1. Outline

This is a microminiature quartz watch for ladies, featuring the world smallest (capacity) movement which is developed through the Citizen's superb technology along with its concerted efforts.

Thanks to such microminiature movement full of diversity, a wide variety of designing becomes possible. Thus this new ladies' quartz watch will enhance the Citizen brand image to be also suited to take its stand in the market of the high-class watches.

2. Features

1) The microminiature and thin-gage quartz oscillation type watch for ladies with high-class ornamental sense, featuring the 30-second hand movement with no center second.
Its movement features the world smallest capacity of 120mm^3, along with the size of 7.0 x 9.0mm (maximum dia. 9.5mmϕ), the thickness of 2.0mm^t (incl. the power cell part) the case thickness: 3.1mm^t

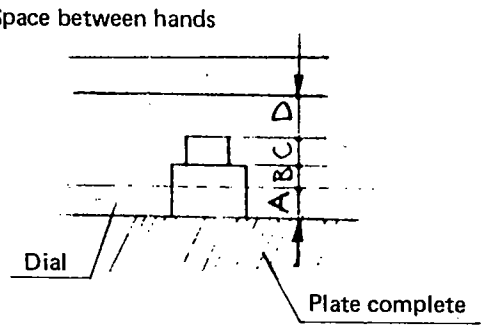
2) The hand setting is of the electromagnetic correction system by means of the push-button.

3. Specifications

Caliber No.	1500E-10	1501E-10
Movement	Size : 7.0 x 9.0 mm (Mechanical dia.) 9.5 mmϕ (Maximum dia.) Thickness : 2.0mm (incl. power cell part)	
Accuracy	±15 sec./month at normal temperature	
Oscillation	32,768 Hz	
Converter	Bipolar step motor (30-second hand movement)	
Integrated circuit	C/MOS-LSI (one unit)	
Effective temperature range	±0°C ~ +60°C (32°F ~ 140°F)	
Hand setting	Electromagnetic correction system by push-button	
Power cell (Power cell block)	Parts No. : 280-49 Cell code : SR610W (UASA)	Parts No. : 280-54 Cell code : DQV (TOSHIBA)
	Size : 6.8ϕ x 1.0mm^t Nominal voltage: 1.5V Capacity : 5.5mAH Life time : About 1.5 years	

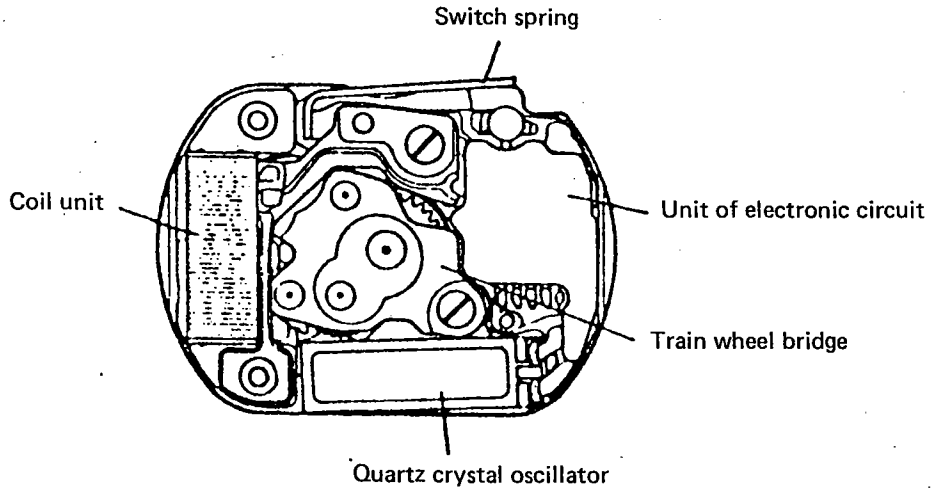
* Points of Difference between Cal. Nos. 1500 and 1501

The space between hands plus the thickness of dial and hands are different between Cal. Nos. 1500 and 1501.
Owing to these changes, the working efficiency is more increased for disassembly and assembly of Cal. No. 1501. Furthermore Cal. No. 1501 adapts a new method by which the dial is fixed to the movement holder ring. This increases the variety of designs to be suited to the ultrahigh-class watches of Citizen.



CAL NO.	1500E-10	1501E-10
A (thickness of dial)	50 μ	200 μ
B	140	220
C	160	250
D	120	150
Thickness of hour/ minute hands	40	100

★ Structure of Movement

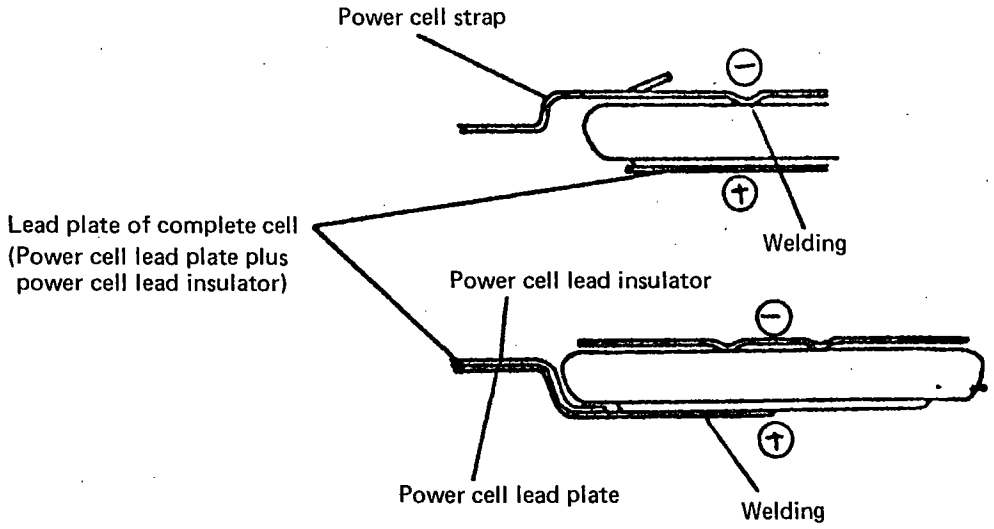


[Plan of movement without power cell block, power cell connector and power cell insulator.]

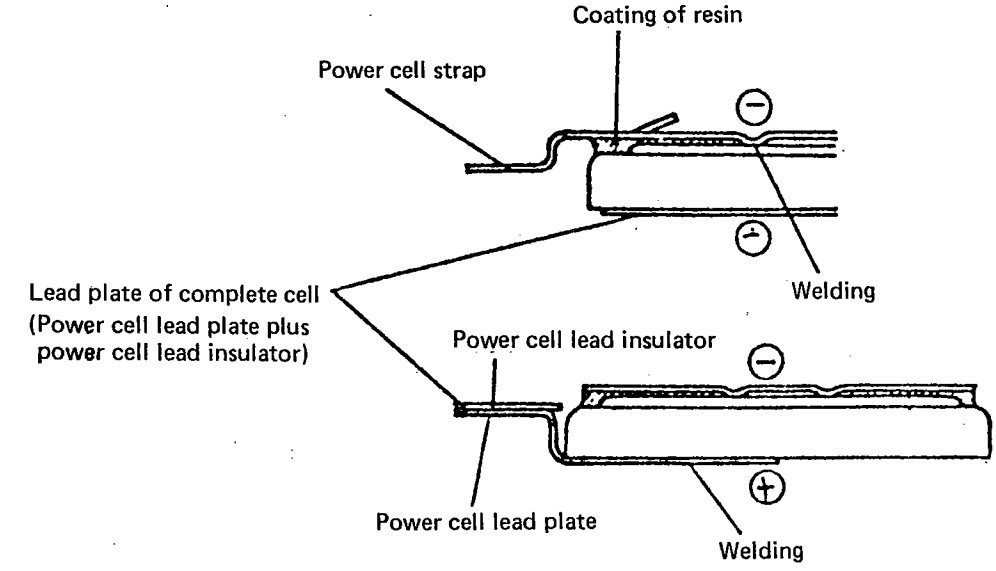
Power cells

The Cal. No. 1500 uses the power cell of 280-49; while Cal. No. 1501 uses the power cell of 280-54 respectively.
These two power cells differ from each other just in the markings provided on the power cell straps.
As listed below, two different types (Toshiba and Uasa) are available for the power cells. Notice that the polarity of a plate complete is negative (–).

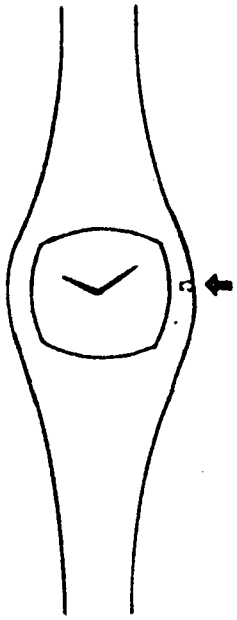
Cell of Toshiba	Cell code : DQV Composition : AgO/Na (Voltage non-control type)



Cell of Uasa	Cell code : SR610W Composition : Ag_2O/Na (Voltage non-control type)



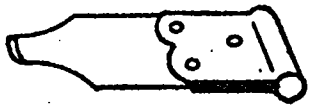
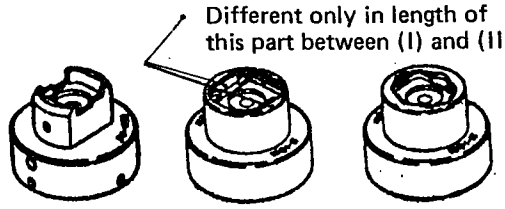
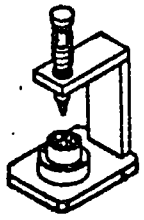
4. Handling Instructions

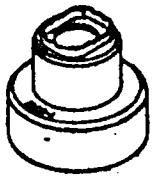
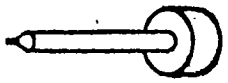
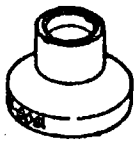
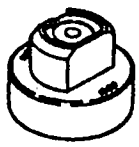


The time setting is carried out by pressing the push-button.
With push of the push-button, the hands advance forward.
In this case, the time equivalent to 30 seconds advances with every push of the push-button (repetition of push and release with 1-second interval). And in case the push-button is pressed continuously (1 second or more), the hands move continuously to secure the quick setting.

5. Main Tools and Jigs

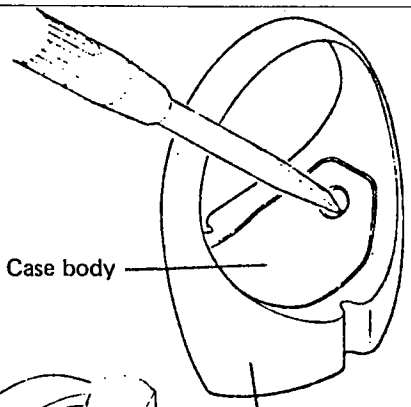
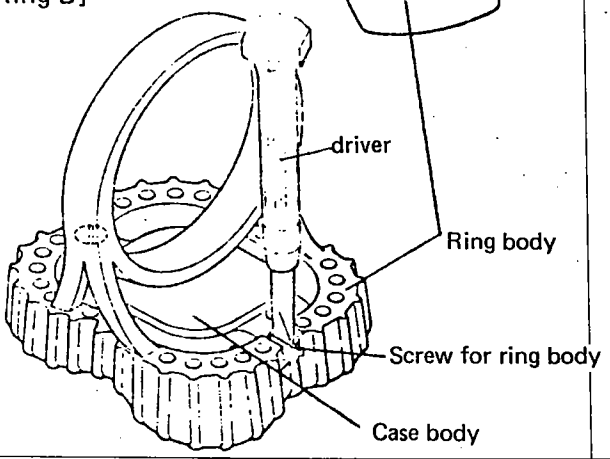
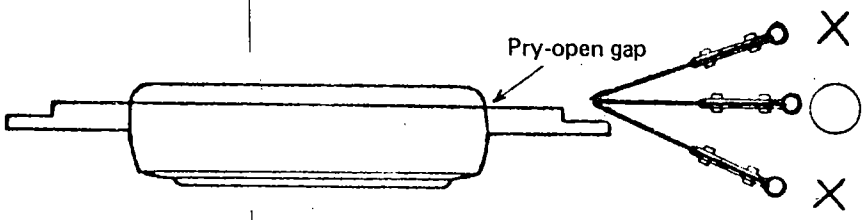
The following tools and jigs are provided for the Cal. No. 15-series watches. Choose proper one among these tools and jigs in accordance with the contents of application.

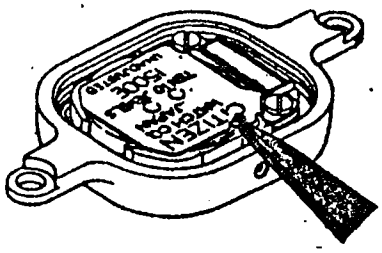
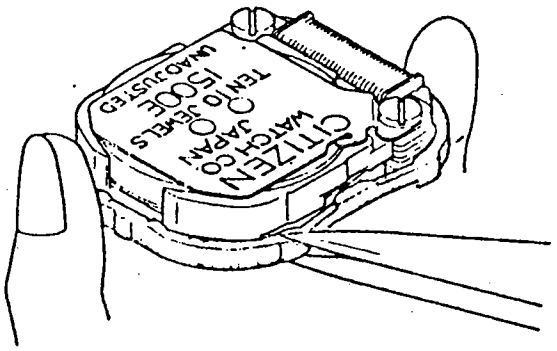
Tools/jigs	Form	Application
Pry opener		A pry opener exclusive for Cal. No. 790 is used.
Movement holder for attachment of hands	 ·CAL 1500 (I) ·CAL 1501(I) ·CAL 1501(II) ·CAL 1501 (III)	• three types are available for Cal. No. 1501 according to the form of the movement holding ring. • The height of a pin provided at the center of the movement holder can be adjusted by turning a screw on the back side of the holder with a driver.
Hand setting stand		

Tools/jigs	Form	Application
Movement holder for casing		Use this movement holder when setting the movement holding ring or the case body.
Hand setting rod		Two types are available as follows. • Hand setting rod with hole at tip ..... for hour hand • Hand setting rod with no hole at tip..... for minute hand
Pushing rod for push-button		This rod is used when carrying out the adjustment of time rate with a complete watch for trouble-shooting and adjustment with a bezel only.
Hand remover		This hand remover is common with Cal. No. 7900. Before use, apply the light buffing to the tip of the hand remover to avoid giving flaws to the dial or hands.
Movement holder for replacement of power cell		This movement holder bears a marking "1500" and can be used in common with Cal. No. 1501.
Movement holder for disassembly/ assembly		This movement holder also bears a marking "1500" and can be used in common with Cal. No. 1501.

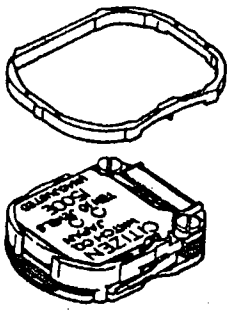
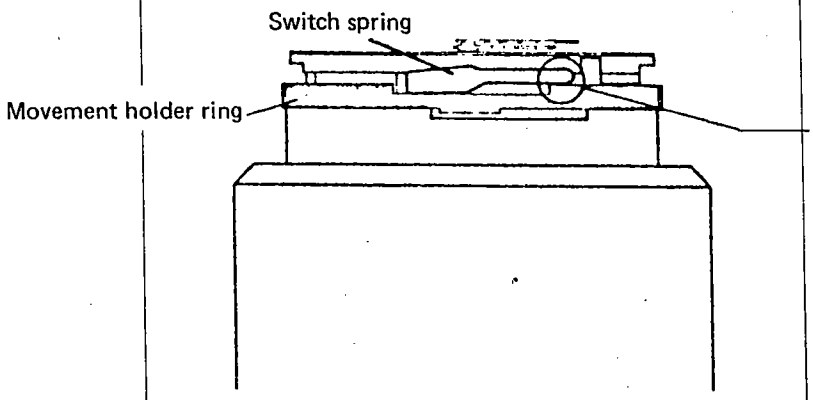
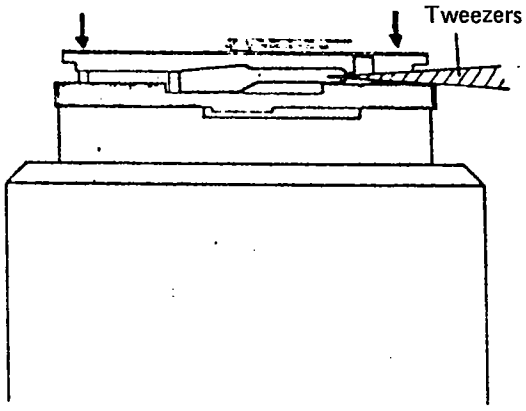
6. Appearance Disassembly/Assembly

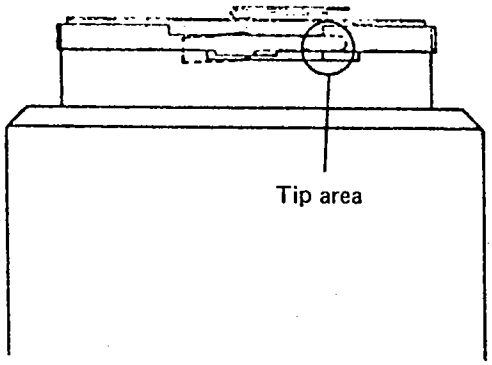
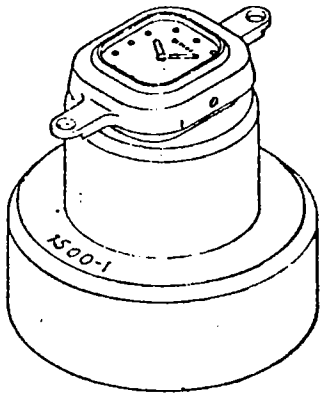
For the ring-type models, the screw for ring body is removed first to take out the case body.

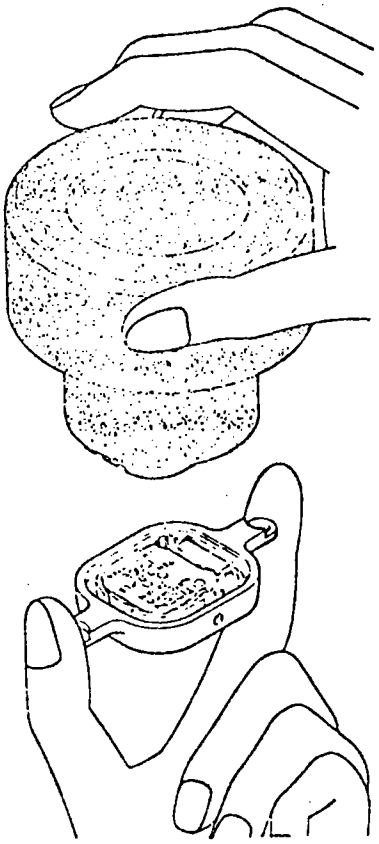
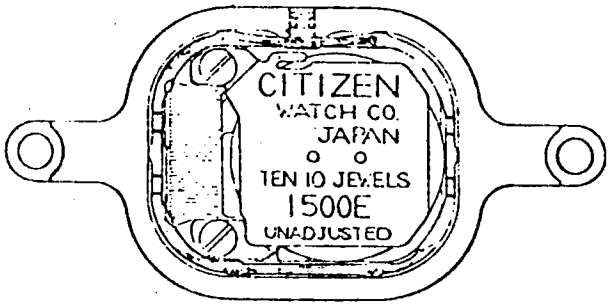
Working procedure	Illustration of working	Remarks
1 Removal of case body (only for ring A and B)	[Ring A]  [Ring B]  	The two screws for ring body are removed, and then the case body is taken out. The appearance structure of the bracelet-type watch is identical to the conventional double-part type (case back biting type).
2 Removal of case back (The appearance mode is described with ring B.)	Hereafter, the procedure is common to each model.  Pry-open gaps: Ring type : 6-o'clock side Bracelet type : 9-o'clock side	The pry-opener is inserted horizontally into the pry-open gap and then into other areas in the same way after securing an ample space at the pry-open gap area. Then the case back is removed when it comes up horizontally.

Working procedure	Illustration of working	Remarks
3 Detachment of movement		Never fail to hold the movement only at the earth part of the power cell strap.
4 Removal of casing supporter		The movement must be held in the 11-5 o'clock direction as illustrated when using your fingers to remove the casing supporter. The movement holder ring can also be removed while it is put on the movement holder with the dial side of the movement turned up.
5 Detachment of hands	1) The space between hands of this caliber is small. When detaching the hands, lay a vinyl sheet or the like over the hands to avoid damaging the dial or hands. 2) Both the hour and minute hands are put together and pulled out at one time. * Use a hand remover exclusive for Cal. No. 150 **.	Avoid using again the hand once used.

Working procedure	Illustration of working	Remarks
6 Detachment of dial	1) Two screws for dial are unset. 2) The dial is detached.	Avoid applying the strong force to a driver when unsetting the screws. Be careful not to slip a driver to avoid giving flaws or malformation to the dial or the plate complete. Hold soft the hidden outer circumference area of the dial with a tweezers or the like.
7 Attachment of dial	The two screws for dial are driven alternately after deciding an accurate center position.	Mind to hide the center hold of the dial since the outer diameter of the hand skirt is nearly equal to the center hole of the dial.
8 Attachment of hour hand	The hour hand is attached to the dial after putting the power cell into the movement.	Make sure that the hour hand does not rub the dial at the worst.
9 Attachment of minute hand	After attachment of the minute hand, make sure the following points. • The minute hand does not rub neither the hour hand nor the dial. • The hands are fitted in a correct way.	The electromagnetic correction system is applied to this caliber. Thus the minute hand must be attached to the dial after advancing the time quickly up to 11:58 for instance and then setting the time at 12 o'clock with a stepped advance of time.

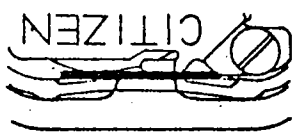
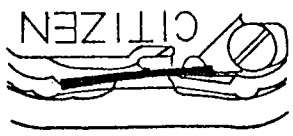
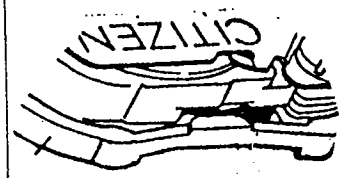
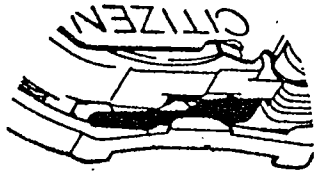
Working procedure	Illustration of working	Remarks
10 Attachment of movement holder ring to movement for replacement.	① The movement holder ring is attached temporarily to the movement with the side having two joggles each in the 12-6 o'clock direction turned to the case back side. 	
	② The movement is set on the movement holder. 	The movement holder ring must not be pushed at this moment. The tip of the switch spring hits the movement holder ring to be held as it is.
	③ The movement is pushed in soft while the switch spring is being pressed. 	

Working procedure	Illustration of working	Remarks
	④ The condition of attachment is confirmed for the movement holder ring. Points of confirmation: 1) The movement holder ring must be parallel to the surface of the plate over the entire circumference of the movement holder ring. 2) The switch spring must be covered up by the movement holder ring, or the tip of the switch spring can be seen a little from the lower side.  	The confirmation is given with the movement being put on the movement holder.
11 Confirmation of push-button's working	The push-button is pressed in the state of bezel alone to confirm whether the push-button works smooth or not. In case the smooth working is not secured for the push-button. ↓ The push-button must be cleaned along with clearing of the dust on the case.	The pushing rod for push-button is used. The silicone oil is applied to the O-ring of the push-button.
12 Attachment of bezel	① The bezel is attached to the movement which is put on the movement holder. 	

Working procedure	Illustration of working	Remarks
	② The bezel is held by fingers, and then the movement holder is turned over to detach the bezel gently from the movement holder. 	
	③ The state of attachment is confirmed through the binoculars for the movement holder ring and the movement. Points of checking: 1) The steady positioning of the whole movement holder ring is confirmed at the position right above the movement. 	Never fail to use the binoculars. Make sure that the movement holder ring is not floating at all.

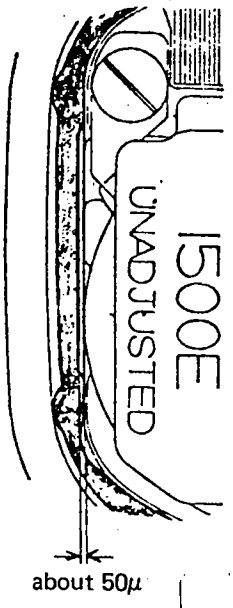
Working procedure	Illustration of working	Remarks

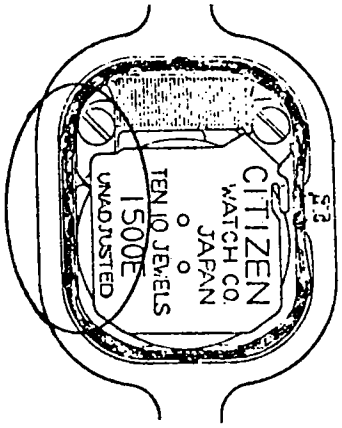
2) The setting position between the switch spring and the movement holding ring is confirmed from upper and oblique sides.

	Correct	Wrong
Upside view		
Side view		

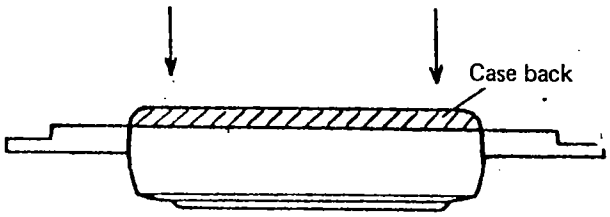
In the completed watch, the push-button pressures the switch spring via the movement holder ring and thus the tip (in the 2-o'clock direction) of the switch spring touches the pattern of the unit of electronic circuit. In this connection, the closing of the case back in the incomplete condition will cause the defective working of the watch.

3) Make sure that a gap of about 50μ is secured between the plate and the movement holder ring in the 9-o'clock direction of the movement.





If the case back is closed with the movement holder ring positioned on the plate or with no gap secured between the plate and the movement holder ring the quartz crystal oscillator may be broken.

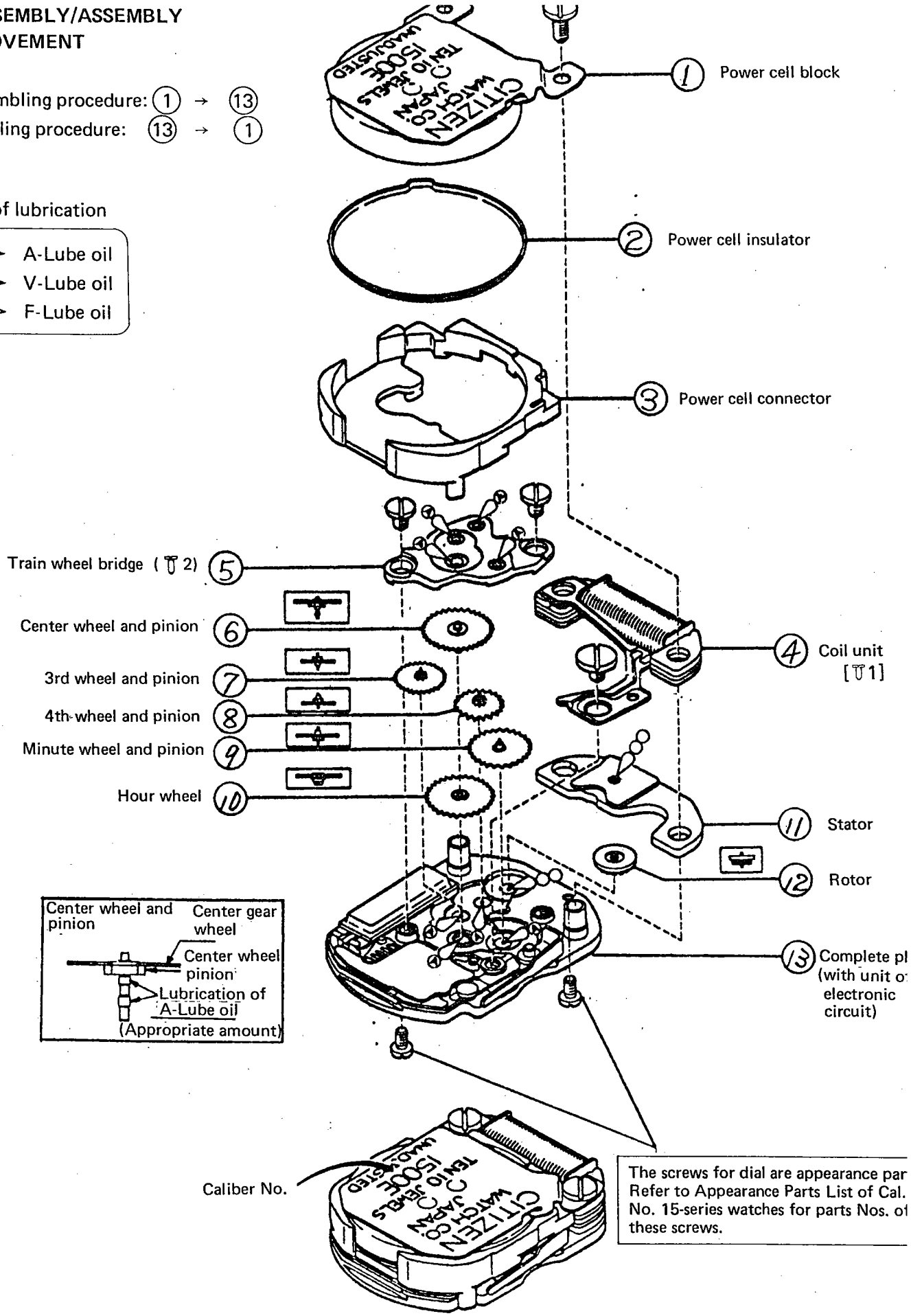
Working procedure	Illustration of working	Remarks
13 Closing of case back		The case back is closed horizontally as much as possible to avoid the shift of the movement holder ring after fitting the notch area of the case back to the push-button area.
14 Attachment of case body to ring body	(For ring A and only) The case body is attached to the ring body by referring to the illustration of working procedure 1 .	
15 Check of appearance & functions	① Make sure that no dust nor stains attach to the upper surface of the dial or the inside of the glass. ② The working of the push-button is checked with use of the pushing rod for push-button. · 1 push : ⟶ Advance of 30 sec. · Continuous push (1 sec. or more): ⟶ Quick advance of time ③ The time is measured by the timing machine. As this watch adapts the DFC (digital frequency control) system, the "MEASURE TIME" of the timing machine must be set to 10 sec. or its integer-fold value.	This watch has no time control terminal and thus cannot receive the time adjustment in the market.

7. DISASSEMBLY/ASSEMBLY OF MOVEMENT

Disassembling procedure: (1) → (13)
Assembling procedure: (13) → (1)

Marks of lubrication

- (A) A-Lube oil
- (V) V-Lube oil
- F-Lube oil



- **Notes on disassembly/assembly of movement**

1) Detachment of power cell block
The power cell block is unset by holding soft with a tweezers at the area of the screw part of the power cell strap at the 3-o'clock position.

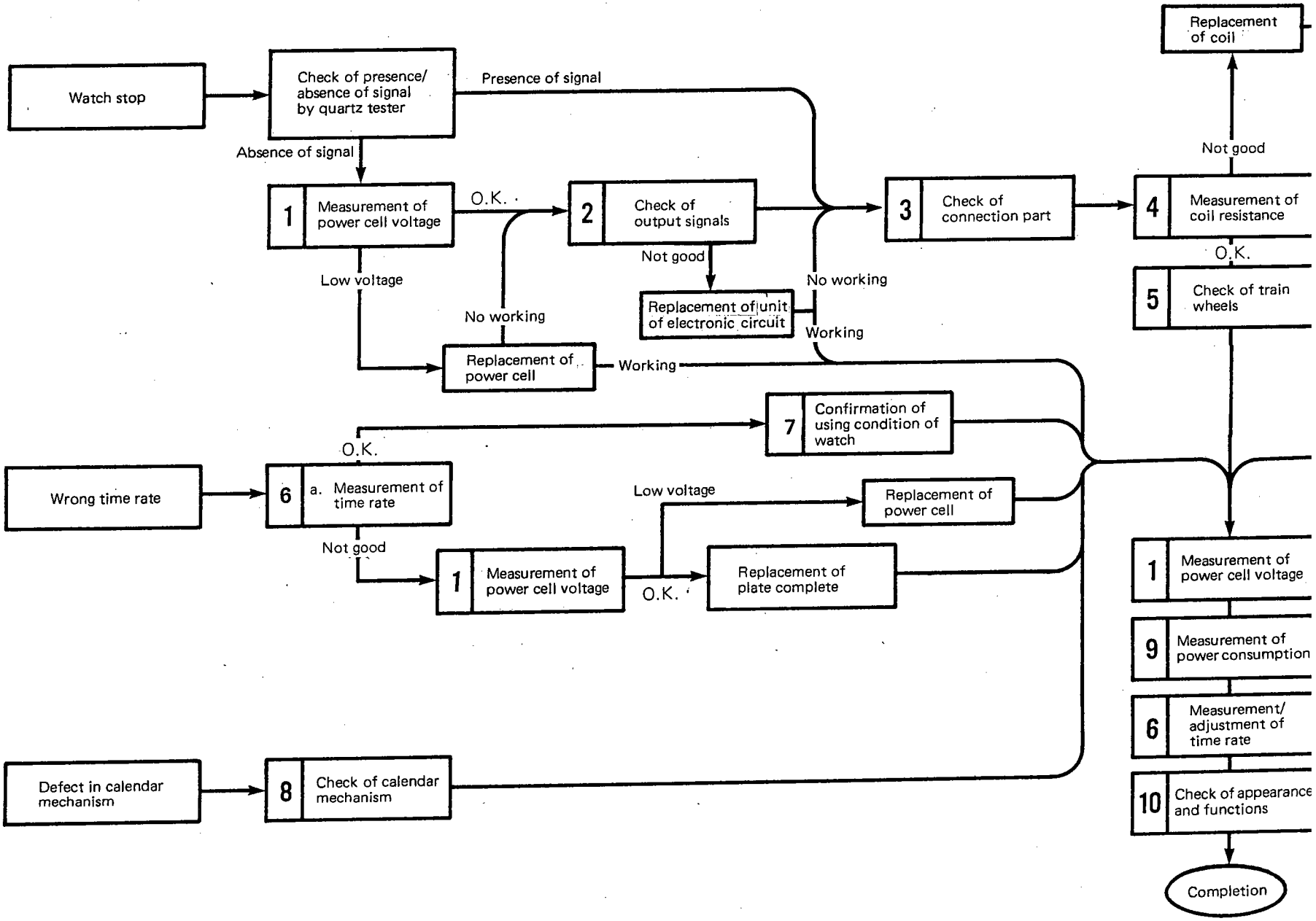
2) Attachment/detachment of screw for coil
The screw for coil is attached and detached while pressing light the upper or side surface of the power cell strap with fingers.
If the strong force is applied from upside, the exfoliation will be caused to the IC.

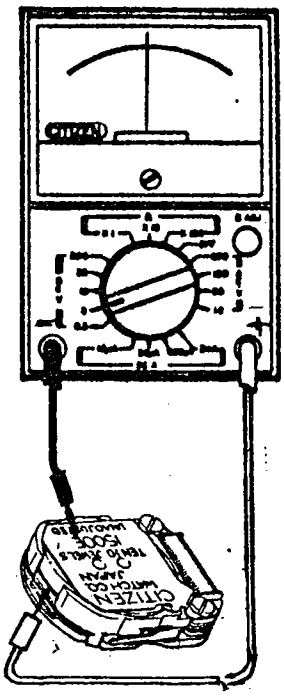
3) A quartz crystal oscillator, the IC parts and others are mounted on a plate complete. And the warp of the plate complete, if arises, will cause the disconnection of the quartz crystal oscillator or other faults.
In this respect, never fail to use the designated movement holder.

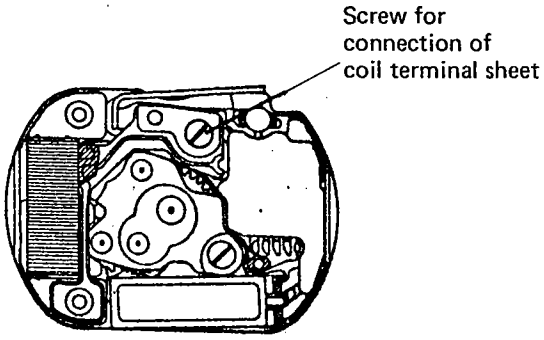
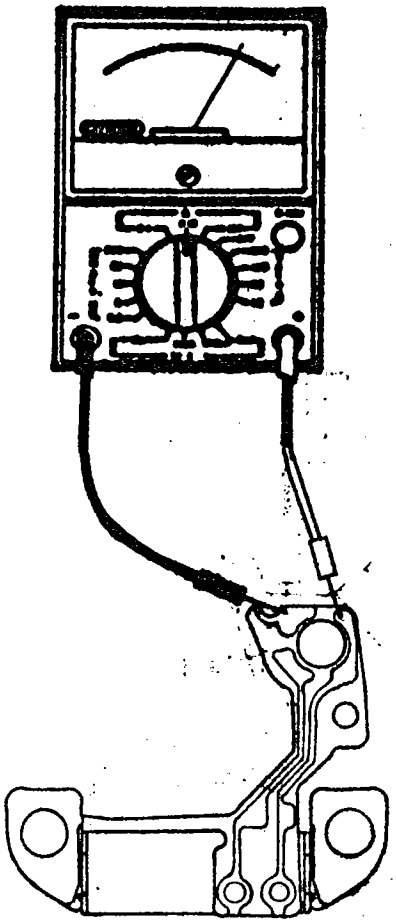
4) The washing of the plate complete must be done by hands.

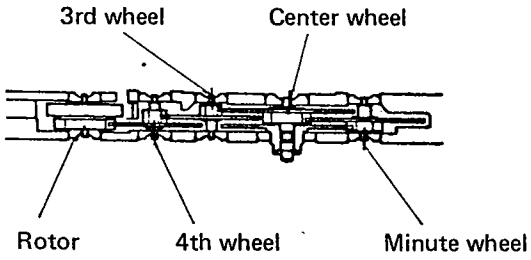
5) The hour wheel can easily be removed by pushing light the shaft of the hour wheel from the side opposite to the plate complete and with use of a tweezer. Avoid holding the tooth part of the hour wheel with strong force to prevent the malformation or damage of the teeth. This is due to a very small thickness of the hour wheel.

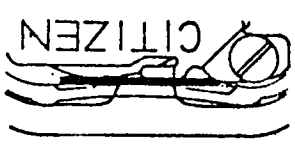
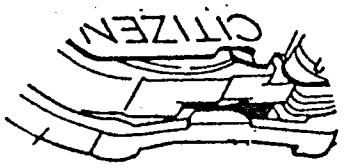
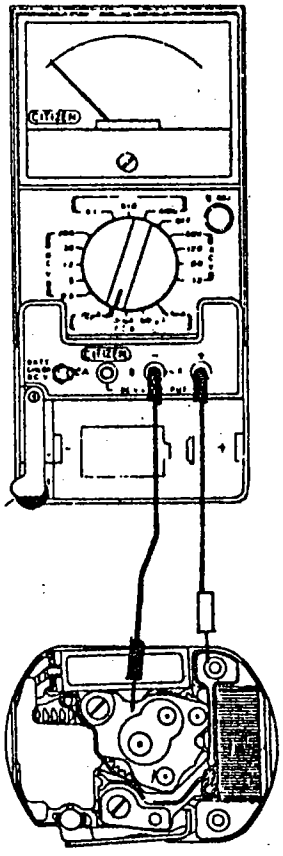
8 FLOW CHART OF TROUBLESHOOTING AND ADJUSTMENT



Checking items	How to check	Result & treatment
1 Measurement of power cell voltage	 A contact is secured by putting the tip of a lead wire into the bottom area (+) of the power cell from this side. The minus (—) lead wire is previously applied to the movement as illustrated above.	Over 1.5V ⟶ Nondefective Under 1.5V ⟶ Replacement of power cell Note: If the measured watch has been used 1.5 years or longer, the power cell must be replaced with new one although the measured value is 1.5V or higher.
2 Check of 512 Hz oscillation of quartz crystal oscillator	Refer to attached "Check by Oscilloscope".	

Checking items	How to check	Result & treatment
3	· Make sure that the connection part between the coil terminal sheet and the unit of electronic circuit is free from dust or stains. · Make sure that the screw for connection of coil terminal sheet is driven tight. 	Dust or stains ⟶ To be cleared away Incomplete driving of screw ⟶ To be driven tight
4 Measurement of coil resistance		1.6 ~ 2.2 kΩ ⟶ Nondefective Outside the above range of resistance ⟶ Replacement of coil unit * The pattern of the coil connection terminal sheet has a difference of level, and this area must be held by a Rodico or the like when measuring the coil resistance.

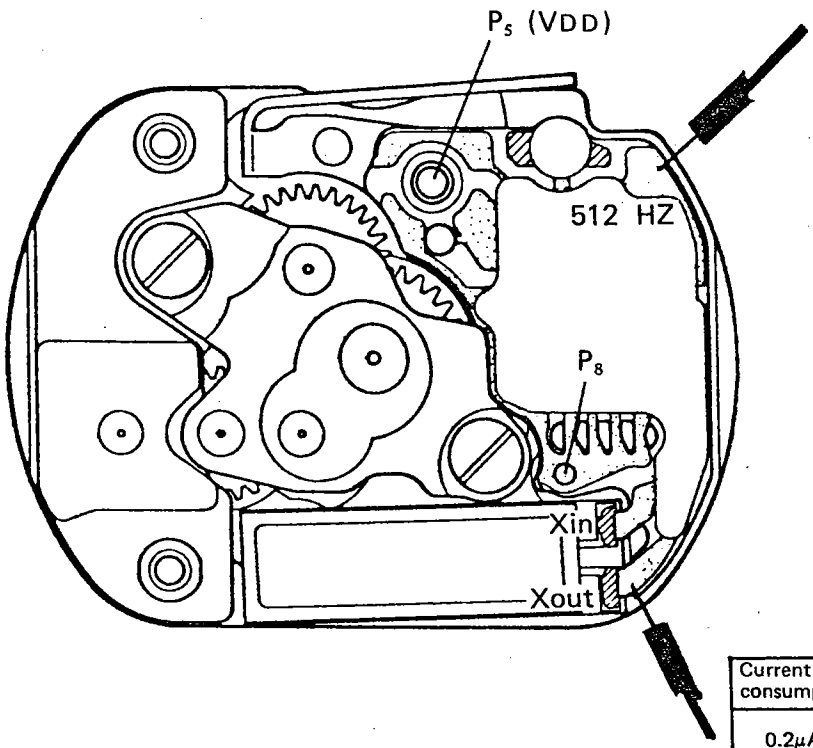
Checking items	How to check	Result & treatment
5 Check of train wheels (incl. minute wheel & hour wheel)	1) Make sure that a proper clearance is secured for each wheel. (Rotor 10 ~ 40 μ : Center, 3rd & 4th wheels plus minute/hour wheels 20 ~ 40 μ) 2) Make sure that the lubrication is appropriate to each wheel. 3) Make sure that each wheel is completely free from dust or stains.  	Break of gears due to inappropriate clearance ⟶ Replacement of train wheel bridge or broken gears Inappropriate lubrication ⟶ Lubrication again Dust or stains ⟶ To be cleared away
6 Measurement of time rate	The unit time of measurement must be set at "10 sec." or an integerfold period of time of 10 sec. owing to the DFC method. If a big error is detected in the time rate owing to an impact or the like factor, the plate complete must be replaced with new one since this caliber applies the DFC method.	Normal time rate ⟶ Confirmation of using condition of watch
7 Confirmation of using condition of watch	The using condition of a watch must be confirmed with its user about the following points. 1) Whether or not the user handled the watch in a wrong way. 2) Whether or not the user used the watch outside its effective range of temperature. 3) How many days passed since the latest adjustment of time rate ? 4) Other factors related to the handling of watch.	

Checking.items	How to check	Result & treatment
8 Check of switch mechanism	1) Make sure that the switch spring is set in a correct way. 2) Make sure that the push-button and the area around the switch spring are free from dust or stains. 3) Make sure that the push-button and the switch spring are free from any mal-formation and break. * Never fail to apply the silicone oil when replacing or cleaning the push button. · Correct setting of switch spring  (Upside view)  (Side view)	Defective setting of switch spring → To be set again Dust or stains → To be cleared away Malformation or break of push-button or switch spring → Repair or replacement
9 Measurement of power consumption		Under 0.4μA → Nondefective Over 0.4μA → Measurement of circuit power consumption · Measurement of circuit power consumption Under 0.2μA → Washing & lubrication of movement Over 0.2μA → Replacement of plate complete *The power consumption value of this caliber is small compared with other calibers, and thus the tester's amplitude is very small. So take the meticulous care to read out the measured value.

Checking items	How to check	Result & treatment
10 Check of appearance & function	The following points are checked with a complete watch. 1) The push-button can be operated in a correct and smooth way. 2) The area of each function is free from dust or stains. * Refer to 15 (Check of appearance & function) of 6. (Appearance Disassembly/ Assembly). — Page 6.	

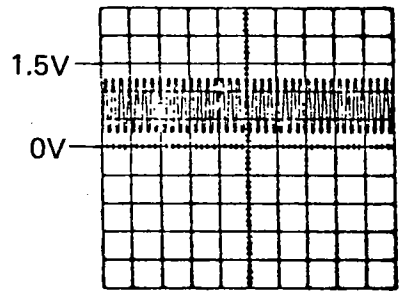
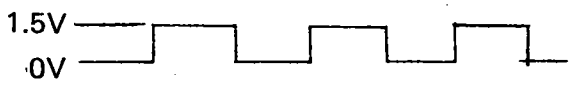
Cal. No.	150 **

Plate complete



Current consumption	Element at Xin side	Element at Xout side
0.2μA		

Waveform diagram

Waveform of quartz crystal oscillation	512 HZ
	

Notes

1. Check the state of conduction (presence or absence of crack) on both the upper and lower surfaces of the unit of electronic circuit by means of a binocular microscope since P_5 (VDD) of the unit of electronic circuit is a through hole.
2. Make sure that the area P_8 of the unit of electronic circuit is free from any exfoliation of solder.
3. The areas around Xin and Xout are coated, and make sure that these areas are free from cracks.