

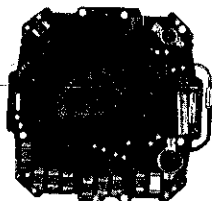
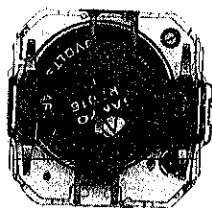
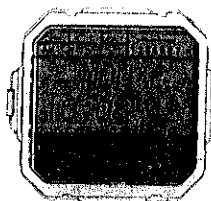
SEIKO

DIGITAL QUARTZ

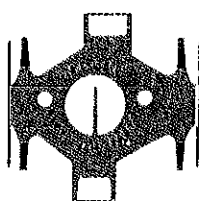
Cal. D409A

**PARTS
CATALOGUE**

Cal. D409A



4001 199



4225 043



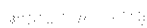
4246 020



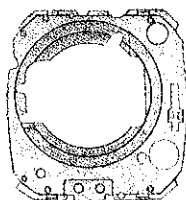
4257 005



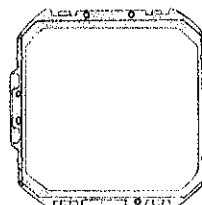
4270 040



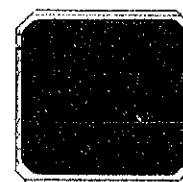
4313 041



4398 098



4398 099



☆4510 206



☆4521 206



☆ Sanyo CR2016

Cal. D409A

Characteristics :

Casing diameter : 26.0 × 26.0 mm
 Maximum height : 4.9 mm without battery
 Frequency of quartz crystal oscillator : 32,768 Hz (Hz = Hertz Cycles per second)
 Regulation system : Trimmer condenser
 Display medium : Nematic liquid crystal, FE-Mode.
 Time and calendar display
 Alarm display
 Seven channel memory display
 Stop watch display
 Hourly time signal
 Illuminating light

PART NO.	PART NAME	PART NO.	PART NAME
4001 199	Circuit block		
4225 043	Battery clamp		
4246 020	Speaker lead terminal		
4257 005	Anti-static electricity plate		
4270 040	Battery connection (—)		
4313 041	Connector		
4398 098	Battery guard		
4398 099	Liquid crystal panel frame		
☆4510 206	Liquid crystal panel (Silver)		
☆4510 207	Liquid crystal panel (Gold)		
☆4521 206	Reflecting mirror (Silver)		
☆4521 207	Reflecting mirror (Upper row . . . Silver, Lower row . . . Blue)		
☆ Sanyo CR2016 } ☆ Matsushita BR2016 } ☆ Maxell CR2016 }	Lithium battery		

Remarks :

Liquid crystal panel

☆4510 206 } Be sure that combination between the color of panel cover and Liquid crystal panel
 ☆4510 207 } should be matched according to the "SEIKO Quartz Casing Parts Catalogue".

Reflecting mirror

☆4521 206 } Be sure that combination between the color of panel cover and reflecting mirror should
 ☆4521 207 } be matched according to the "SEIKO Quartz Casing Parts Catalogue".

Battery

☆ Sanyo CR2016 }
 ☆ Matsushita BR2016 } The substitutive battery might be added to the applied battery in the future.
 ☆ Maxell CR2016 } In that case please refer to separate "BATTERY LIST FOR SEIKO
 QUARTZ WATCHES".

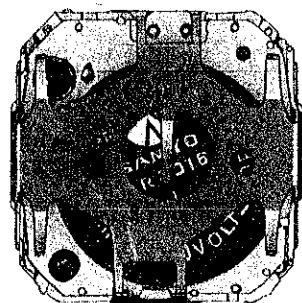
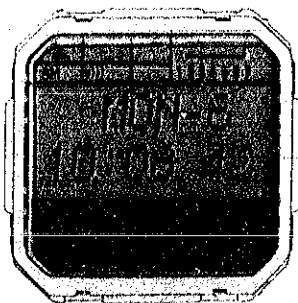
☆⇒ Please see remarks

Part numbers in light letters are not shown in photos.

TECHNICAL GUIDE

SEIKO DIGITAL QUARTZ

CAL. D409A



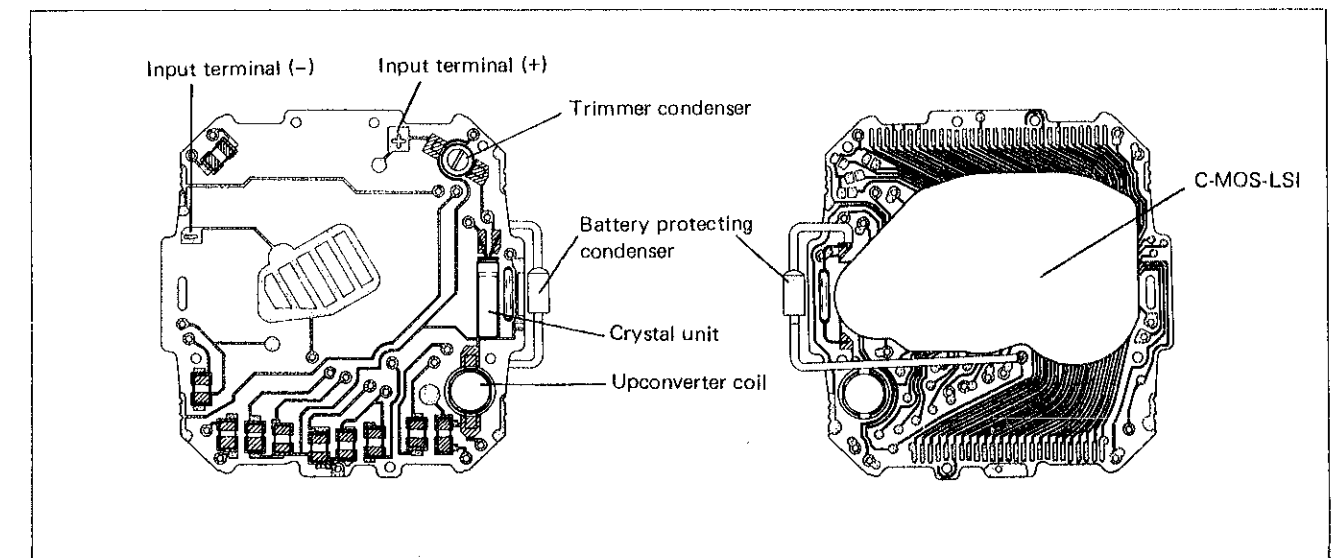
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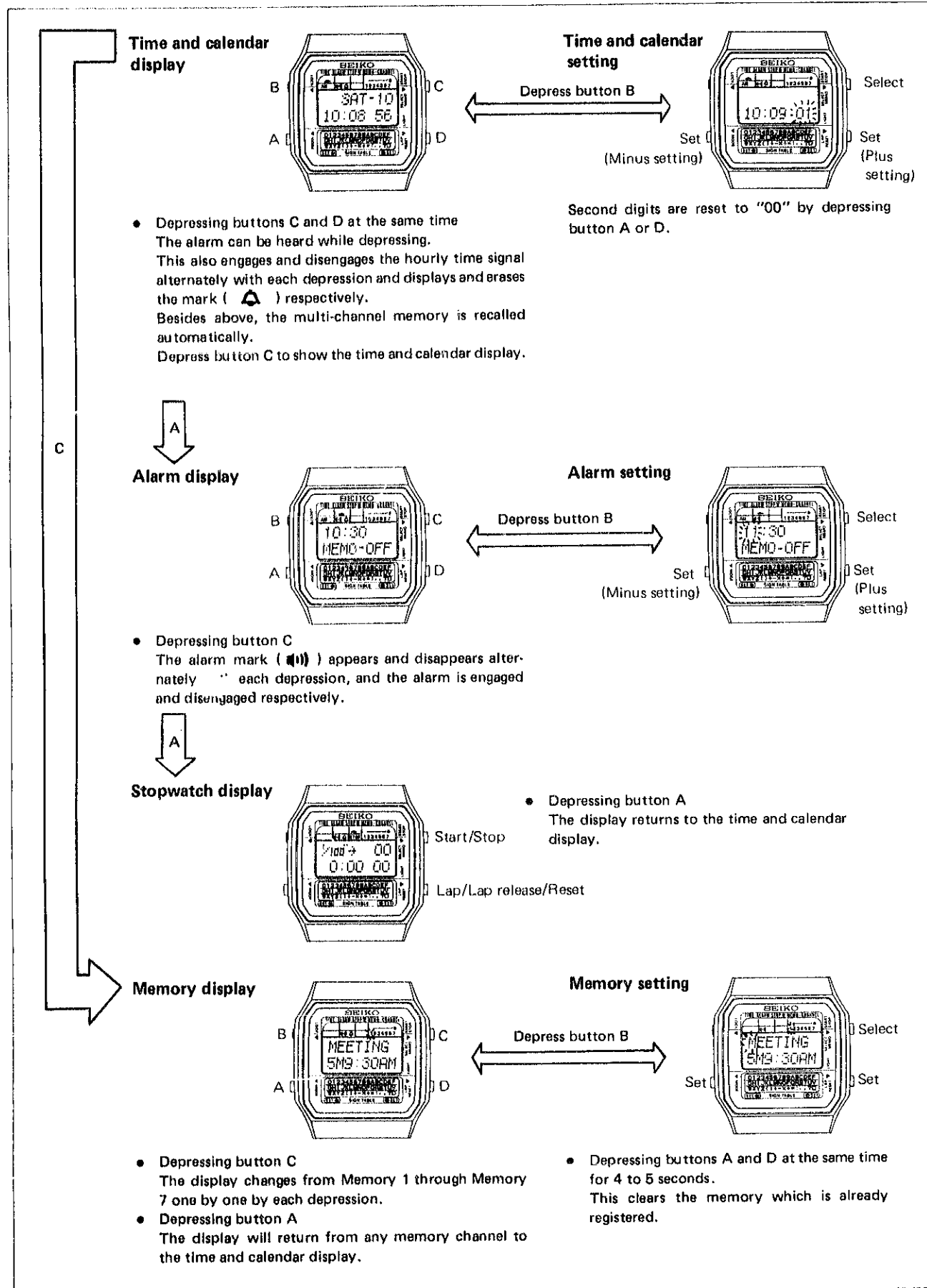
I. SPECIFICATIONS

Cal. No.		D409A
Item		
Display medium		Nematic Liquid Crystal, FEM (Field Effect Mode)
Liquid crystal driving system		Multiplex driving system
Display system		<ul style="list-style-type: none"> • Time and calendar function (12- or 24-hour indication) • Alarm function • Stopwatch function • Multi-channel memory function (7 channel memory display up to 16 digits or letters in one channel)
Additional mechanism		<ul style="list-style-type: none"> • Hourly time signal • Alarm test system • Multi-channel memory automatic recalling system • Automatic calendar display system • Illuminating light
Loss/gain		Monthly rate at normal temperature range: less than 15 seconds
Module size	Outside diameter	ϕ 30.8mm (26.0mm between 6 o'clock and 12 o'clock sides) (26.0mm between 3 o'clock and 9 o'clock sides)
	Height	4.9mm without battery
Regulation system		Trimmer condenser
Measuring gate by quartz tester		Any gate is available.
Battery		Lithium battery Sanyo CR2016, Maxell CR2016, Matsushita BR2016 Battery life is approximately 1.5 years. Voltage: 3.0V for Sanyo CR2016, Maxell CR2016 2.8V for Matsushita BR2016

II. STRUCTURE OF THE CIRCUIT BLOCK



III. DISPLAY FUNCTION





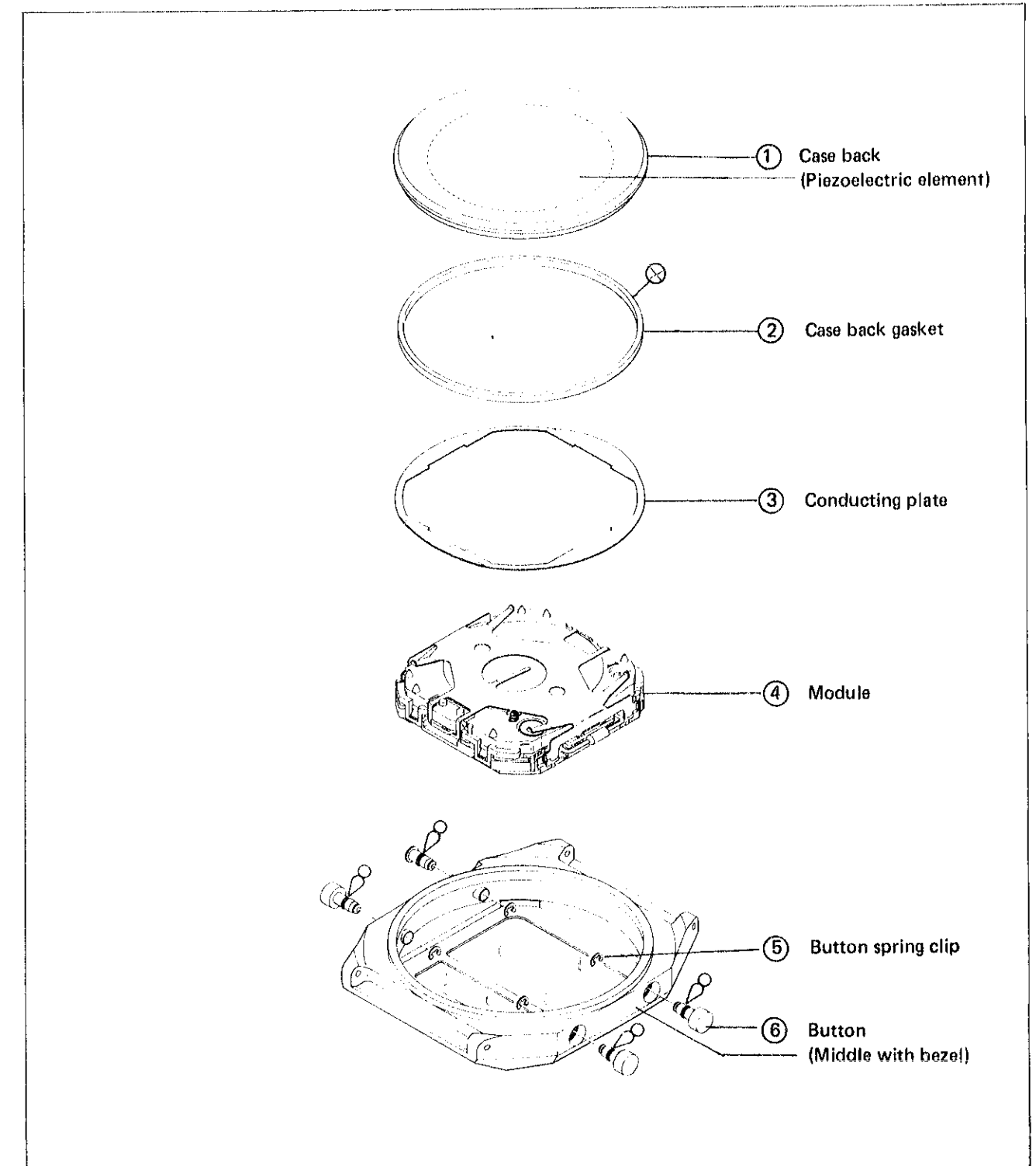
IV. DISASSEMBLING, REASSEMBLING AND LUBRICATING OF THE CASE

Disassembling procedures Figs.: ① → ⑥

Reassembling procedures Figs.: ⑥ → ①

Lubricating

Type of oil	Oil quantity
Silicon grease 500,000 c.s.	 Normal quantity
 No lubricating	



V. DISASSEMBLING AND REASSEMBLING OF THE MODULE

Disassembling procedures Figs.: ① → ⑪

Reassembling procedures Figs.: ⑪ → ①

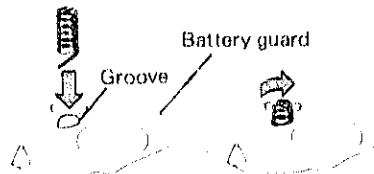
① Speaker lead terminal

Removing

Turn the speaker lead terminal to release the straight portion of its end from the groove of the battery guard and remove it.

Installing

Hook the straight portion at the end of the speaker lead terminal to the groove of the battery guard, and then turn it to set it in position.



② Battery clamp

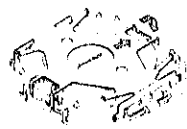
Removing

First, put the tips of tweezers into the clearance between the battery clamp and the battery guard at the 12 o'clock position, then release the battery clamp from the hook of the battery guard, and finally remove it.



Installing

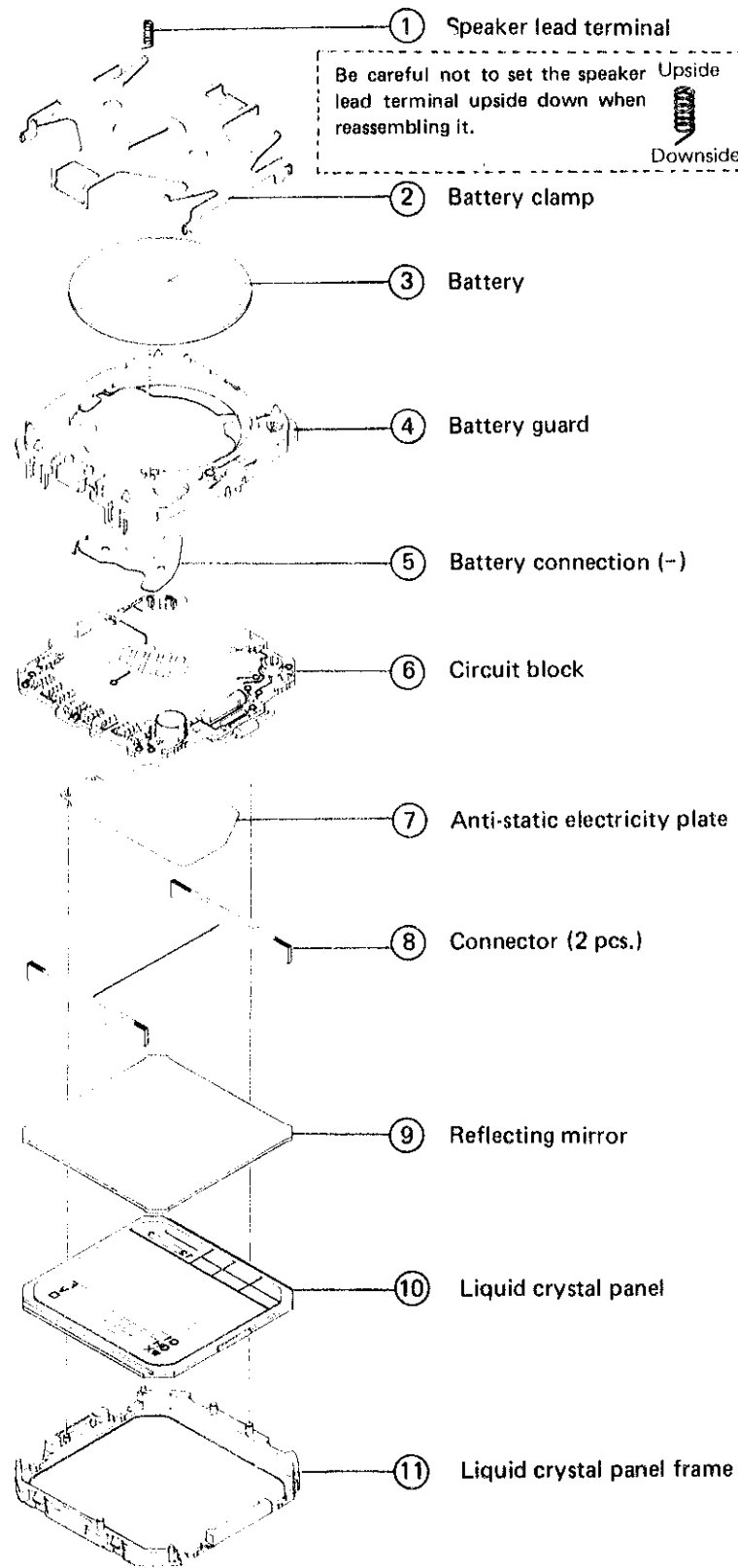
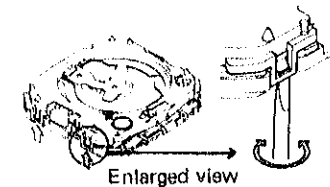
When setting the battery clamp, hook its 6 o'clock position at first and then the 12 o'clock position to the battery guard.



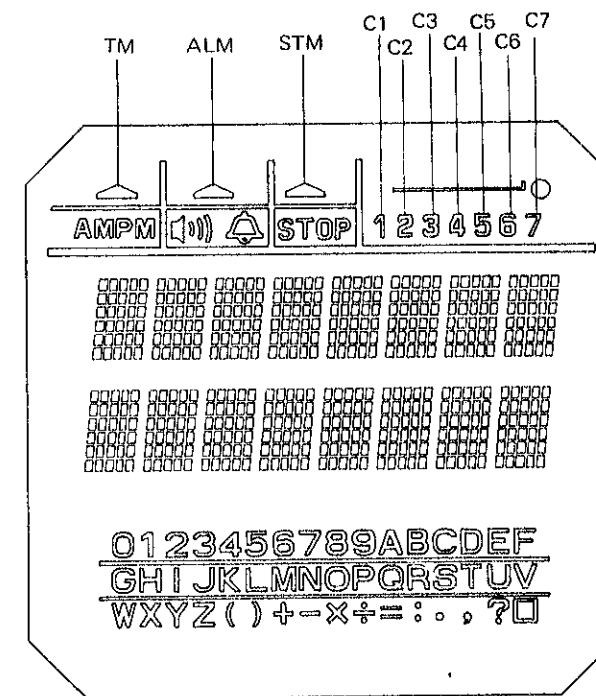
④ Battery guard

Removing

Pry up the battery guard lightly at the four hooking places by using the tips of tweezers.



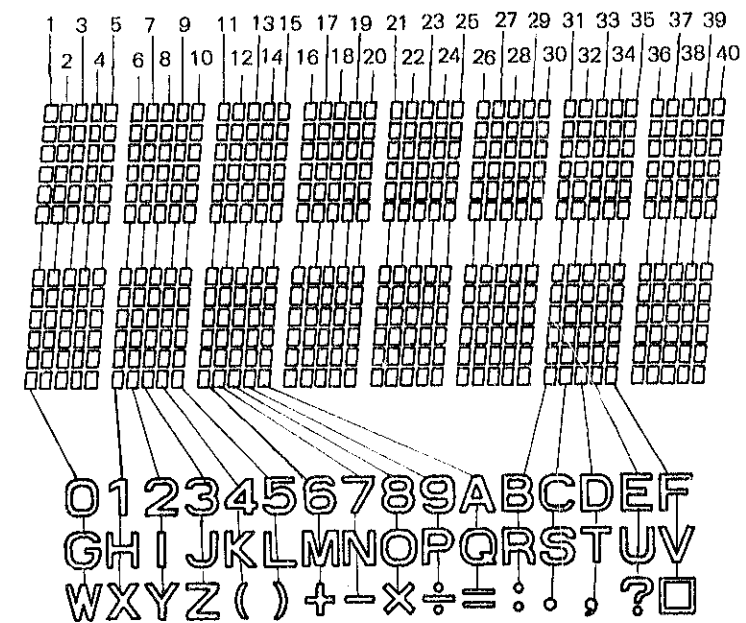
VI. RELATIONSHIP BETWEEN THE SEGMENT (LIQUID CRYSTAL PANEL ELECTRODE) AND THE C-MOS-LSI OUTPUT TERMINAL



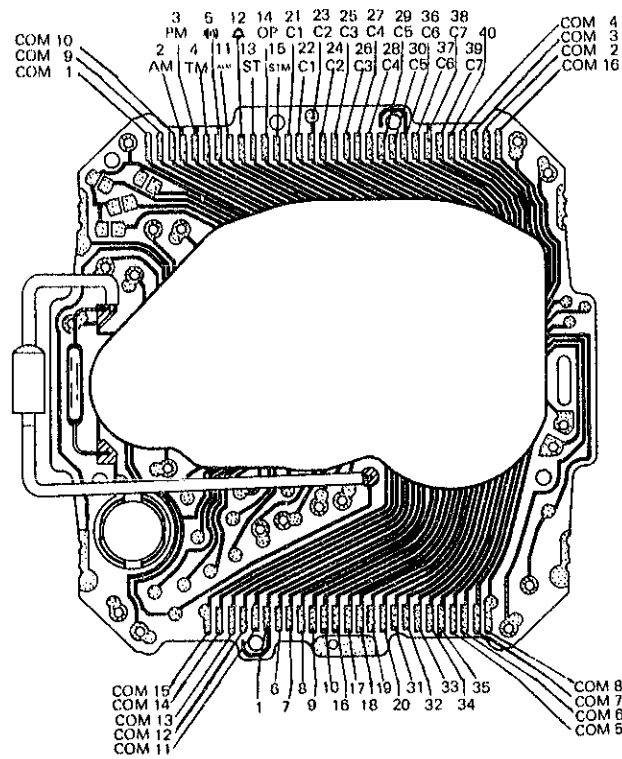
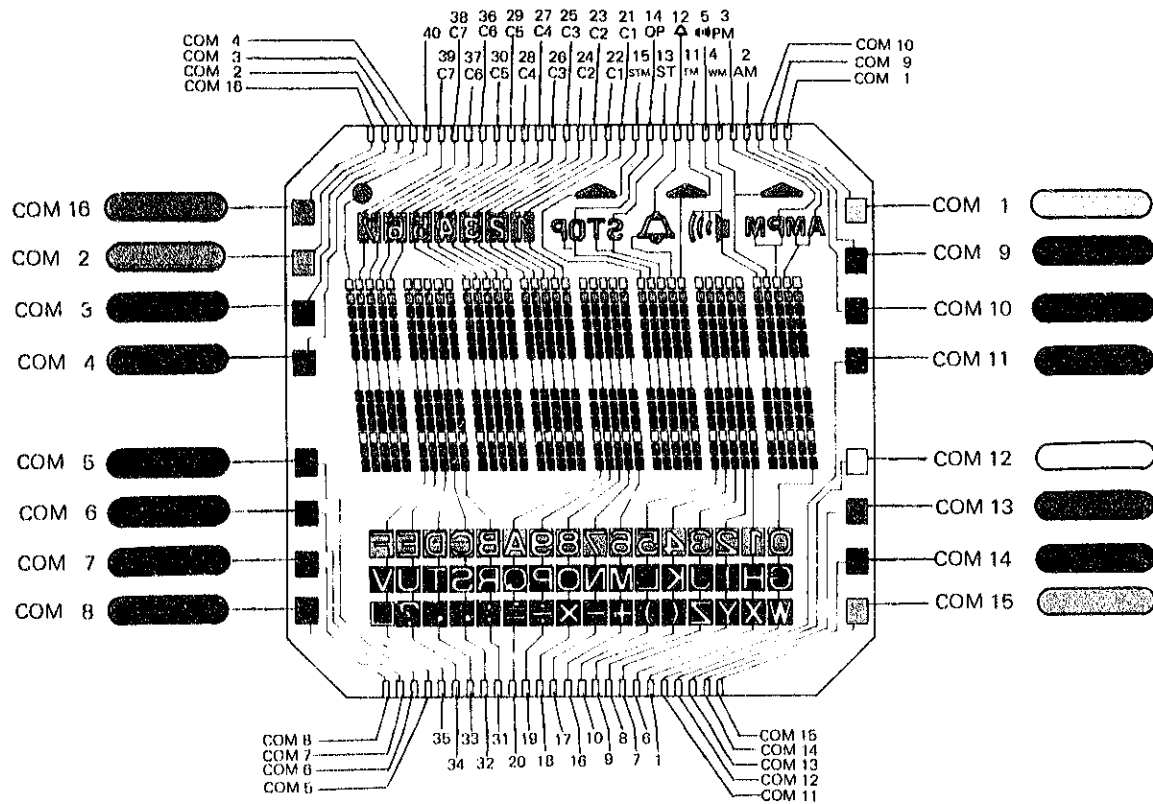
TM: Time mode mark

ALM: Alarm mode mark

STM: Stopwatch mode mark



*COM: COM stands for common electrode.



VII. CHECKING AND ADJUSTMENT

- The explanation here is particularly for the points of Cal. D409A. Refer to the "TECHNICAL GUIDE, GENERAL INSTRUCTION" for SEIKO Digital Quartz for ordinary checking and adjustment.

Procedure

Remarks on replacing battery

In this watch, after replacing the battery, depress buttons A, B, C and D simultaneously to reset the circuit. Follow the same procedure when checking battery voltage.

CHECK BATTERY VOLTAGE

Set up the volt-ohm-meter.

Range to be used: DC 6V

Result:

When either Sanyo or Maxell CR2016 is used:

Normal: More than 3.0V

Defective: Less than 3.0V

When Matsushita BR2016 is used:

Normal: More than 2.8V

Defective: Less than 2.8V

Note: After checking battery voltage, depress buttons A, B, C and D simultaneously.

CHECK BATTERY CONDUCTIVITY

CHECK ALL SEGMENTS LIT UP

In the time and calendar setting function, check to see if all the segments light up by depressing buttons C and D at the same time. That can be released by depressing any one of buttons A, B, C, and D.

CHECK CURRENT CONSUMPTION

Set up the volt-ohm-meter.

Range to be used: DC 12 μ A

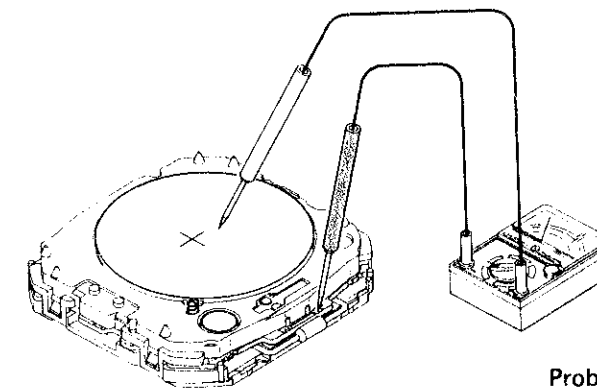
- Be sure to protect the C-MOS-LSI from light with case back or black paper, etc. while measuring. Do not check current consumption under an incandescent lamp since strong light causes a watch to consume excess current.

Result:

Normal: Less than 6 μ A

Defective: More than 6 μ A

* Replace the circuit block or the liquid crystal panel with a new one.

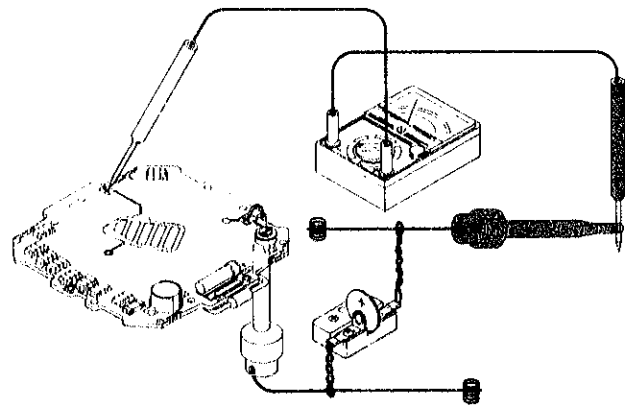


Probe red. Battery surface (+)
 Probe black Circuit block (+) terminal

Procedure

***How to find defects when the current consumption is more than 6μA**

Check current consumption for the circuit block alone.



Result:
Less than 3.5μA: Replace the liquid crystal panel with a new one.
More than 3.5μA: Replace the circuit block with a new one.

CHECK WATER RESISTANCE

CHECK CONTACT BETWEEN C-MOS-LSI AND LIQUID CRYSTAL PANEL

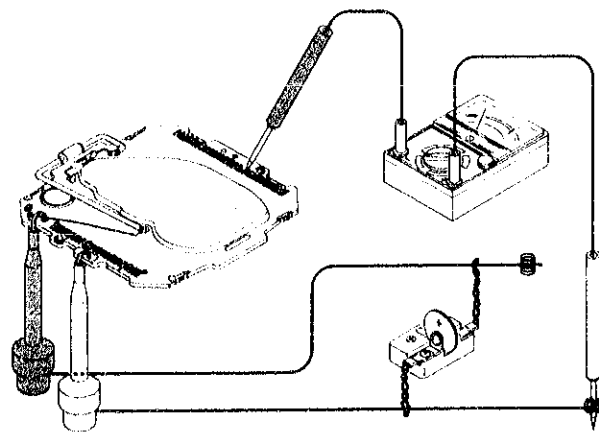
Refer to the "RELATIONSHIP BETWEEN THE SEGMENT (LIQUID CRYSTAL PANEL ELECTRODE) AND THE C-MOS-LSI OUTPUT TERMINAL", and check for poor conductivity of the liquid crystal panel, connector, and C-MOS-LSI output terminal.

CHECK LIQUID CRYSTAL PANEL AND CIRCUIT BLOCK

(1) Check to see if there is any broken wire, short circuit, etc. in the liquid crystal panel.
Set up the volt-ohm-meter.
Range to be used: OHMS x 1 ~ x 1K

Result:
Normal: Lights up.
Defective: Does not light up.
Replace the liquid crystal panel with a new one.

(2) Check to see if the electric signal is correctly transmitted from the circuit block.
Set up the volt-ohm-meter.
Range to be used: DC 3V



Result:
Normal: More than 0.8V
Defective: Less than 0.8V
Replace the circuit block with a new one.

Procedure

CHECK ACCURACY

- The daily rate can be measured easily when all the segments are lit up.
- Be sure to protect the C-MOS-LSI from light with case back or black paper, etc. while measuring.
Do not measure accuracy under an incandescent lamp, since strong light adversely affects time accuracy.

Result:
Normal: Neither gain nor loss
Defective: Either gain or loss
Adjust time accuracy.
* Turn the trimmer condenser.

CHECK FUNCTIONING AND ADJUSTING

Refer to the "DISPLAY FUNCTION", and check to see if the time and calendar setting and other functions are correctly activated.

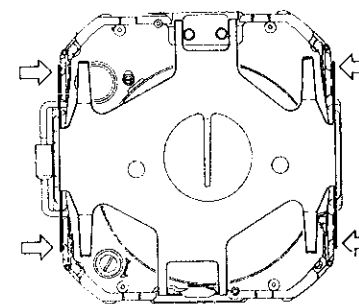
Result:
Normal: Operate correctly.
Defective: Do not operate correctly.
Go back or proceed to the procedures CHECK CIRCUIT BLOCK and CHECK CONDUCTIVITY OF SWITCH COMPONENTS.

CHECK ALARM TEST SYSTEM

In the time and calendar display, check to see if the alarm rings by depressing buttons C and D at the same time.

Result:
Normal: The alarm rings.
Defective:
- The display disappears.
 Replace the battery with a new one.
- The alarm does not ring.
 Proceed to the procedure CHECK ALARM CONDITION.

CHECK CONDUCTIVITY OF SWITCH COMPONENTS



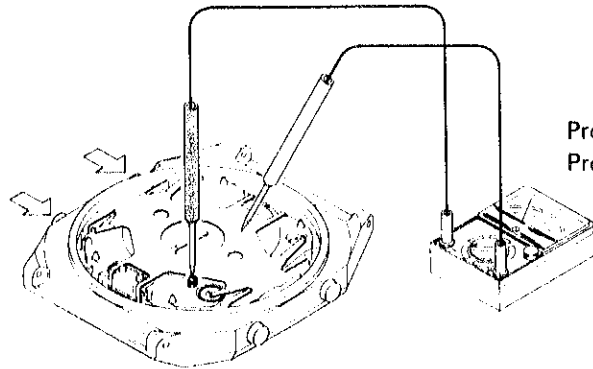
Check to see if the switch components (marked with "←") operate correctly.

Procedure

CHECK ALARM CONDITION

Check the alarm condition if the alarm does not ring.

- (1) Check alarm output voltage from the circuit block. Apply the probes as shown in the illustration below before operating the alarm test system. (Depress buttons C and D at the same time in the time and calendar display.)



Set up the volt-ohm-meter.

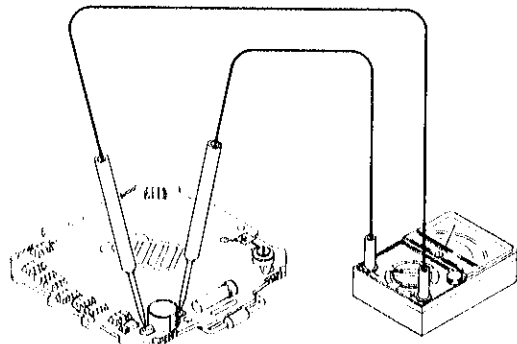
Range to be used: DC 12 μ A

Probe red. Battery clamp
Probe black Speaker lead terminal

Result:

- Normal: The pointer swings.
- Defective: The pointer does not swing.
Check the upconverter coil.

- (2) Check the upconverter coil.
Set up the volt-ohm-meter.
Range to be used: OHMS x 1



Result:

- Normal: 130 Ω ~ 170 Ω
- Defective:
 - Less than 130 Ω
(Short circuit)
 - More than 170 Ω
(Broken wire)Replace the circuit block with a new one.

- (3) Check the appearance of the piezoelectric element. When there is no defect to be found through the checking methods above, check the piezoelectric element to see if there is any crack, chip, peeling, or the like on the piezoelectric element.

CHECK BULB CONDITION

OTHERS

● Caution when receiving repair requests

When Cal. D409A is exposed to a high temperature over 80°C, its time display may become disordered, or its memory may change or be cleared. When the watch is requested to be repaired for such a symptom, place it first in the normal temperature (5°C ~ 35°C) and then clear the display by depressing all the four buttons at the same time. After that, set the time and memory again.

If the watch does not return to normal through the operation above, follow the procedures of CHECKING AND ADJUSTMENT.

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