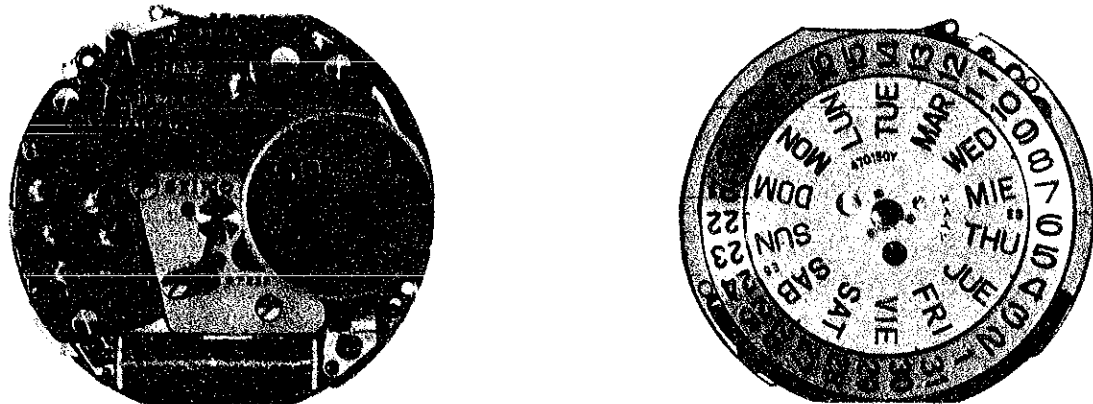


TECHNICAL GUIDE

SEIKO
QUARTZ

CAL. 97 SERIES



CONTENTS

1. SPECIFICATIONS	1
2. DISASSEMBLING, REASSEMBLING AND LUBRICATING	2
3. TIME ACCURACY ADJUSTING	5
4. CHECKING AND ADJUSTMENT	6

Based on the advanced mechanism of Cal. 71 series quartz watches which are thin and multifunctional, Cal. 97 series quartz watches are provided with the twin quartz crystal oscillator which enables the watch to maintain extremely high accuracy.

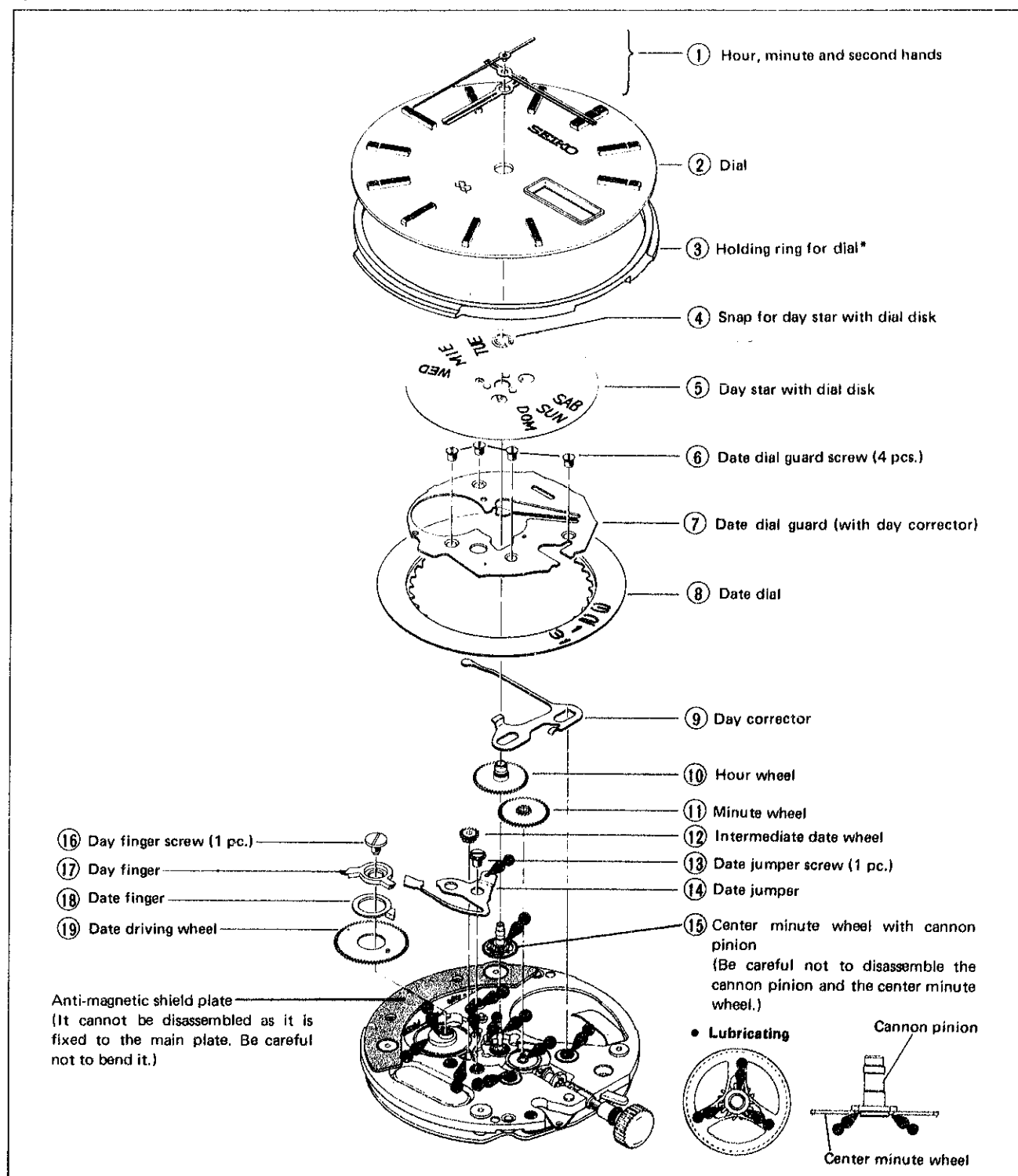
1. SPECIFICATIONS

Item	Caliber No.	9723A	9721A
Time indication		3 hand time indication (Hour, minute and second)	
Additional mechanism	Date	○	
	Day of the week	○	
	Bilingual changeover system for day of the week	○	
	Instant day setting device	○	
	Second setting device (Stops every second)	○	○
	Battery life indicator	○	○
	Electronic circuit reset switch	○	○
Crystal oscillator		32,768 Hz (Hz = Hertz Cycles per second)	
Loss/gain		Loss/gain at normal temperature range (5°C ~ 35°C) Monthly rate: less than 4 seconds (Annual rate: less than 20 seconds)	
Casing diameter		φ26.0 mm (φ23.7 mm between 3 o'clock and 9 o'clock sides)	
Height		3.3 mm without battery	2.9 mm without battery
Operational temperature range		-10°C ~ +60°C (14°F ~ 140°F)	
Driving system		Step motor system (2 poles)	
Regulation system		Trimmer condenser	
Battery power		Silver oxide battery (SEIKO SR1130SW or SB-AU or Maxell SR1130SW) Battery life is approximately 5 years. Voltage: 1.55 V	
Jewels		2 jewels	

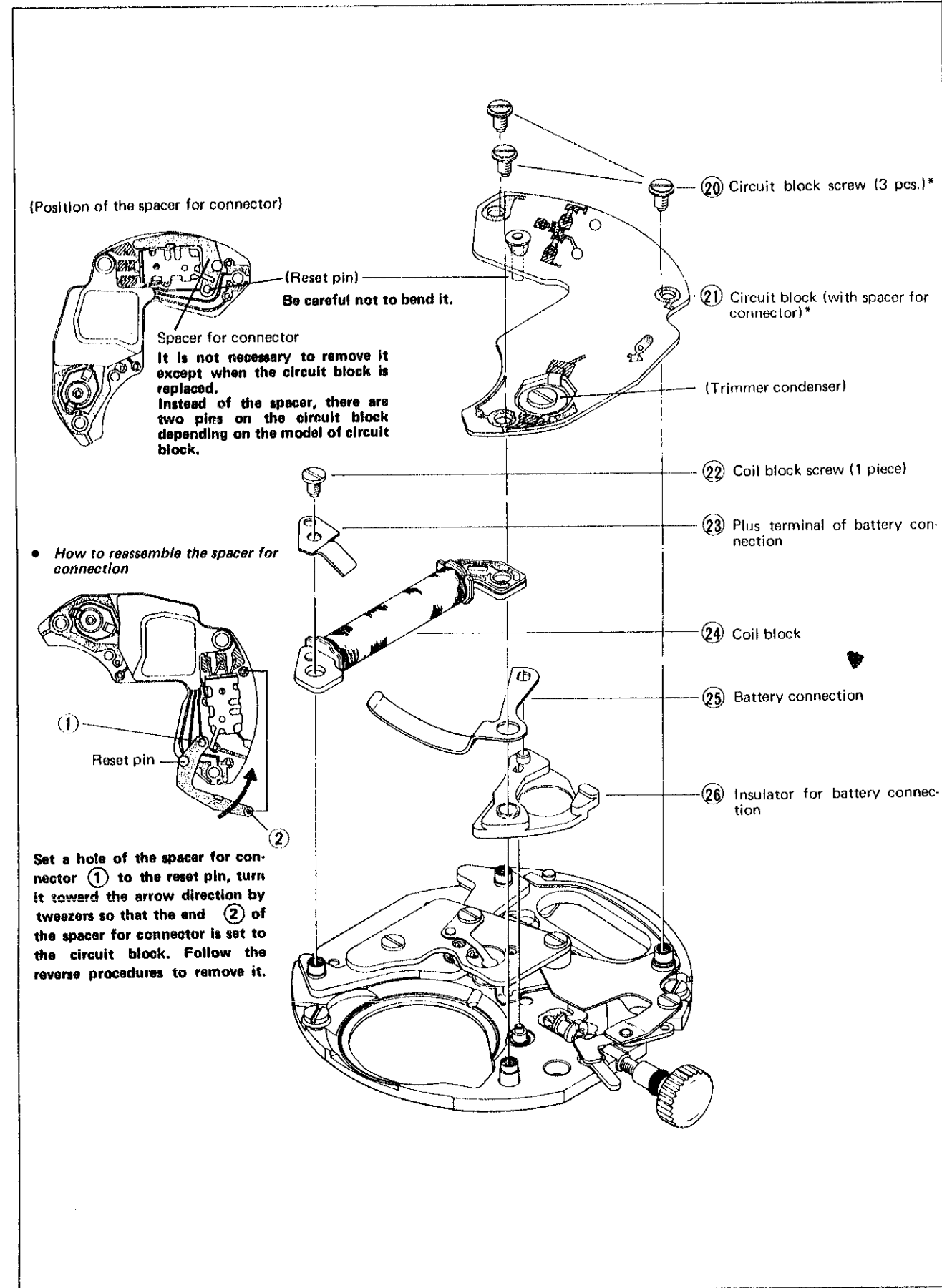
2. DISASSEMBLING, REASSEMBLING AND LUBRICATING

- The movement parts of Cal. 97 Series and Cal. 71 Series are the same except the parts designated * mark.
- Refer to the "Checking and Adjustment" of the Technical Guide, Cal. 7123 for remarks for "Disassembling and Reassembling", and "Checking and Adjustment".
- **Disassembling and Reassembling**
 Disassembling procedure Figs: ① ~ ④⑩
 Reassembling procedure Figs: ④⑩ ~ ①
- **Lubricating**
 Types of oil
 ● Moebius A
 ○ SEIKO Watch Oil S-6
 Oil quantity
 ○ Normal
- Use the movement holder S-651 for Cal. 4316, Cal. 48, Cal. 58 and Cal. 71.

1) Calendar mechanism

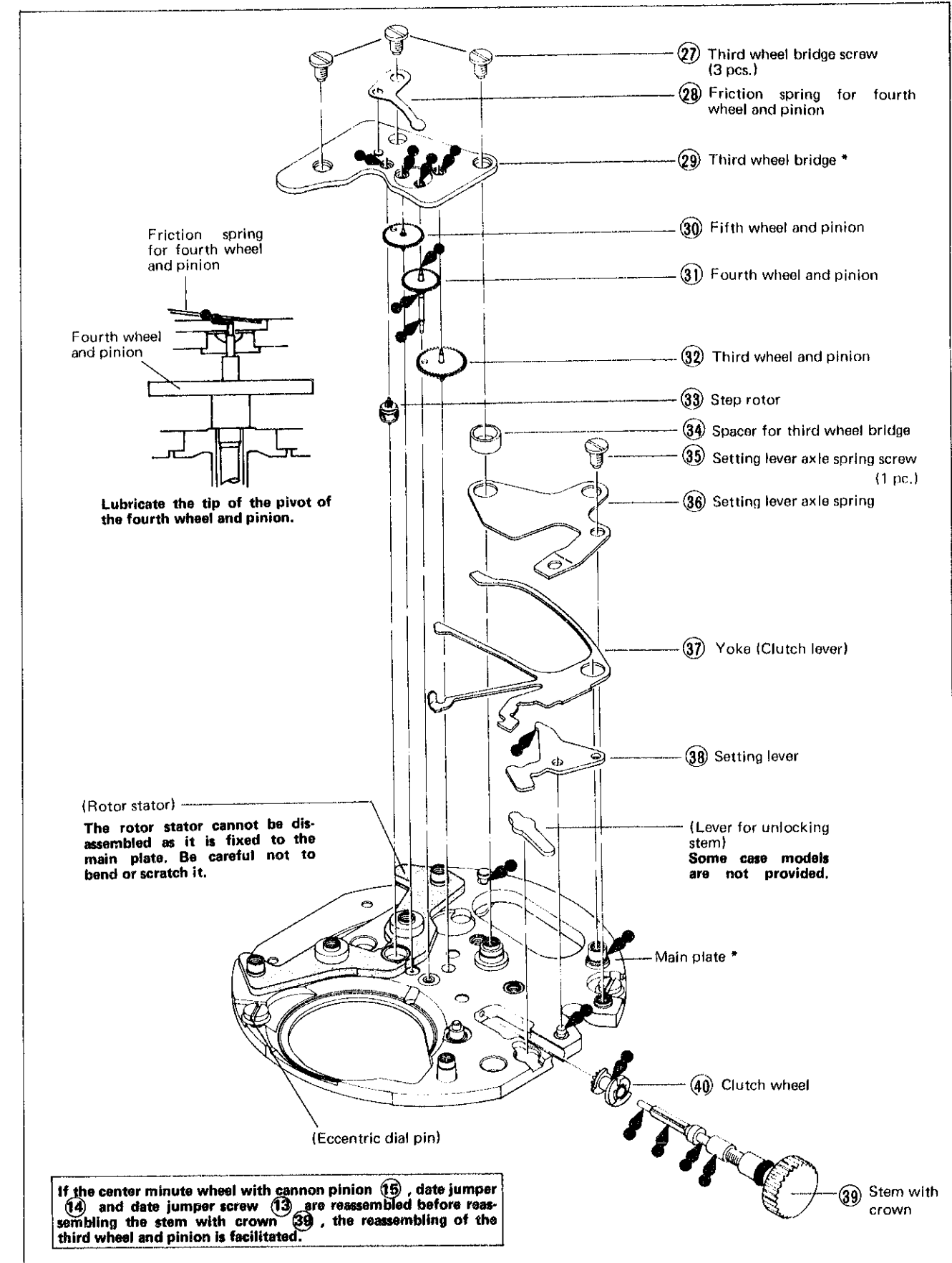


2) Electronic circuit



3) Gear train and setting mechanism

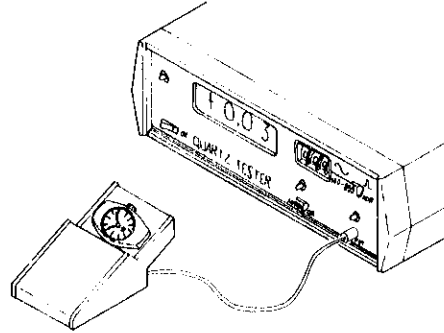
● How to lubricate the fourth wheel and pinion



3. TIME ACCURACY ADJUSTING

1) Remarks for time accuracy adjusting

- Time accuracy of Cal. 97 Series watches is adjusted by turning the trimmer condenser, but time accuracy adjusting of the circuit block is controlled by the trimmer condenser together with the variable frequency countdown system (by which the frequency of the oscillator circuit is changed according to the oscillation of the crystal oscillator) which is used for time accuracy adjusting of Cal. 5931. Accordingly, be sure to set the gate time selection switch of the Quartz Tester at "0.1" or "10" to measure the time accuracy.



- At any other gate time, the exact time cannot be obtained.
- Do not use the Timing microphone (US-32), which does not indicate the exact time.

2) Checking items for adjusting time accuracy

As the time accuracy of Cal. 97 Series watches is extremely high and the loss or gain is approximately 20 seconds a year, the daily rate may be slightly changed by the way the watch is used.

Check causes of malfunction in the following matters when the watch is received to be repaired.

- Check to see if the watch was left for a long time at temperatures below 5°C or over 35°C such as in a showcase exposed to direct sunlight or in a car.
As the daily rate may be slightly changed at temperatures exceeding normal temperature range in summer or winter, the monthly rate will not be exactly one twelfth of the annual rate.
(Although the watch may have a loss or gain of some seconds at temperatures exceeding the normal temperature range, extremely high time accuracy is obtained when temperature is within the normal temperature range.)
- Check to see if the watch was left on or near the following things which generate strong magnetism.
Ex. Electric health band (800 – 1200 gauss), electric bracelet (700 – 1200 gauss), or necklace (1300 gauss), etc.
- Check to see if the watch was exposed to strong shocks when a consumer was playing a sport, if it was used in the manner that it was exposed to a shock continuously, or if it hit against a hard object or it dropped on a hard object.

4. CHECKING AND ADJUSTMENT

1. Check accuracy

Procedure	Result	Adjustment and Repair
<p>Check loss and gain of time. (When the battery is replaced with a new one, check loss and gain several minutes later.)</p> <p>(1) Set the gate time selection switch of the Quartz Tester at "0.1" or "10". (Any quartz tester except the QT-10 can measure the daily rate.)</p>	<p>Normal ... within ± 0.05 second</p>	
	<p>Defective</p> <ul style="list-style-type: none"> ± 0.05 second \sim ± 0.10 second over ± 0.10 second 	<p>Proceed to <u>Time Accuracy Adjusting</u>.</p> <p>Replace the circuit block with a new one.* Proceed to <u>Time Accuracy Adjusting</u>.</p>
<p>(2) Place the watch on the microphone after reassembling the case, measure the daily rate.</p> <p>Remarks: If the measured value indicates a slight difference each time when the daily rate is measured, find the average value after several measurements.</p>		<p>* If the daily rate is over ± 0.1 second, the temperature compensation device is defective, and the complete time accuracy adjusting is not possible however the daily rate is adjusted in 24°C as it is varied by the difference of temperature. Be sure to replace the circuit block with a new one. Even if the daily rate is over ± 0.1 second after the circuit block is replaced, time accuracy adjusting can be completed.</p>
	<p>The daily rate must be measured in a room at around 24°C.</p>	

2. Time accuracy adjusting

- The daily rate may change slightly after the caseband and case back are reassembled. This difference of the daily rate have been negligible, but it cannot be ignored in Cal. 97 Series watches which are required to maintain extremely high accuracy.

Follow the procedures below for time accuracy adjusting.

(1) When consumer requires to adjust loss and gain.

Procedure 1: Convert loss and gain into the daily rate.

[ex] There is constant 3 seconds loss a month.
 $3 \text{ seconds} \div 30 \text{ days} = -0.10 \text{ second per day}$

Procedure 2: Disassemble the caseband and case back, and place the movement on the microphone and measure

[ex] the daily rate.

When the Quartz Tester indicates: $-0.08 \text{ second per day}$

Procedure 3: Adjust the daily rate to the value obtained by adding the value calculated by the calculation formula to the daily rate required ($+0.01 \text{ second}$):

$$\begin{array}{r} -0.08 \text{ second per day} \\ -) -0.10 \text{ second per day} \\ \hline +0.02 + 0.01 = +0.03 \text{ second per day} \end{array}$$

(2) When a consumer does not mention any particular loss and gain, or when the case back is removed.

(3) When the circuit block is replaced while the watch is repaired.

In case of (2) and (3), it is required to check the changes of the daily rate caused by the disassembling and re-assembling of the case. Adjust the daily rate considering the above changes.

Procedure 1: Check the daily rate with the case assembled.

[ex] $+0.05 \text{ second per day}$

Procedure 2: Check the daily rate without the case.

[ex] $+0.09 \text{ second per day}$

Procedure 3: Check the difference of the daily rate measured in procedures (1) and (2).

$$\begin{array}{r} +0.05 \text{ second per day} \\ -) +0.09 \text{ second per day} \\ \hline -0.04 \text{ second per day} \dots \text{Difference} \end{array}$$

Procedure 4: As the calculation formula indicates -0.04 second , in order to make the daily rate $+0.01 \text{ second}$ (desired daily rate) when the case is assembled, the daily rate must be $+0.05$ when the case is not assembled.

When the daily rate is $+0.09 \text{ second}$ without case, adjust it to -0.04 second when the case is assembled.

$$\begin{array}{r} +0.09 \text{ second per day} \\ -) -0.04 \text{ second per day} \\ \hline +0.05 \text{ second per day} \end{array}$$

(After adjusting the daily rate by following the above procedures, check the daily rate 24 hours later, and the adjustment is completed if the daily rate is from -0.04 second to $+0.05 \text{ second}$ after it is checked several times.)

Remarks for time accuracy adjusting:

- Watch position : 3 o'clock side up
- Frequency : Several times
- Temperature : 24°C (Allowable difference $\pm 2^{\circ}\text{C}$)
- Desired daily rate : $+0.01 \text{ second}^*$

* Cal. 97 Series watches may lose time extremely a little depending on the way the watch is used (position and temperature) and the desired daily rate therefore must be from 0.00 second to $+0.02 \text{ second}$.

Note: As the time accuracy is required to be adjusted to $1/1000 \text{ second}$, be sure to turn the trimmer condenser little by little with most care.

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