttons "A" and "B".



Buttons A and B  
(It is not necessary to disassemble them under normal disassembling procedure. But when they are disassembled, be sure to lubricate.)

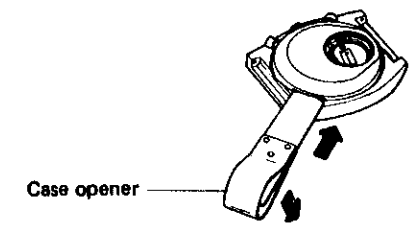
Be sure to reassemble in the above order. If they are reassembled in reverse order, it might be difficult to reassemble or the gaskets may be twisted.

### Remarks for disassembling

- ③ Disassemble the case back with the case opener and the parts from ③<sub>1</sub> to ③<sub>4</sub> are disassembled as one combined unit.

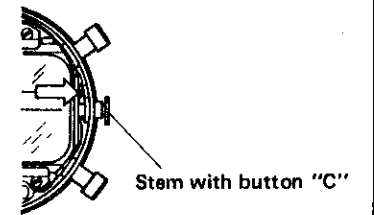
### Remarks:

Be sure to put a vinyl sheet on the tip of the case opener before inserting it into the opening notch not to scratch the caseband and the case back.



- ③<sub>1</sub> Stem with button "C"

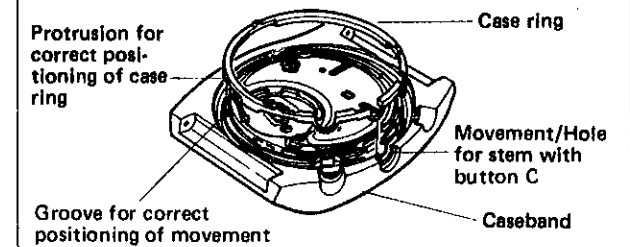
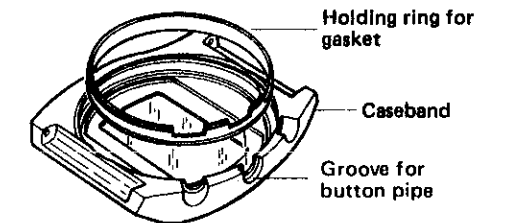
While pushing the arrow-marked portion with tweezers, pull out stem with button.



### Remarks for reassembling

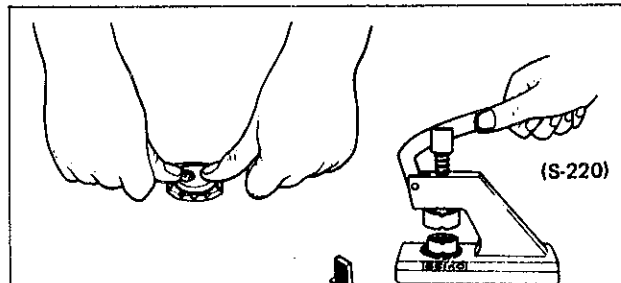
- ② Holding ring for gasket
- ④ Movement
- ⑤ Case ring

Reassemble the above three parts as shown in the illustration on the right. Make sure that they are reassembled in the correct position and direction.



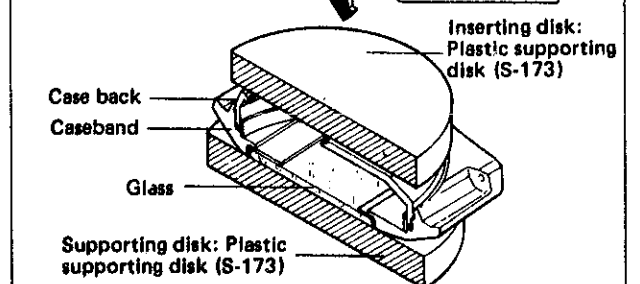
- ⑥ Case back

- (i) Mount the case back evenly on the caseband making sure that stem with button is fixed into the groove.
- (ii) Push the case back hard with fingers so that the case back is snapped closed to the caseband firmly as shown in the illustration. If it is not snapped closed with fingers, use SEIKO tightening tool (S-220).



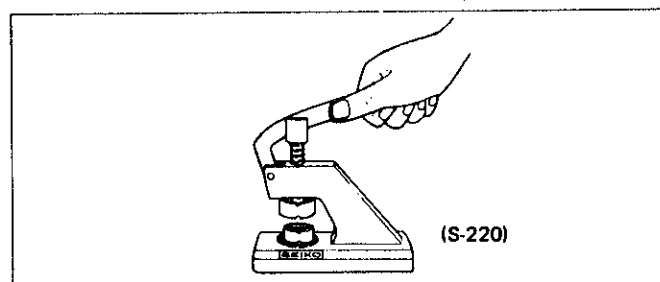
- ⑦ Stem with button "C"

After reassembling, check to see if stem with button "C" is pulled out and depressed in correctly.



## How to replace the glass

[As the glass is combined with the caseband, disassemble it only when the replacement of parts is necessary. Use the tightening tool S-220.]

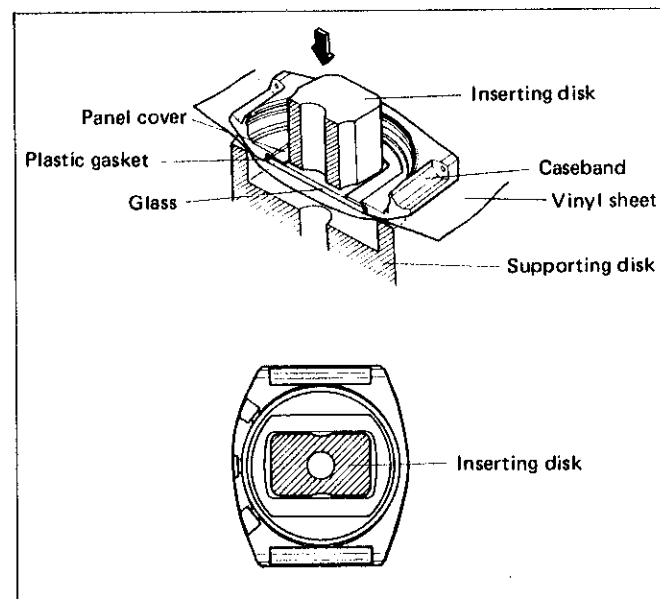


### How to disassemble the glass

Use the S-161 Disk to disassemble the glass. (If it is not available, use the  $\phi 18.5 - 21.5$  mm disk in the S-160 disk unit.)

**Supporting disk:  $\phi 38.0$  mm**

- Place a vinyl sheet between the supporting disk and the glass as shown in the illustration. When the S-161 is used, push the glass and remove it. When one of the disks in S-160 unit is used, push the glass and panel cover together and remove the glass.
- Push down the handle of the tightening tool S-220 slowly so that the panel cover is not bent.



### How to reassemble the glass

#### i) Fix the plastic gasket

- Be sure to replace it with a new plastic gasket so as to maintain high water resistance.
- Do not mistake the upper side of the plastic gasket for the lower side.

#### ii) Fix the panel cover

- Be sure to fix the back side of the panel cover firmly to the caseband.

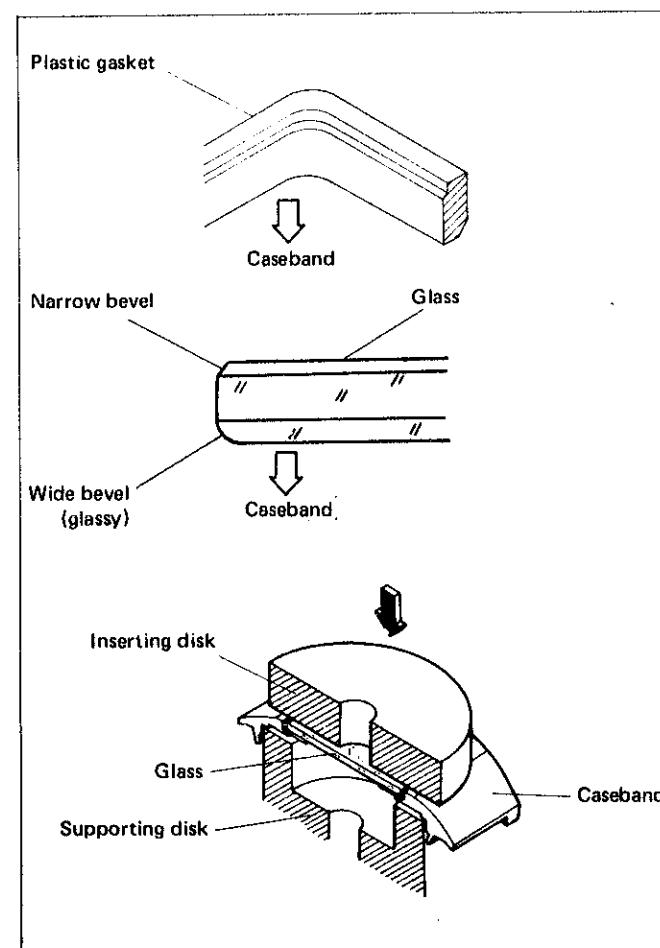
#### iii) Set the glass

Do not mistake the upper side of the glass for the lower side.

#### iv) Push the glass

Inserting disk: plastic supporting disk (S-173)

**Supporting disk:  $\phi 26.0 \sim 26.5$  mm**



## 3. Disassembling and reassembling of the movement and lubricating of the switch components

Disassembling procedures Figs.: ① ~ ②⑤

Reassembling procedures Figs.: ②⑤ ~ ①

Lubricating: SEIKO Watch Oil, S-6

Normal quantity  $\infty$

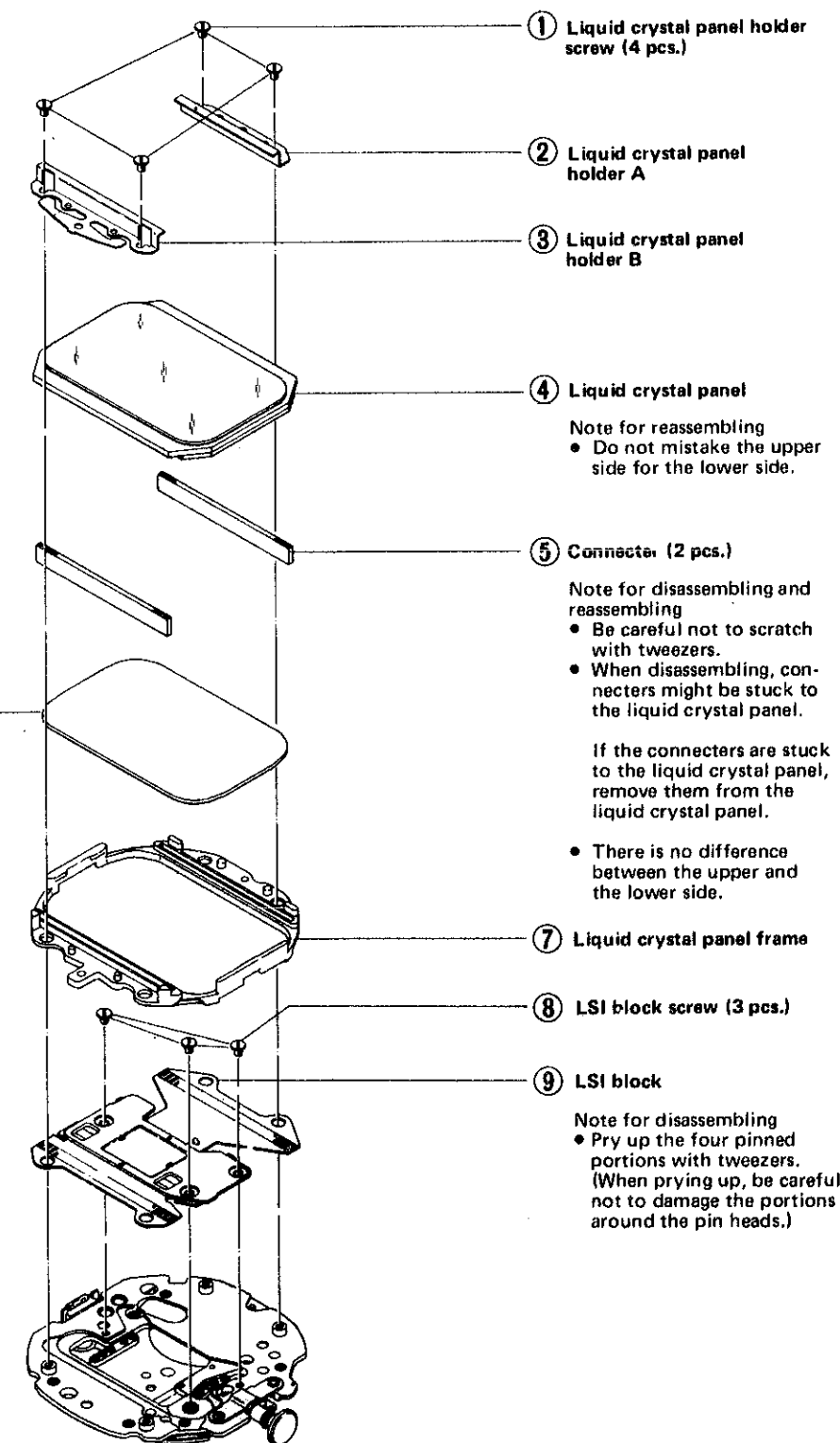
**Note:**  
After reassembling, hold the battery with the battery holding spring and check the display. If there are any display malfunctions, move the connector slightly to the right or left as they may be out of the position.

All the screws used are the same.

### Reflecting mirror ⑥

**Note for disassembling and reassembling**

- Be careful not to scratch the surface.
- Reassemble with the black coated side down.



**Note for reassembling**

- Do not mistake the upper side for the lower side.

**Note for disassembling and reassembling**

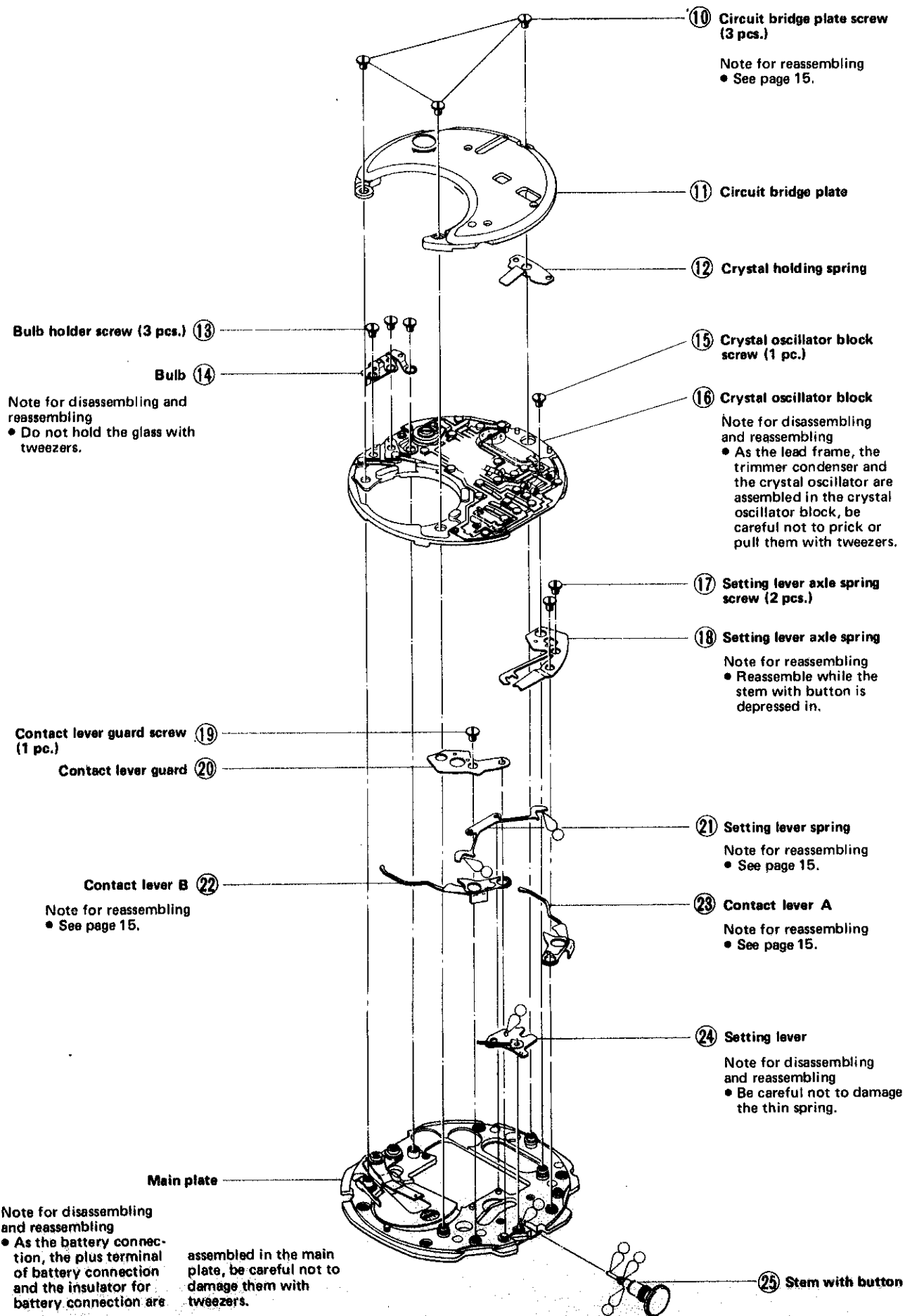
- Be careful not to scratch with tweezers.
- When disassembling, connectors might be stuck to the liquid crystal panel.

If the connectors are stuck to the liquid crystal panel, remove them from the liquid crystal panel.

There is no difference between the upper and the lower side.

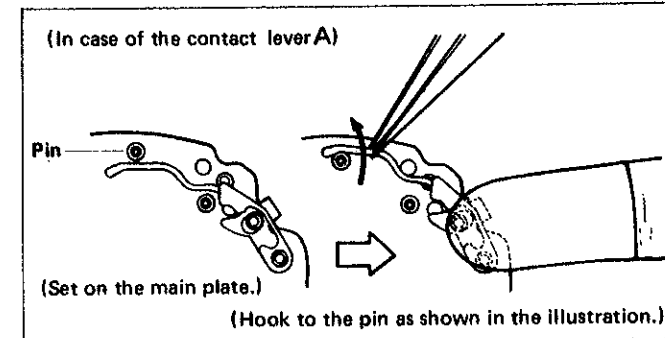
**Note for disassembling**

- Pry up the four pinned portions with tweezers. (When prying up, be careful not to damage the portions around the pin heads.)



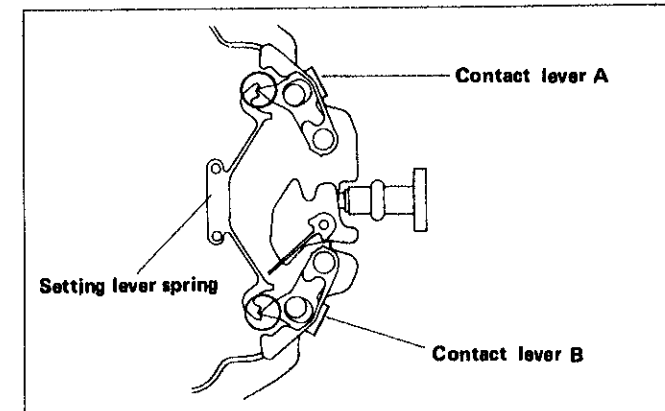
Remarks for reassembling

- { **22 Contact lever B**
- { **23 Contact lever A**



**21 Setting lever spring**

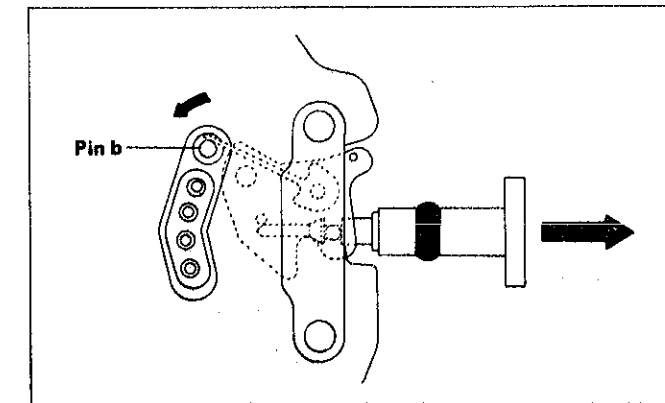
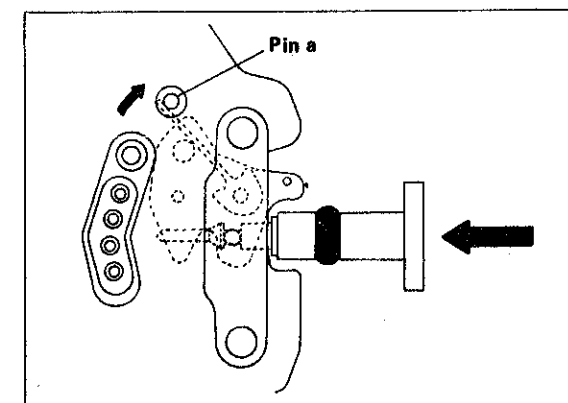
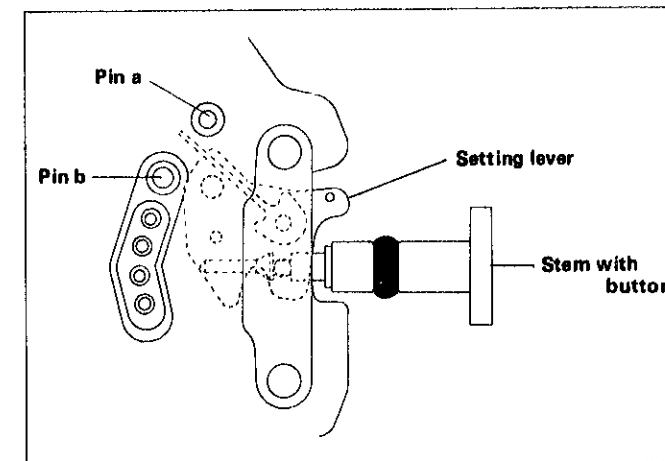
Set the setting lever spring making sure that the portions marked with circles do not overlap the contact point levers A and B.



**10 Circuit bridge plate screw**

After reassembling up to the circuit bridge plate screws by following the procedures on page 14 check in the following order.

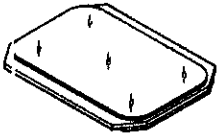

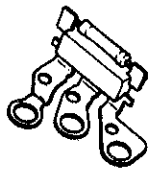
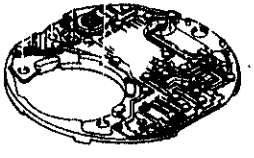
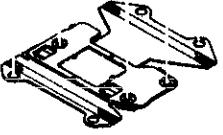

- i) The stem with button is in the normal position.  
The thin spring of the setting lever touches neither pin (a) nor pin (b).
- ii) The stem with button is in the pushed in position. (When released, the stem with button springs back to the normal position.)  
The thin spring of the setting lever touches pin (a) and it does not touch pin (a) when the stem with button is released.  
This enables the watch function to be changed to and from the home time function and the world time function.
- iii) The stem with button is in the pulled out position.  
The thin spring of the setting lever touches pin (b), and this makes the time and calendar display ready to be adjusted.



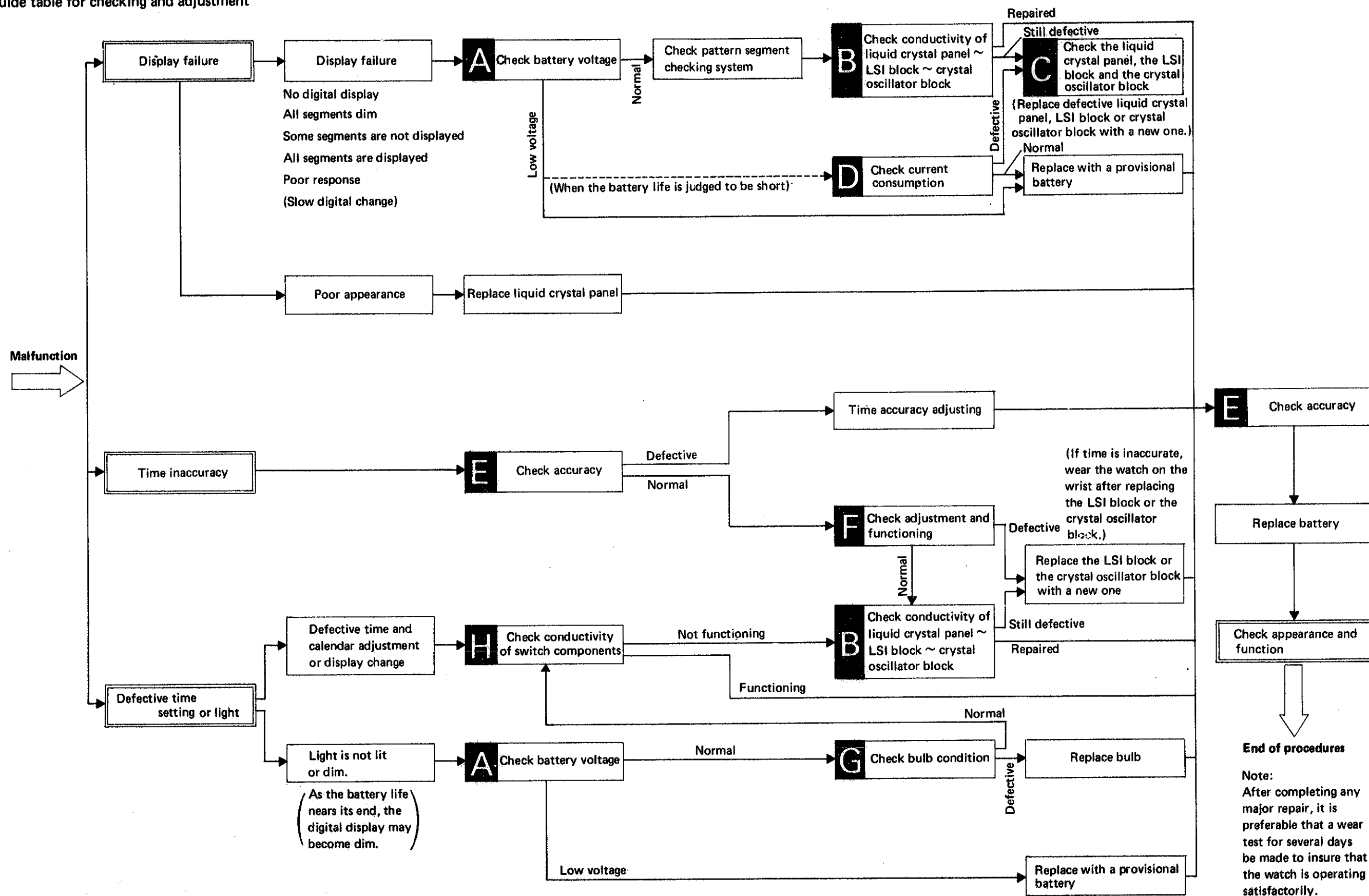
#### 4. Cleaning

Since several parts of Cal. M158A differ from the conventional mechanical watches, use the following method when cleaning.

##### HOW TO CLEAN




Name of part	Cleaning	Drying	Solution	Remarks
<b>Liquid crystal panel</b> 	DO NOT CLEAN			Wipe dust and lint off with a soft brush.  Wipe the electrodes of the liquid crystal panel and the LSI block ONLY with a cloth moistened with benzine or alcohol.
<b>Reflecting mirror</b> 				
<b>Bulb</b> 				
<b>Crystal oscillator block</b> 				
<b>LSI block</b> 				
<b>Connector</b> 	Rinse or wash with a soft brush	Cool air	Alcohol	Do not use benzine or trichloroethylene. Be sure to thoroughly dry before reassembling.
<b>Main plate</b> <b>Liquid crystal panel frame</b>	Rinse or wash with a soft brush	Cool air	Benzine or alcohol	
<b>Circuit bridge plate</b>			Alcohol	
<b>Other parts</b>	Clean with cleaner, rinse or wash with a soft brush.	Cool or hot air	Trichloroethylene, benzine or alcohol.	

1. Guide table for checking and adjustment



2. Malfunction and checking points

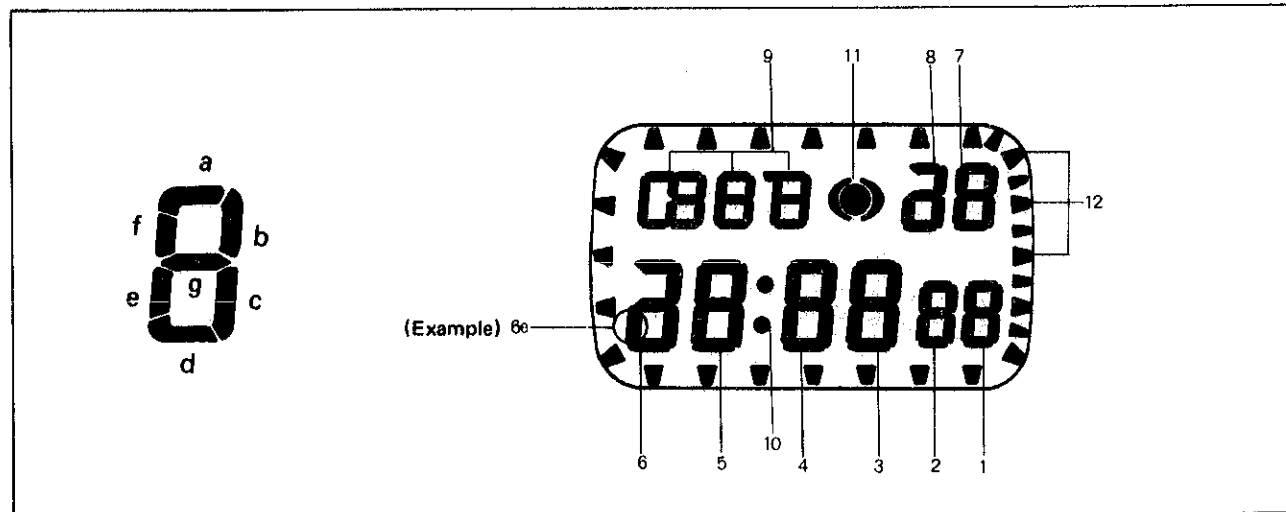
- Check in the numerical order.
- Refer to "Guide table for checking and adjustment" on page 17.

FAULTY SYMPTOMS		CHECKING POINTS								
		A		B	C			F	G	H
		Battery voltage	Lighting of all segments	Conductivity of liquid crystal panel, LSI block and crystal oscillator block	Liquid crystal panel	LSI block, crystal oscillator block	Time accuracy adjusting	Adjustment and functioning	Bulb	Switch components
DISPLAY FAILURE	No digital display, dim digital display or extremely slow response.	①		②	③	④				
	All segments are lighted.			①	②	③				
	<ul style="list-style-type: none"> <li>• Some segments of the digital figures are not lighted.</li> </ul> 		①	②	③	④				
	<p>(Deflection) Some or all of one segment show different contact depending on the direction of view.</p> <p>(Poor appearance) Some portions of the liquid crystal panel will have air bubbles or iridescent view.</p> <p>Example: </p> <p>Example: </p>					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.			②		③		①		
DEFECTIVE TIME AND CALENDAR SETTING OR LIGHT	Defective time and calendar adjustment or display change.			②		③				①
	Light is not lit or light is lit but dims soon.	①		④		⑤			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 a d adjustment.

• **Designation of segment**

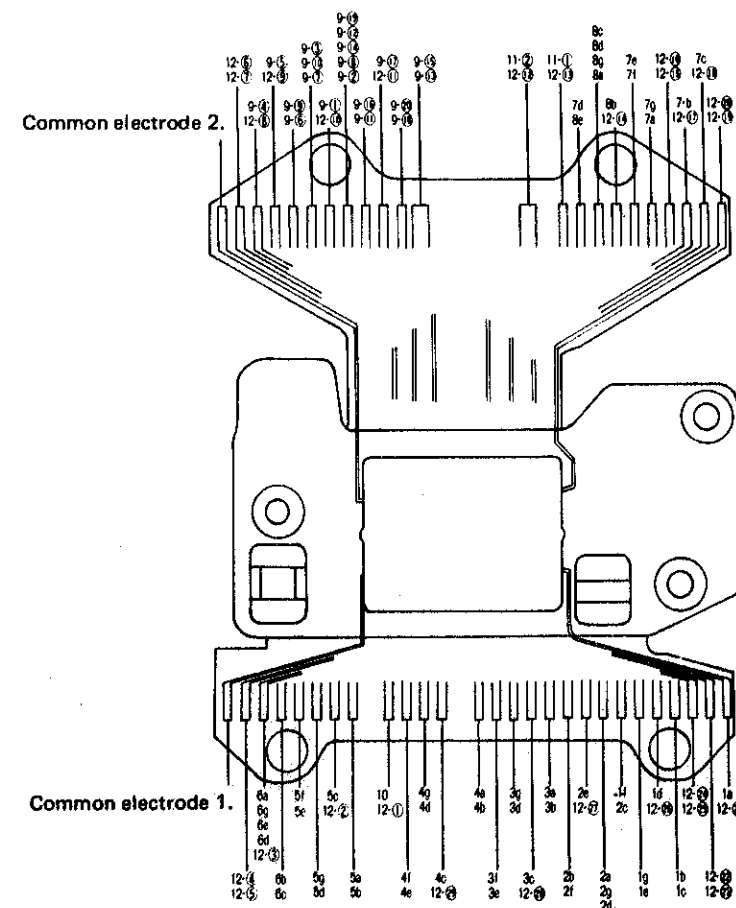
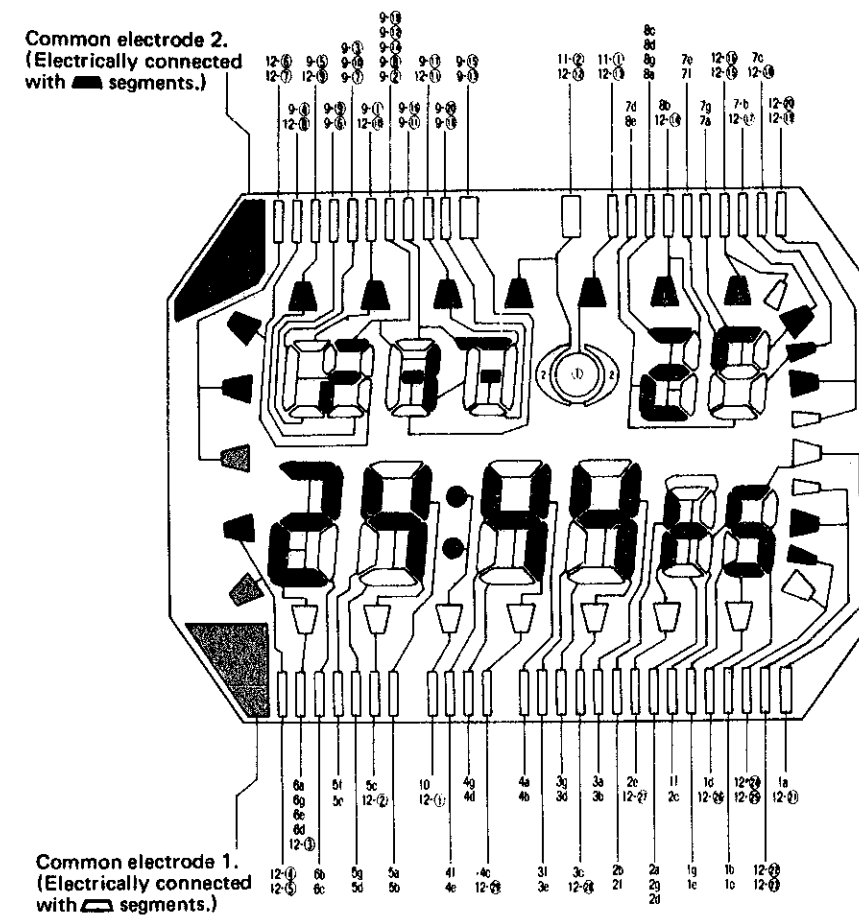


• **Relationship between the segment and the C-MOS-LSI output terminal**

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 on the right.

(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.


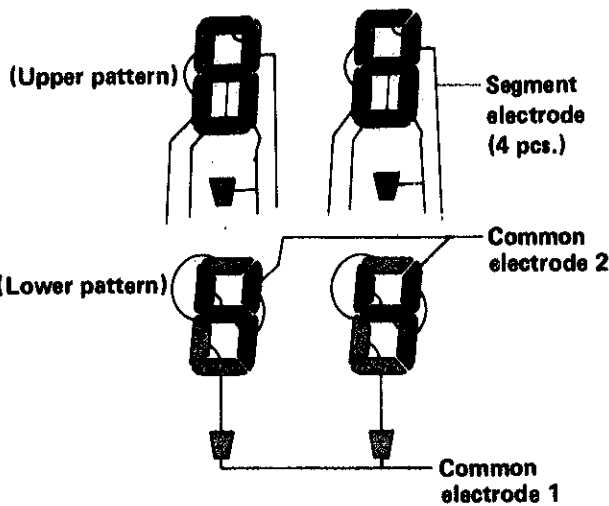
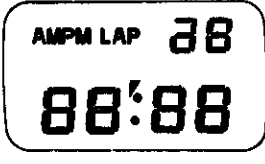
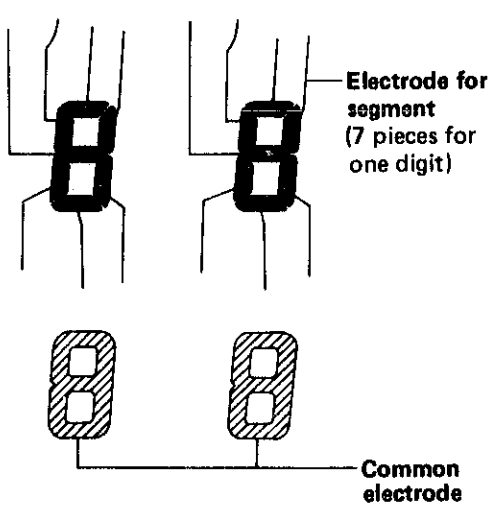
The liquid crystal panel of Cal. M158A has a pair of common electrodes. (Refer to the explanation on the next page.) As the checking procedures for this liquid crystal panel are different from the existing ones, follow the checking procedures on page 23.



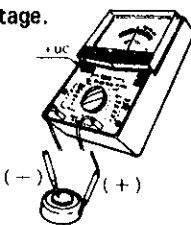
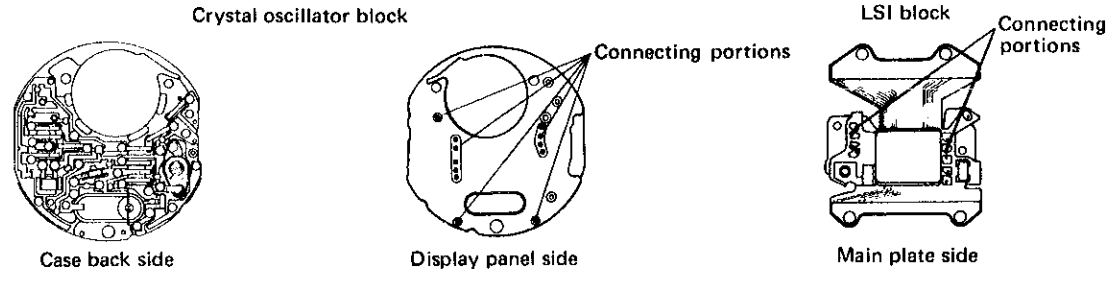
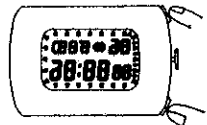


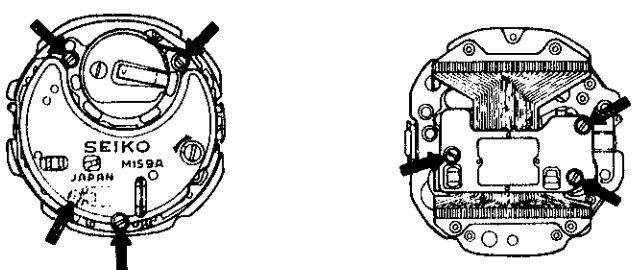
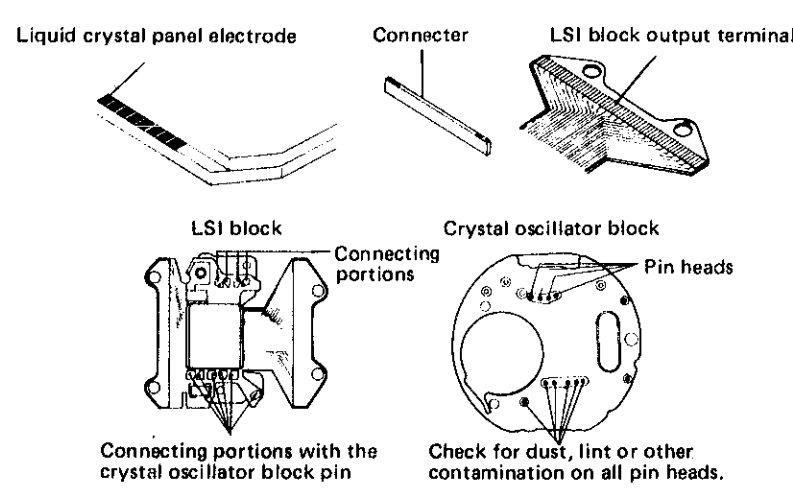
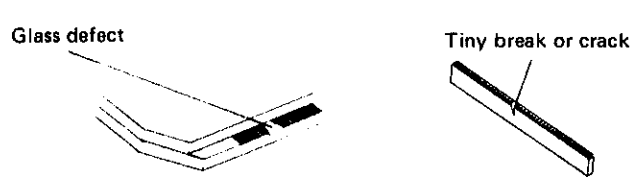
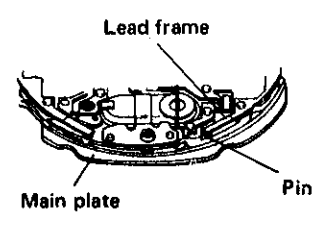
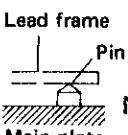
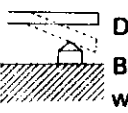
#### 4. Multiplex drive

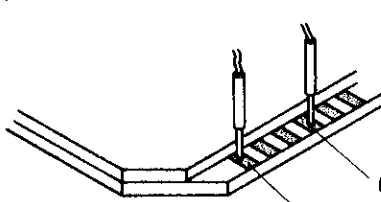
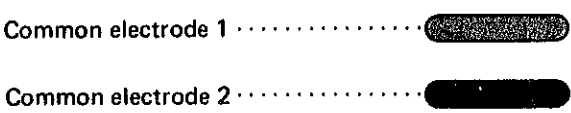


Cal. M158A employs the multiplex driving system which is new instead of the direct driving system. In the direct driving system, there is a single common electrode and a single segment is electrically connected with one segment electrode. In the multiplex driving system which Cal. M158A has adopted, the number of the common electrode is increased to two, thereby enabling some segments to be electrically connected with one segment electrode. In the multiplex driving system, more than twice number of segments can be displayed by almost the same number of segment electrodes used in the direct driving system. Thus the multiplex driving system is most useful for displaying a large number of segments.

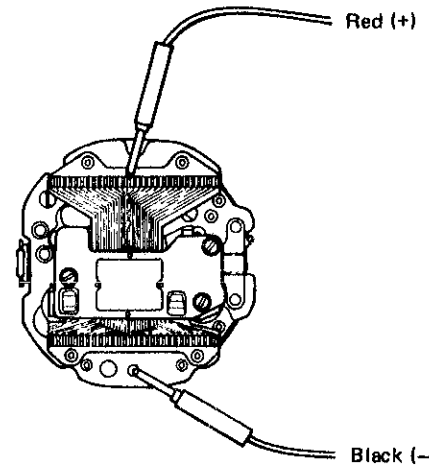
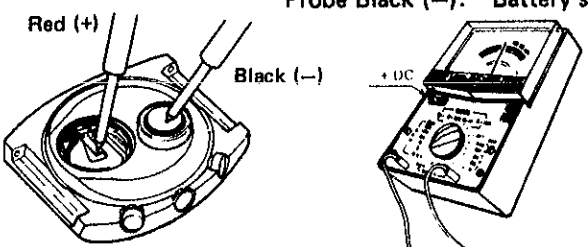
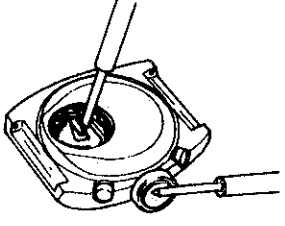
Multiplex driving system (Ex.: M158A)	Direct driving system (Ex.: 0634)
 <p>Number of all segments: 96</p> <p>Number of terminals (The number of patterns on both sides of the liquid crystal panel)</p> <p>For segment: 48</p> <p>For common electrode: 2</p> <p>Total: 50</p> 	 <p>Number of all segments: 44</p> <p>Number of terminals</p> <p>For segment: 44</p> <p>For common electrode: 1</p> <p>Total: 45</p> 

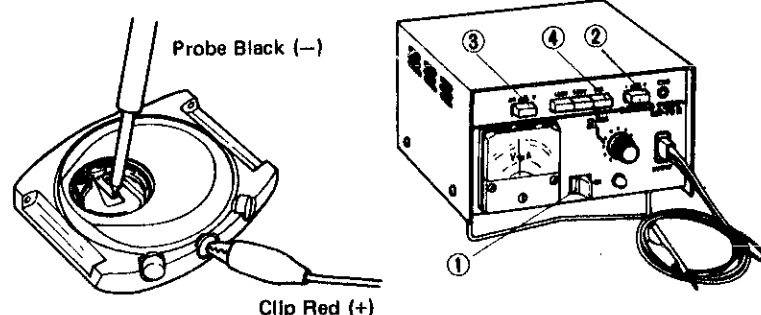
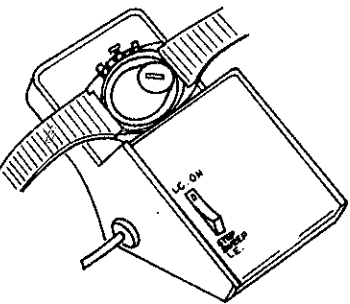
#### 5. Procedures for checking and adjustment

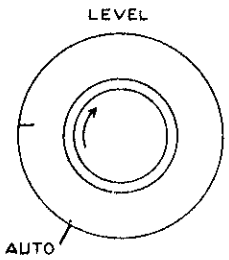
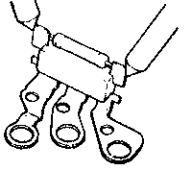
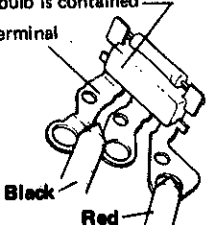
	Procedure	Result and repair
CHECK BATTERY VOLTAGE	<p><b>A</b> Use the following procedures to check battery voltage.</p> <ol style="list-style-type: none"> <li><b>Set up the volt-ohm-meter</b> Range to be used: DC 3V</li> <li><b>Measuring</b> Probe red (+): Battery surface (+) Probe Black (-): Battery surface (-)</li> </ol>  <p>When there is battery electrolyte leakage, refer to "HOW TO CHECK BATTERY ELECTROLYTE LEAKAGE AND REPAIR" below for repairing.</p>	<p>More than 1.5V: Normal Less than 1.5V: Defective</p>
HOW TO CHECK BATTERY ELECTROLYTE LEAKAGE AND REPAIR	<ol style="list-style-type: none"> <li>Remove the movement from the case</li> <li>Disassemble the movement</li> <li>Wipe off battery electrolyte on the crystal oscillator block and the LSI block           <ol style="list-style-type: none"> <li>Wipe off battery electrolyte on the lead frame, each connecting portion, etc. with a cloth moistened with distilled water. (Do not use such fluffy cloth as gauze, flannel, etc.) When the crystal oscillator block and the LSI block are cleaned, be sure to clean the shaded portions shown below and the connecting portions.</li> </ol> <p><b>Note:</b> 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.</p>  <ol style="list-style-type: none"> <li>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.)</li> <li>Dry with cool air by using a dryer.</li> </ol> </li> <li>Wipe off battery electrolyte on the other parts (main plate, switch components, etc.).           <ol style="list-style-type: none"> <li>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.)</li> <li>Rinse with alcohol.</li> <li>Dry with cool air by using a dryer.</li> </ol> </li> <li>Reassemble the movement Replace the battery with a new one.</li> <li>Check if the time setting functions and the current consumption are normal.</li> </ol>	
CHECK PATTERN SEGMENT CHECKING SYSTEM	<p>If some segments are dead or dim, change the watch function into the time and calendar setting function. Then depress buttons A and B at the same time to find the defective segments while referring to the basic pattern shown on page 19. (If there is no defective segment, all segments will be displayed.)</p> 	<p>One segment is not displayed: Defective Proceed to Replace liquid crystal panel. The segment other than above is not displayed. Proceed to 13</p>

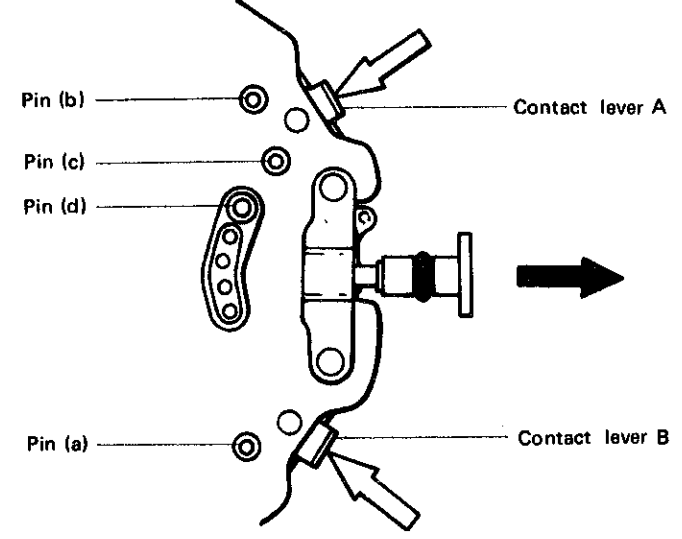
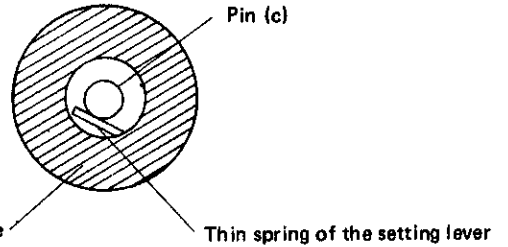
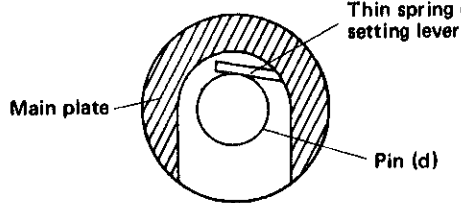
	Procedure	Result and repair
<b>B</b>	<p>(1) Make sure that the crystal oscillator block screw, circuit bridge plate screws and LSI block screws are tightened firmly.</p> <p>① Crystal oscillator block screw ② LSI block screws (3 pcs.) (1 pc.) and circuit bridge plate screws (3 pcs.)</p>  <p>(2) Check for dust, lint or other contamination on the conductive portions shown in the illustration below.</p>  <p>(3) Check the liquid crystal panel electrode for any glass defect and the connector for any tiny break.</p>  <p>(4) Remove the circuit bridge plate and check the connection of the lead frame of the crystal oscillator block with the pins by using a microscope.</p> 	<p>No loosened screw: Normal Proceed to <b>B</b>(2) Loosened screw: Defective Retighten screws.</p> <p>Uncontaminated: Normal Proceed to <b>B</b>(3) Contaminated: Defective Wipe off any foreign matter.</p> <p>No glass defects, break or crack: Normal Proceed to <b>B</b>(4) Glass defects, break or crack: Defective Replace with new one.</p>  <p>Normal</p>  <p>Defective: Bend the lead frame with tweezers so that it touches the pin.</p>

	Procedure	Result and repair
<b>C</b>	<p>Check to see if the liquid crystal panel, the LSI block and the crystal oscillator block function correctly.</p> <p>(1) Check the liquid crystal panel</p> <p>① Set up the volt-ohm-meter Range to be used: OHMS R x 1 ~ R x 1k</p> <div style="border: 1px solid black; padding: 5px;"> <p>Note: Any range will do if more than 3V is applied to the terminal of the volt-ohm-meter. If, however, the output voltage of the volt-ohm-meter is less than 3V, no segment may be displayed. When no segment is displayed, change the range to R x 10k which is higher in resistance than R x 1k.</p> </div> <p>② Remove the liquid crystal panel from the movement and turn it upside down.</p> <p>③ Measuring</p>  <p>Electrode of defective segment</p> <p>Common electrode (Either red or black probe must be applied to the common electrode.) Note: Either red or black probe will do.</p> <p>Note: As shown in the illustration for "Relationship between the segment (Liquid Crystal Panel Electrode) and the C-MOS-LSI output terminal" on page 19, Cal. M158A 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 19, the relationship between the segment and the common electrodes 1 and 2 are;</p>  <p>Common electrode 1 ..... </p> <p>Common electrode 2 ..... </p> <p>Check by referring to the above.</p> <p>(Example of checking) When segments 5d and 5g are not displayed.</p> <ul style="list-style-type: none"> <li>By referring to the illustration on page 19, make sure that the segment 5d is connected with the common electrode 1 and the segment 5g with common electrode 2.</li> <li>Locate the electrodes of the segments 5d and 5g, and turn upside down the liquid crystal panel. Apply the probe of the volt-ohm-meter to the electrodes of the 5d and the 5g and the common electrode 1 to check to see if the 5d is displayed. Then apply the probe to the electrodes of the 5d and 5g and the common electrode 2 to check to see if the 5g is displayed.</li> </ul>	<p>Displayed: Normal Proceed to <b>C</b>(2) Not displayed: Defective Proceed to Replace liquid crystal panel.</p>

	Procedure	Result and repair
<b>C</b> CHECK LIQUID CRYSTAL PANEL, LSI BLOCK AND CRYSTAL OSCILLATOR BLOCK	<p>(2) Check the LSI block and crystal oscillator block output voltage.</p> <ol style="list-style-type: none"> <li>① Set up the volt-ohm-meter. Range to be used: DC 3V</li> <li>② After reassembling the battery and the battery holding spring to the movement, remove all the parts from the liquid crystal panel holder screw ① to the panel frame ⑦ on page 13.</li> <li>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.)</li> </ol>  <p>(3) Replace the LSI block with a new one and check the output voltage once again.</p>	<p>More than 0.8V: Normal (All the terminals must be more than 0.8V.) Return to <b>B</b></p> <p>Less than 0.8V: Defective Either the LSI block or the crystal oscillator block is defective. Proceed to <b>C</b>(3)</p> <p>More than 0.8V: Normal Proceed to <b>E</b></p> <p>Less than 0.8V: Defective Proceed to Replace crystal oscillator block.</p>
<b>D</b> CHECK CURRENT CONSUMPTION	<p>Check to see if the current consumption is normal. Check in the home time function, in the world time function and in the setting function.</p> <p>Measuring</p> <p>(1) Volt-ohm-meter</p> <p>Range to be used: DC 0.03 mA*</p> <p>Probe Red (+): Battery connection Probe Black (-): Battery surface (-)</p>  <p>Note: If it is impossible to measure (Current does not flow from the case to the movement), place the battery surface (+) to the stem with button (or button B) so that it touches, and proceed to measure.</p> <p>Reasons: • Button is conductive to (+). • When the battery surface (+) is touched to button A, the light is lit and the current consumption increases greatly.</p> 	<p>* Note: If the pointer of the volt-ohm-meter swings over the maximum value when DC 0.03 mA 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 again for measuring.</p>

	Procedure	Results and repair
<b>D</b> CHECK CURRENT CONSUMPTION	<p>(2) Micro Test Set up the Micro Test.</p> <ol style="list-style-type: none"> <li>① Power switch: ON</li> <li>② Polarity changeover button: +</li> <li>③ Current consumption/Voltage indication button: <math>\mu A</math></li> <li>④ Voltage selection button: 1.55V</li> </ol> <p>Clip Red (+): Stem with button (or button B) Probe Black (-): Battery connection</p> 	<p>Less than 5.0 <math>\mu A</math>: Normal Proceed to Replace with a provisional battery.</p> <p>More than 5.0 <math>\mu A</math>: Defective Proceed to <b>C</b></p>
<b>E</b> CHECK ACCURACY	<p>Check gain and loss of time. (As Cal.M158 employs the multiplex driving system, the procedure for checking accuracy is slightly different from that for the existing calibers.) Except the two points listed below, the procedure for checking accuracy is exactly the same as that mentioned in the instruction manual of the Quartz Tester for the digital watches.</p> <ol style="list-style-type: none"> <li>1. With the watch function changed into the calendar setting function by pulling out the stem with button and depressing button "B" (Date, month, year or day digit is flashing for adjustment.), place the watch on the microphone.</li> </ol> <p>Reason: If the second digit is displayed, which is changed every second, it is difficult to measure the daily rate as the watch employs the multiplex drive system. Be sure not to make the second digit displaying when measuring the daily rate.</p>  <p>(When the QT-10 is used, place the watch on the electric-field detection microphone in the same way that is mentioned above.)</p>	

	Procedure	Results and repair
CHECK ACCURACY	<p>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. (Be careful not to turn the level adjuster excessively.)</p>  <p>Remarks: When measuring the daily rate by the oscillation detection microphone for QT-100 or the timing microphone US-32, it is not necessary to change the watch function into the calendar setting function. Follow the procedures for measuring the daily rate by using these microphones.</p>	<p>Normal: According to the checking procedures of "Guide table for checking and adjustment" on page 17, proceed to the next checking items of the guide table.</p> <p>Defective: Proceed to Time accuracy adjusting Time accuracy is adjusted by turning the trimmer condenser. Refer to page 28.</p>
CHECK ADJUSTMENT AND FUNCTIONING	<p>(1) Check adjustment Check to see if the digit adjustment can be made correctly by the button operation by following the procedures on page 6. Check adjustment by changing all digits and indications cyclically.</p> <p>(2) Check functioning Check to see if the time zone mark moves correctly by the button operation in the world time function.</p>	<p>Can be adjusted or functions correctly: Normal Proceed to <b>B</b></p> <p>Cannot be adjusted or does not function: Defective Replace the LSI block or the crystal oscillator block with a new one.</p>
CHECK BULB CONDITION	<p>Check to see if the bulb functions correctly.</p> <p>(1) Check to see if there are any loosened bulb holder screws (3 pcs.).</p> <p>(2) Check with the Volt-ohm-meter.</p> <p>① Remove the bulb from the crystal oscillator block.</p> <p>② Set up the Volt-ohm-meter. Range to be used: OHMS R x 1</p> <p>③ Measuring</p> <p>i) 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.</p> <p>Probe Red (+): Probe Black (-): Apply to either side of the bulb.</p>  <p>ii) Check to see if the transistor for the bulb functions correctly.</p> <p>Transistor for the bulb is contained Bulb lead terminal</p> <p>Probe Red: Bulb lead terminal which is indicated in the illustration.</p> <p>Probe Black: Other two bulb lead terminals. (Apply at the same time.)</p>  <p>Note: The light might be dimmer than usual in checking. This is not a malfunction, however.</p>	<p>No loosened screw: Normal Proceed to <b>G</b>(2)</p> <p>Loosened screw: Defective Retighten the screws.</p> <p>Lights up: Normal Proceed to <b>G</b>(2) ii)</p> <p>Does not light up: Defective Replace bulb.</p> <p>Lights up: Normal Proceed to <b>H</b></p> <p>Does not light up: Defective Replace bulb.</p>

	Procedure	Result and repair
CHECK CONDUCTIVITY OF SWITCH COMPONENTS	<p>Check to see if the switch components function correctly. Check by using a microscope after disassembling procedures have been completed up the LSI block ⑨ on page 13.</p>  <p>(1) Check functioning of the contact levers A and B. Check to see if the thin springs of the contact levers A and B touch the pins (a) and (b) when the arrow-marked portions of the contact 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 levers A and B are released.</p> <p>(2) Check functioning of the setting lever</p> <p>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.</p>  <p>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.</p>  <p>(3) Check for dust, lint or other contamination on the conductive portions of the parts above.</p> <p>When there is battery electrolyte leakage, refer to "HOW TO CHECK BATTERY ELECTROLYTE LEAKAGE AND REPAIR" on page 21 for repairing.</p>	<p>Function correctly: Normal Proceed to <b>I</b>(2)</p> <p>Do not function correctly: Defective Adjust the contact point levers. (If adjustment is impossible, replace the contact point levers with new ones.)</p> <p>Function correctly: Normal Proceed to <b>I</b>(3)</p> <p>Do not function correctly: Defective Adjust the thin spring. (If adjustment is impossible, replace the setting lever with a new one.)</p> <p>Uncontaminated: Normal Proceed to <b>B</b></p> <p>Contaminated: Defective Wipe off any foreign matter.</p>

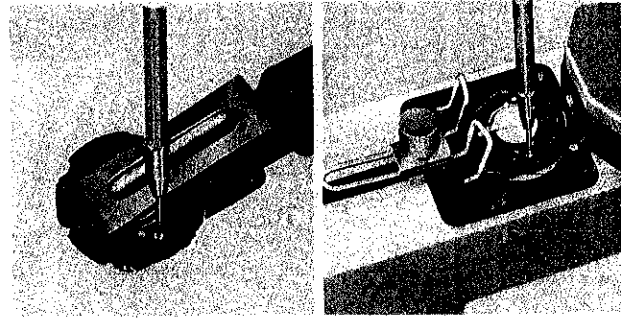
## TIME ACCURACY ADJUSTING

Time accuracy of Cal. M158A 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.

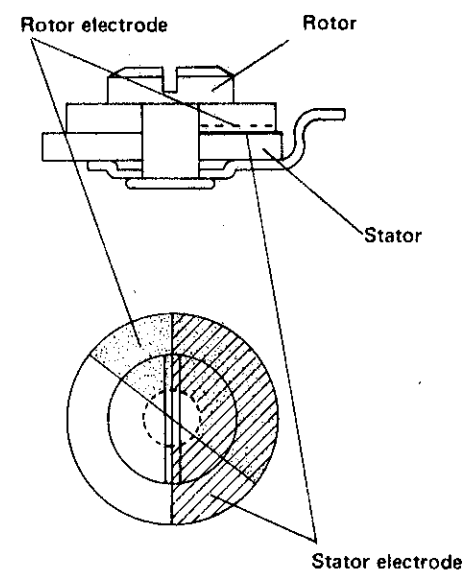


- **Note for handling the trimmer condenser**

Avoid excessive depressing and turning of the trimmer condenser.

- **Function of the Trimmer Condenser**

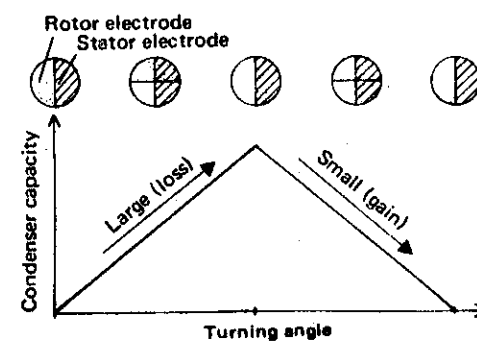
The trimmer condenser consists of a rotor electrode and a stator electrode as shown in the diagram. Turning the shaft fixed to the rotor changes the overlapped area between the stator electrode and rotor electrode, which in turn changes the capacity of the trimmer condenser.



- **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 and Reassembling, and Checking and Adjustment are completed.