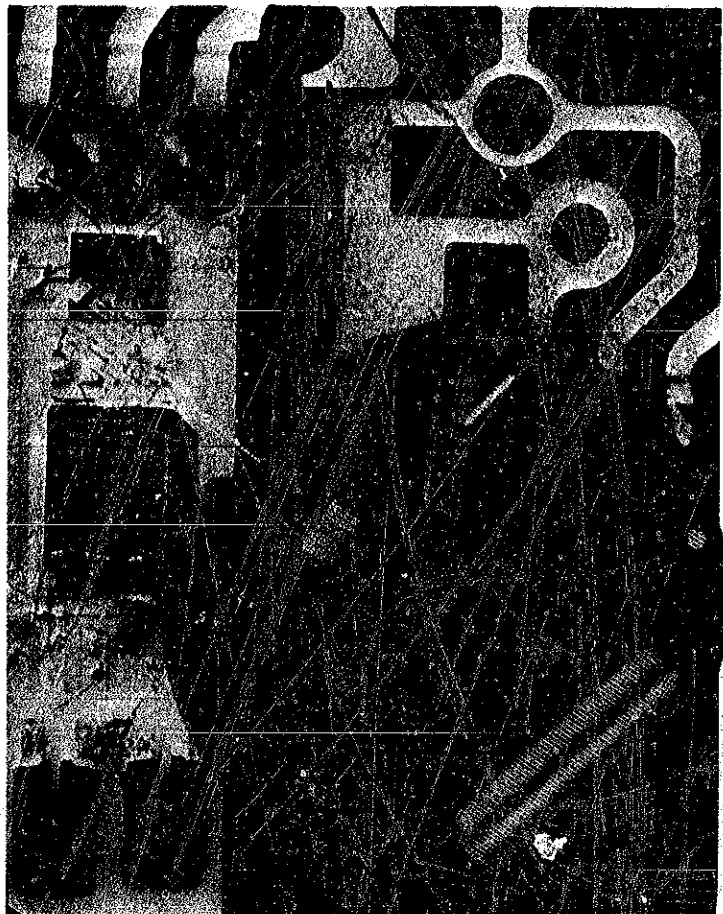


# TECHNICAL GUIDE

## SEIKO

QUARTZ

CAL. 4100A & 4110A



Cal. 4110A • 4100A SEIKO QUARTZ

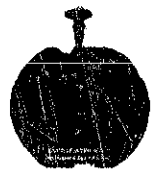
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Cal. 4110A • 4110A SEIKO QUARTZ

The SEIKO Quartz Cal. 41 series is a small, thin, crystal oscillator watch, that has finally been made possible through SEIKO's advanced techniques in manufacturing crystal oscillator watches; a product of SEIKO's extensive research and experience.

Our new manufacturing techniques have resulted in another SEIKO first, the world's first fashionable crystal oscillator watch, available in various designs. We have given the world a new image for its most advanced timepiece.



Movement

SPECIFICATIONS AND FEATURES

1. Specifications

	Cal. 4110A	Cal. 4100A
Time indication	Hour & minute hands	Hour, minute & second hands
Crystal oscillator	32,768 Hz (Hz = Hertz . . . cycles per second)	
Loss/gain	Loss/gain at normal temperature Monthly rate: less than 15 seconds (Annual rate: less than 4 minutes)	
Casing diameter	φ19.4 mm (φ17.3 mm. 3 o'clock and 9 o'clock direction)	
Height	3.8 mm	4.0 mm
Operational temperature range	-10°C ~ +60°C (14°F ~ 140°F)	
Temperature compensation device	Temperature compensation by means of special condenser	
Driving system	Step motor system (Minute hand rotates once every five seconds)	Step motor system (Second hand rotates once each second)
Regulation system	Trimmer condenser	
Battery power	Silver oxide battery (U.C.C. 384 and 312) Voltage 1.5V	
Jewel	2 jewels	3 jewels

2. Features

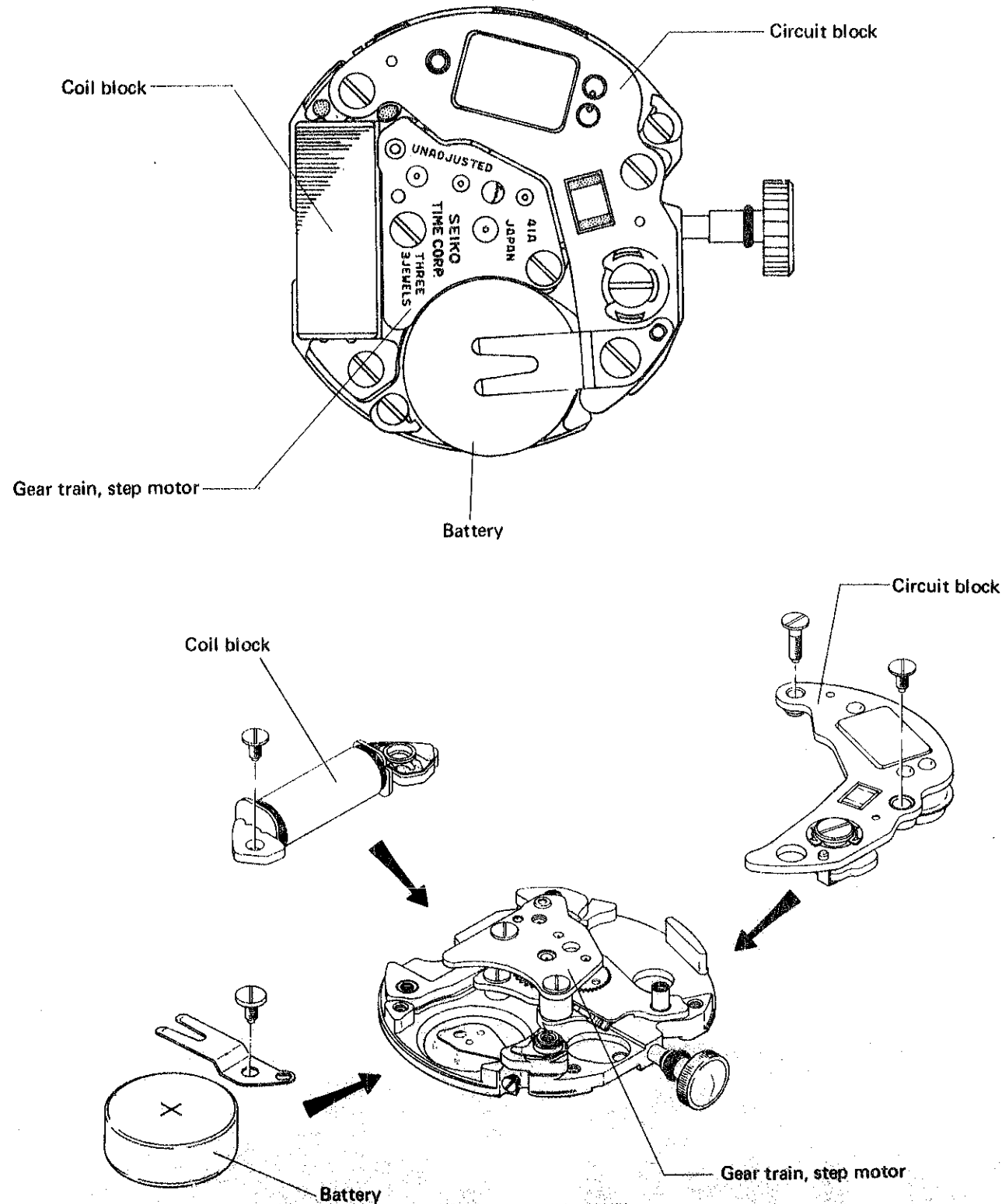
- ( 1 ) Cal. 4110A and 4100A are extremely small, thin crystal oscillator watches with a casing diameter of φ19.4 mm.
- ( 2 ) Step motor system with high stability and durability.
- ( 3 ) Extensive simplification of the construction and easy adjusting facilitate after-servicing.
- ( 4 ) Time accuracy can be easily adjusted by simply turning the trimmer condenser.
- ( 5 ) Low power consumption has succeeded in minimizing the battery size but the battery life exceeds one year.

### MOVEMENT STRUCTURE

#### 3. Movement structure

The circular movement consists of a circuit block, coil block, battery and mechanical portion, the components of which are a step motor and a gear train.

Each portion can be detached separately, thus simplifying checking and adjustment.

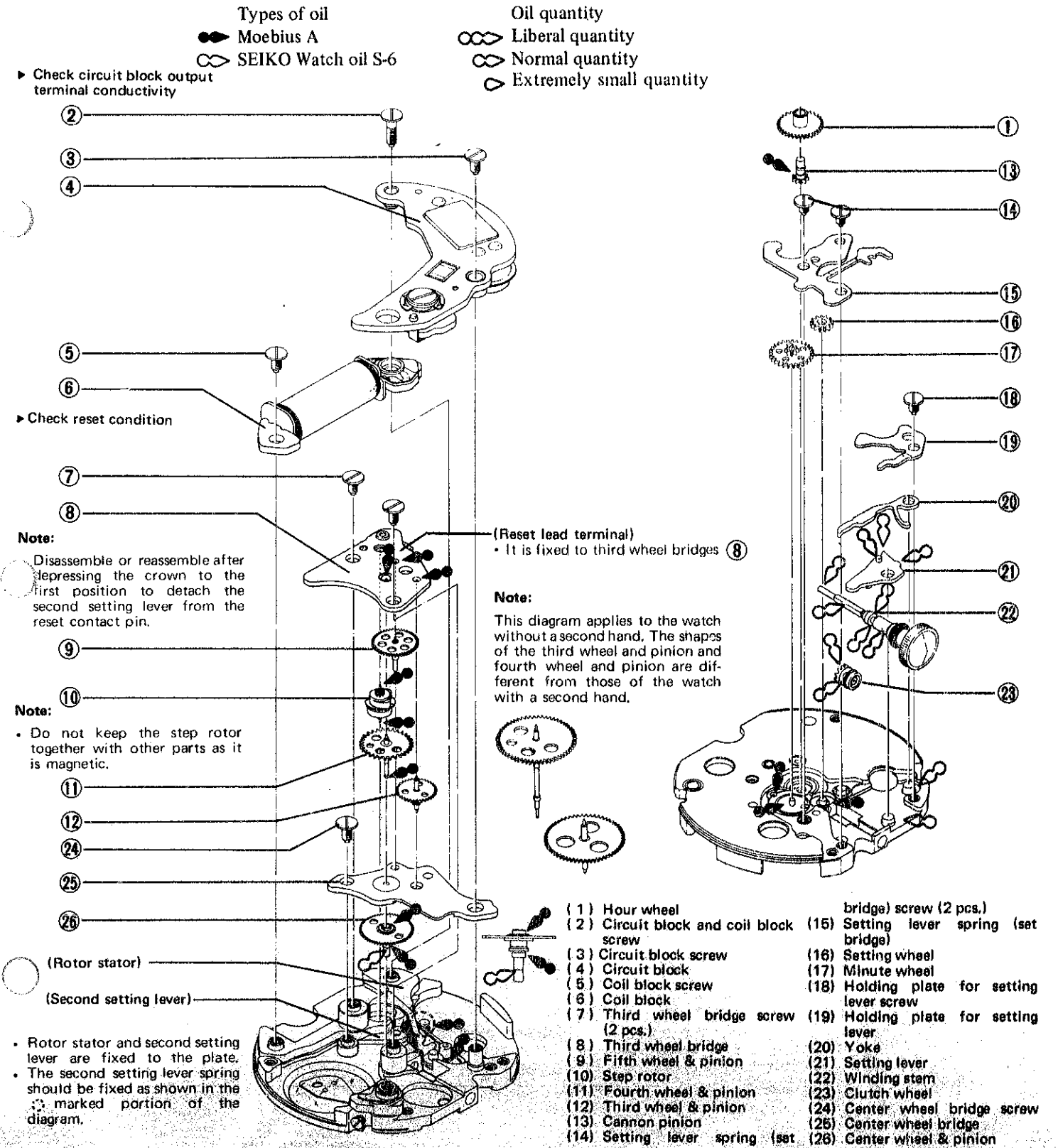


### DISASSEMBLING, REASSEMBLING, LUBRICATING AND CLEANING

#### 4. Disassembling, reassembling, lubricating and cleaning

##### (1) Disassembling, reassembling and lubricating


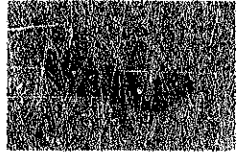
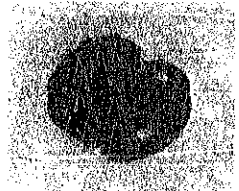
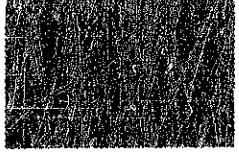
- Disassembling and reassembling  
Disassemble watch according to Figs: (1) → (26)  
Reassemble reversing above procedures: Figs (26) → (1)
- Lubricating



( 2 ) Cleaning

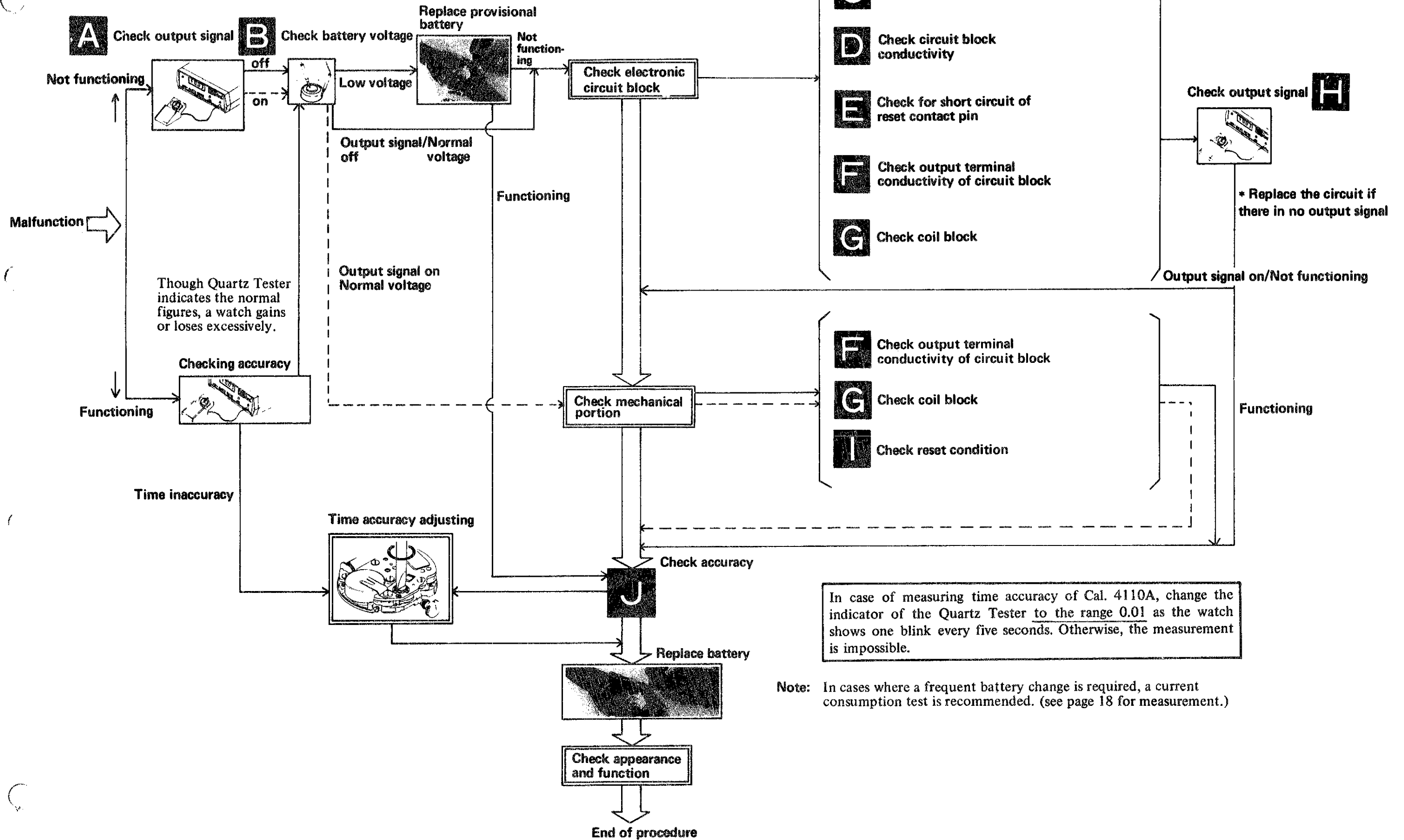
Since several special parts (electronic parts) used in the 41 series differ from conventional mechanical watches, use the following cleaning method when cleaning.

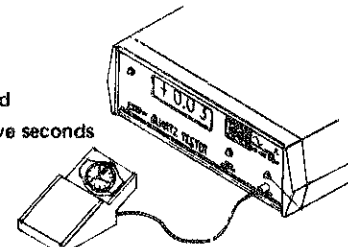
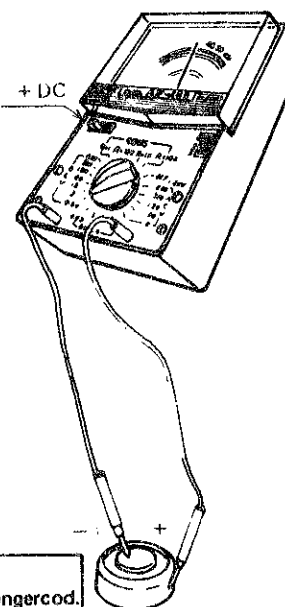
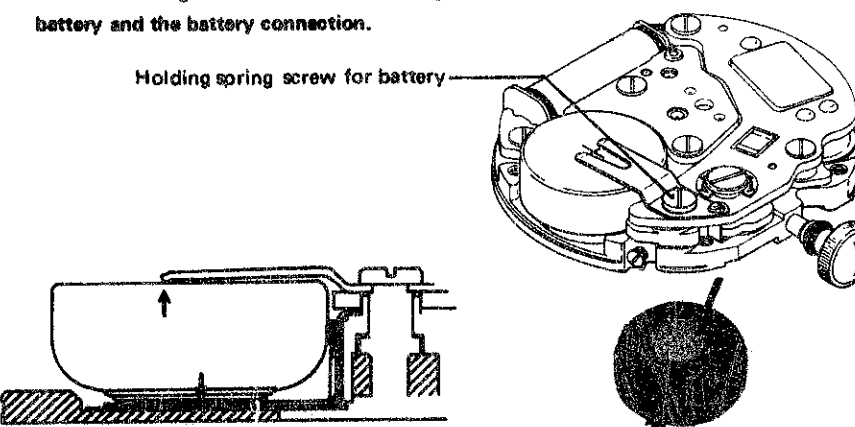
HOW TO CLEAN

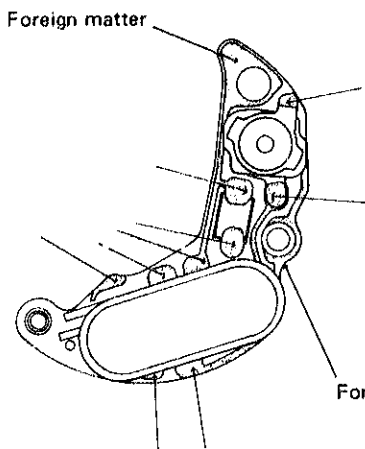
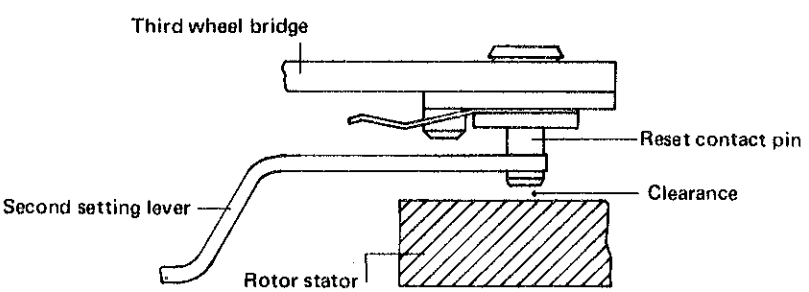
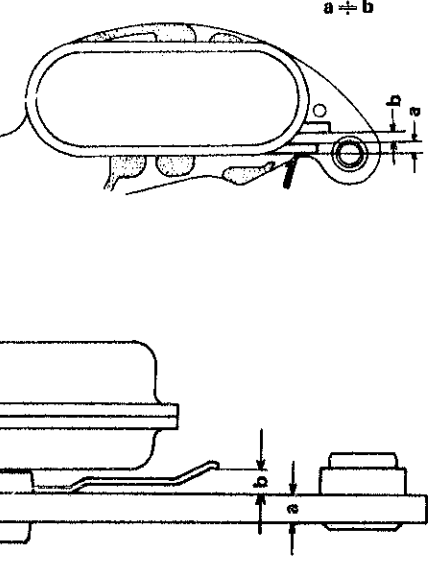
Name of Part	Cleaning	Drying	Solution	Remarks
(1) Circuit block  Coil block 	DO NOT CLEAN			Conducting portion <u>ONLY</u> may be cleaned with a cloth moistened with benzine, or alcohol. Dry in <u>COOL</u> air.
(2) Plate  Step rotor 	Rinse or gently scrub with brush	Cool air drying	Benzine	<ul style="list-style-type: none"><li>• Be careful not to remove the contacted portions of plate.</li><li>• Since the step rotor is magnetic, use a clean solution. Any foreign matter which cannot be removed by cleaning should be removed with adhesive tape.</li></ul>
(3) Parts other than the above	Clean with cleaner Rinse or gently scrub with brush	Cool or hot air drying	Benzine, trichloroethylene	

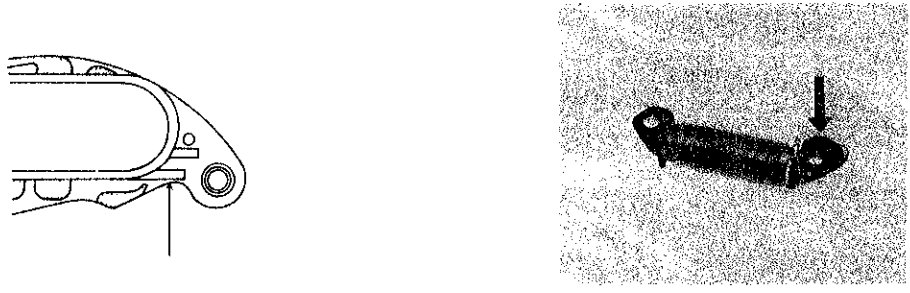
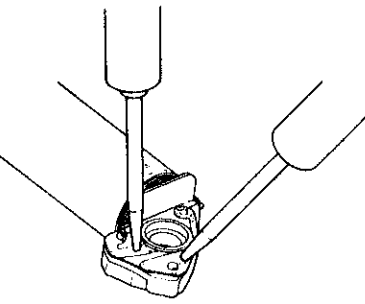

### 5. Guide for Checking and Adjustment

The servicing instruments and materials for Cal. 4110A & 4100A are the same as for Cal. 0903A

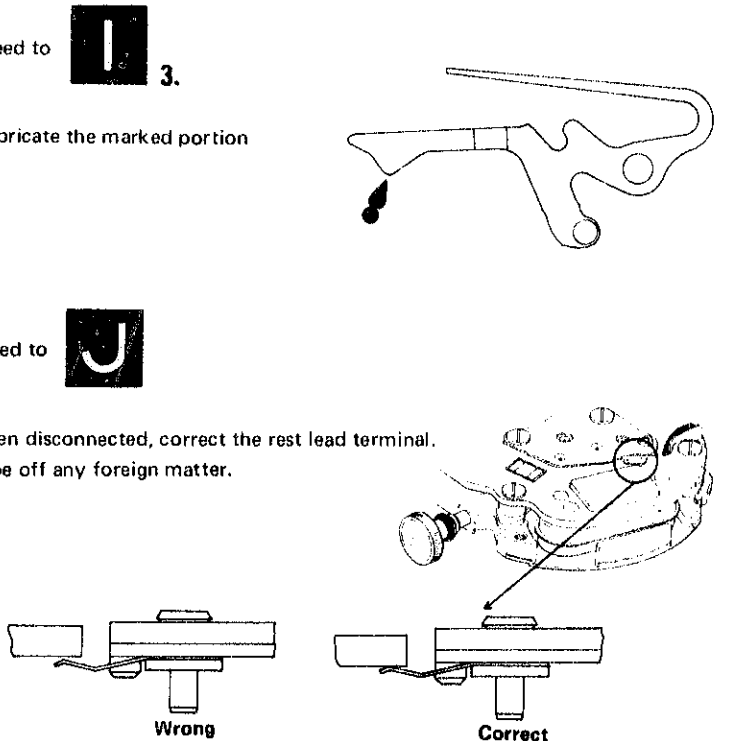
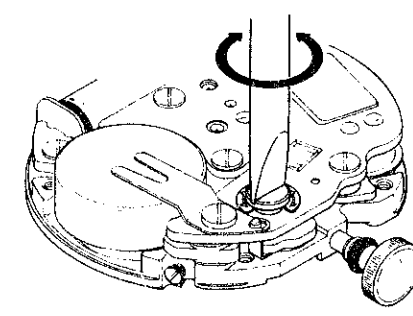
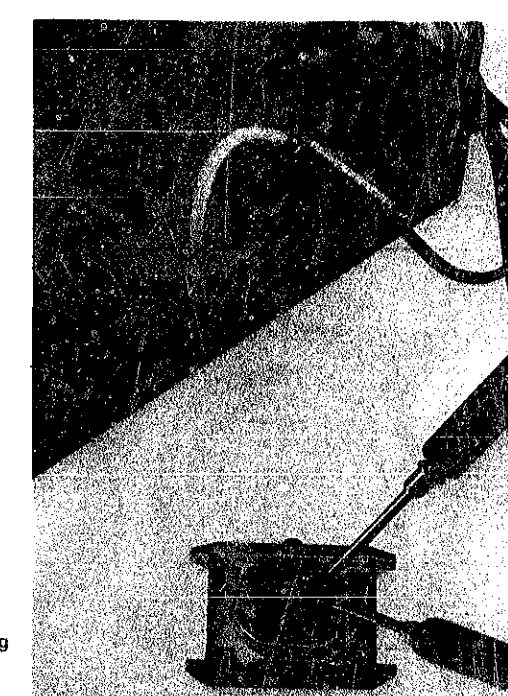


	Procedures		Results	Adjustment and Repair
<b>A</b> CHECK OUTPUT SIGNAL	<p>Check for output signal</p> <ol style="list-style-type: none"> <li>1. Set up the Quartz Tester</li> <li>2. Checking</li> </ol> <p>Put the watch in the center of the microphone but make sure to place the crown side up and check the input indication lamp.</p> <p>Blinking input indication lamp:        Watch with second hand . . . one blink per second        Watch without second hand . . . one blink every five seconds</p>  <p><b>Note:</b>        Push the crown to the normal position.        Read the indicator at its measuring range of 0.01 as the watch without second hand shows one blink every five seconds.</p>		<p>One blink per second or once every five seconds</p> <p>No blinking</p>	<p>Proceed to <b>B</b></p>
<b>B</b> CHECK BATTERY VOLTAGE	<p>Use the following procedures to check battery voltage.</p> <ol style="list-style-type: none"> <li>1. Set the tester</li> <li>2. Measuring</li> </ol> <p>Range to be used DC 3V</p> <ul style="list-style-type: none"> <li>• Probe Red (+)</li> <li>..... Battery surface (+)</li> <li>• Probe Black (-)</li> <li>..... Battery surface (-)</li> </ul>  <p><b>Note:</b>        When handling the battery, use non-metallic tweezers or a fingercod.</p>		<p>More than 1.5V indicates</p> <p>Less than 1.5V indicates</p>	<p>In procedure <b>A</b> if one-second blinking is found, check the <b>Mechanical Portion.</b></p> <p>In procedure <b>A</b> if one-second blinking is NOT found, check the <b>Electronic Circuit Block.</b></p> <p><b>Replace with a provisional battery.</b></p> <ul style="list-style-type: none"> <li>• If it operates after battery replacement, proceed to <b>J</b></li> <li>• If it does not operate, check the <b>Electronic Circuit Block.</b></li> </ul>
<b>C</b> CHECK BATTERY CONDUCTIVITY	<p>Use the following procedures to check if the battery current flow to the circuit is normal.</p> <ol style="list-style-type: none"> <li>1. Make sure that the holding spring screw for the battery is tightened firmly.</li> <li>2. Check for foreign matter on the connecting point of the battery, holding spring for the battery and the battery connection.</li> </ol> <p>Holding spring screw for battery</p> 		<p>No loosened screw</p> <p>Loosened screw</p> <p>Uncontaminated</p> <p>Contaminated</p>	<p>Proceed to <b>C</b> 2.</p> <ul style="list-style-type: none"> <li>• Retighten screw</li> </ul> <p>Proceed to <b>D</b></p> <ul style="list-style-type: none"> <li>• Wipe off carefully.</li> </ul> <p><b>Note:</b>        Be careful not to damage the holding spring for the battery and the battery connection.</p>

	Procedures		Results	Adjustment and Repair
<b>D</b> CHECK CIRCUIT BLOCK CONDUCTIVITY	<p>Check for short circuit and defective conductivity of the circuit block. Remove the circuit block and check for short circuit, disconnection of the soldered portion, lead pattern and foreign matter on the contacting surface of the circuit block screws.</p>  <ol style="list-style-type: none"> <li>1. Check the arrow marked place for disconnection of the soldered portion and short circuit.</li> <li>2. Check for disconnection of the circuit block.</li> <li>3. Check for foreign matter on the screw.</li> </ol>	<p>Disconnection of the soldered portion, short circuit and foreign matter</p> <p>No disconnection of soldered portion, short circuit or foreign matter</p>	<p>Proceed to <b>E</b></p>	<p>Proceed to <b>E</b></p> <ul style="list-style-type: none"> <li>• Replace the circuit block when there is disconnection of the soldered portion, short circuit or broken wire.</li> <li>• If contaminated, wipe off foreign matter on the connected place.</li> </ul>
<b>M</b> CHECK FOR SHORT CIRCUIT OF RESET CONTACT PIN	<p>Check to see if the reset contact pin is connected to the rotor stator. Check to see if there is clearance between the reset contact pin and the rotor stator.</p> 	<p>Clearance</p> <p>No clearance</p>	<p>Proceed to <b>F</b></p>	<p>Proceed to <b>F</b></p> <ul style="list-style-type: none"> <li>• Place adhesive on the side of the pin shaft and after inserting, tap lightly on the head.</li> </ul> <p><b>Note:</b> Fix the reset contact pin perpendicularly to the third wheel bridge.</p>
<b>T</b> CHECK OUTPUT TERMINAL CONDUCTIVITY OF CIRCUIT BLOCK	<p>Remove the circuit block to check the contacting portion between the coil and the circuit block.</p>  <ol style="list-style-type: none"> <li>1. Check to see if the arrow marked line of the lower output terminal comes to the center of the pin. The width of the two lines should be almost the same as that of the output terminal.</li> <li>2. As shown in the diagram, the width of the arrow marked portion should be almost the same as that of the circuit block plate (a).</li> </ol> <p>(Width of b should be almost the same as that of the circuit block plate.)</p>	<p>Normal</p> <p>Defective</p> <p>Normal</p> <p>Defective</p>	<p>Proceed to <b>F</b> 2.</p> <p>Proceed to <b>F</b> 3.</p>	<p>Proceed to <b>F</b> 2.</p> <ul style="list-style-type: none"> <li>• Correct the defective portion.</li> </ul> <p>Proceed to <b>F</b> 3.</p> <ul style="list-style-type: none"> <li>• Correct the defective portion.</li> </ul>

	Procedures		Results	Adjustment and Repair
CHECK OUTPUT TERMINAL CONDUCTIVITY OF CIRCUIT BLOCK	<p>3. Check for contamination of the circuit block output terminal and the coil lead terminal.</p> 	<p>Contaminated</p> <p>Uncontaminated</p>	<p>Proceed to <b>G</b></p> <p>Wipe off any foreign matter.</p>	
CHECK COIL BLOCK	<p>Check for broken coil wire and short circuit.</p> <p>1. Set the tester at a range of OHMS R x 100</p> <p>2. Checking</p> <p>Touch the red and black probes to the two terminals of the coil respectively.</p> 	<p>1.5 KΩ ~ 3.5 KΩ</p> <p>Less than 1.5 KΩ</p> <p>More than 3.5 KΩ</p>	<p>Short circuit</p> <p>Broken wire</p>	<p>If Checking the Electronic Circuit Block, proceed to <b>H</b></p> <p>If Checking the Mechanical Portion, proceed to <b>I</b></p> <p>Replace coil block.</p> <p>Unscrew the coil block screw with the third wheel bridge.</p> <p>(Note:) Hold the coil as shown in the photo.</p> 
CHECK OUTPUT SIGNAL	<p>Check the output signal.</p> <p>1. Set up the Quartz Tester.</p> <p>2. Checking</p> <p>Check using the same procedures as in <b>A</b></p>	<p>One blink per second or once every five seconds</p> <p>No blinking</p>	<p>Functioning</p> <p>Not functioning</p>	<p>Proceed to <b>J</b></p> <p>Check Mechanical Portion <b>I</b></p> <p>Replace the circuit block</p>
CHECK RESET CONDITION	<p>Check the reset condition after the circuit block is assembled.</p> <p>1. Check to see if the step rotor stops exactly when the crown is pulled out and starts moving after one second (watch with second hand) or five seconds (watch without second hand) after the crown is pushed back in.</p>	<p>Stops immediately and starts moving again after one second (five seconds).</p> <p>Does not stop or moves irregularly.</p>		<p>Proceed to <b>J</b></p> <p>Proceed to <b>I</b> 2.</p>



	Procedures	Results	Results	Adjustment and Repair								
CHECK RESET CONDITION	<p>2. Check to see if the second setting lever regulates the step rotor when the crown is pulled out to the second click. (Check to see if there is clearance between the second setting lever and the reset contact pin).</p> <p>3. Check for contacting condition between the reset lead terminal and the circuit block, and to see if there is any contamination of the contacting portion.</p>	<p>Clearance _____</p> <p>No clearance _____</p> <p>Connected, Uncontaminated _____</p> <p>Disconnected or Contaminated _____</p>	<p>Proceed to <b>I</b> 3.</p> <p>Proceed to <b>J</b></p>	<p>• Lubricate the marked portion</p> <p>• When disconnected, correct the reset lead terminal.</p> <p>• Wipe off any foreign matter.</p> 								
CHECK ACCURACY	<p>Check gain and loss of time accuracy.</p> <p>1. Set up the Quartz Tester</p> <p>2. Checking</p> <p>Refer to <b>A</b> for procedure</p>	<p>Normal _____</p> <p>Defective _____</p>	<p>Replace the battery</p> <p>Adjust time accuracy</p>									
TIME ACCURACY ADJUSTING METHOD—Cal. 4110A and 4100A	<p>Time accuracy is adjusted by turning the trimmer condenser.</p> <ul style="list-style-type: none"> <li>The watch will gain and 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.</li> <li>Note for handling the Trimmer Condenser. Avoid excessive depressing and turning of the trimmer condenser.</li> </ul> <p>• Be careful to place the watch with the dial side up in the center of the microphone platform, otherwise it might be impossible to time it correctly.</p>		<p><b>L</b></p> <p>MEASURING CURRENT CONSUMPTION</p> <p>In cases where a frequent battery change is required, measure the current consumption as follows:</p> <p>Procedure:</p> <p>1. Set up the Tester</p> <ul style="list-style-type: none"> <li>Range to be used . . . DC 0.03 mA</li> <li>Touch the condenser probes of 200 ~ 500 <math>\mu</math>F to the places indicated in the diagram.</li> </ul> <p>2. Measurement</p> <ul style="list-style-type: none"> <li>Remove the holding spring for battery and measure the current.</li> </ul> <table border="0"> <tr> <td>Probe</td> <td>Red (+)</td> </tr> <tr> <td>.....</td> <td>Battery surface (+)</td> </tr> <tr> <td>Probe</td> <td>Black (-)</td> </tr> <tr> <td>.....</td> <td>Circuit block (-)</td> </tr> </table> <p>(Touch the black probe to the hole of the holding spring screw for the battery).</p>	Probe	Red (+)	.....	Battery surface (+)	Probe	Black (-)	.....	Circuit block (-)	
Probe	Red (+)											
.....	Battery surface (+)											
Probe	Black (-)											
.....	Circuit block (-)											

## TESTING TIME ACCURACY

The time accuracy test is made with the Quartz Tester. When using the Quartz Tester, remember that there will be a slight difference between the tested time and the actual time accuracy as the room temperature and the watch temperature on the wrist are not the same.

For example, when the room temperature is 25°C, the Quartz Tester will show plus figures because the watch is so designed that it maintains high accuracy at the temperature on the wrist which is generally 30°C.

The watch's accuracy is less than 15 seconds per month, or this can be calculated less than 0.5 seconds per day. Therefore, even when the tester indicates an excess of plus 0.5 seconds, because the actual time accuracy will be slightly less than that indicated by the tester when worn on the wrist, it will be within the average tolerance.

Quartz watches displayed in illuminated show cases will have a higher temperature. When tested with the Quartz Tester, the figures may not be stable. Therefore, it should be read after the temperature of the watch becomes stabilized.

