

TECHNICAL GUIDE

CAL. Y434A

ANALOGUE QUARTZ

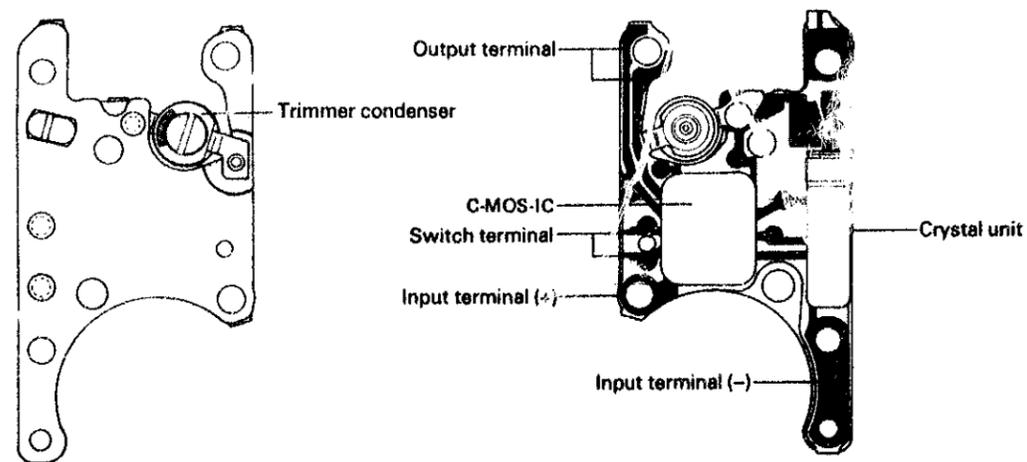
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I. SPECIFICATIONS

Item	Cal. No.	Y434A
Time indication		Two hands (hand moves at 10 sec. intervals)
Additional mechanism		Automatic electronic-handsetting by crown (Turning the crown clockwise or counterclockwise)
Loss/gain		Loss/gain at normal temperature range Monthly rate: Less than 20 seconds
Casing diameter		17.5 (6H - 12H) x 8.4 mm (3H - 9H)
Size of main plate		Ø17.1 (6H - 12H)
Height		2.9 mm (including battery)
Regulation system		Trimmer condenser
Quartz tester measuring gate		10-second gate
Battery		Battery: MAXELL SR 621 SW, TOSHIBA SR621 SW, SEIZAIKEN TR621 SW, VARTA531 Battery life: Approx. 3 years Voltage: 1.55V
Jewels		2 jewels

II. CIRCUIT BLOCK SCHEMATIC



III. SETTING THE TIME

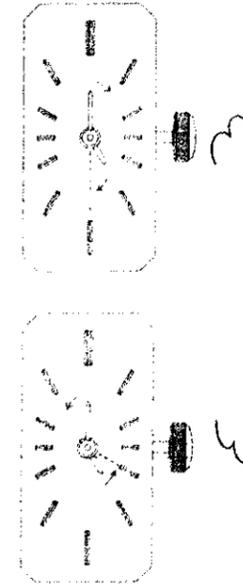
Cal. Y434A employs an advanced electronic time setting system which is different from that of conventional analogue quartz watches. Time setting procedure is as follows:

1 Position of Crown

Normal position: Free
Pulled out position: Time setting

2 Setting the time

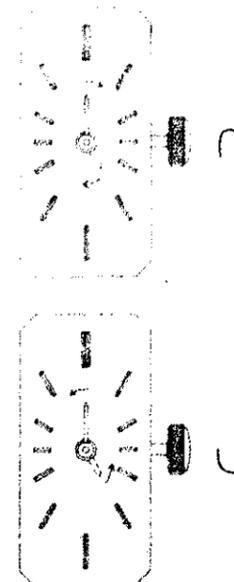
[Setting Hour hand]



1. Pull the crown out.
2. Turn crown clockwise two clicks within 0.5 seconds. By this operation, minute hand advances just one turn and hour hand advances by one hour.
3. If crown is turned counterclockwise in the same manner, minute hand goes back one turn and hour hand goes back one hour. (When more than one hour adjustment is required, repeat above procedures.)
4. In order to stop the minute hand before it has completed its one hour cycle, turn the crown one click clockwise or counterclockwise while the minute hand is moving.

Note: The hands must travel for at least one second before they can be stopped by turning the crown clockwise or counterclockwise.

[Setting Minute hand]

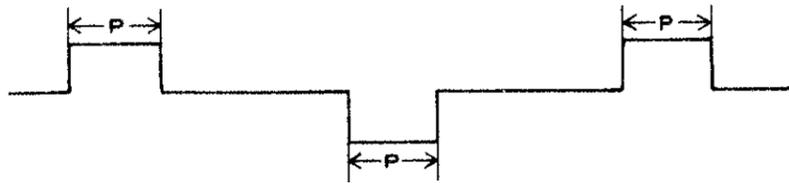


1. Pull the crown out.
2. Each clockwise turn of crown advances minute hand by 30 seconds.
3. Each counterclockwise turn of crown will return minute hand by 30 seconds. However, care should be taken not to turn the crown too quickly as the hands will automatically move one hour as in Setting Hour hand.

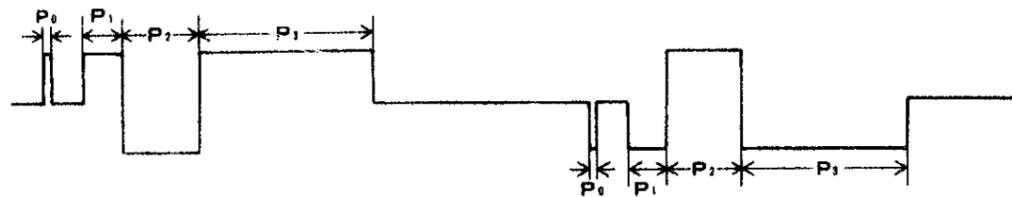
● Return the crown to the normal position after completion of time setting.

3 Operation theory (reverse relation of the step motor)

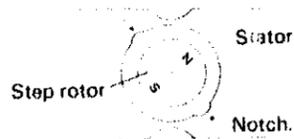
- In addition to regular forward driving pulse, reverse driving pulse noted below is applied to Cal. Y434A to reverse the step rotor.
- Forward driving pulse



- Reverse driving pulse

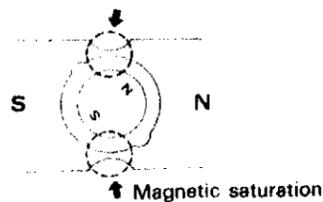


(1) Step rotor stationary condition



- When no electric current is flowing through the stator, magnetic poles N and S of the step rotor stop at 40° - 50° inclined from the horizontal line. The stationary position is determined by the position of notches of the stator.

(2) Driving pulse P₀



- Pulse P₀ applied to the stator first can merely magnetically saturate the thinnest portions (marked with arrows) of the stator. The pulse works to remove residual magnetism, developed by preceding pulse P₁, from the stator and helps to rotate the step rotor easily with subsequent pulse P₁.

(3) Driving pulse P₁



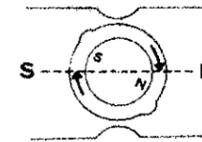
- Pulse P₁, with the same polarity as pulse P₀ but with wider width, is applied to rotate the step rotor forward and bring magnetic poles N and S close to notches of the stator. This step is to rotate the step rotor forward slightly and use the force of its movement to facilitate of reverse rotation.

(4) Driving pulse P₂



- At the next moment, pulse P₂ whose polarity is opposite to that of pulse P₁ is applied. With this pulse the step rotor starts reverse rotation.

(5) Driving pulse P₂



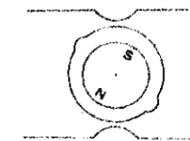
- If a pulse of opposite polarity of pulse P₁ is applied when magnetic poles of the step rotor pass the horizontal line of the stator the rotor continues to rotate reversely. Width of pulse P₁ is sufficient to rotate the step rotor to the position where its magnetic poles and those of the stator are close enough to attract each other.

(6) Cutting off driving pulse P₁



- If pulse P₁ is cut off at this moment the step rotor stops at its stationary position after 180° (10 sec) reverse rotation.

Step rotor returns to the stationary position.



Above operation theory is utilized for time setting as follows.

- Fine adjustment with minute hand is performed by five consecutive reverse driving pulses followed by two forward driving pulses which compensate for backlash of the wheel train caused by reversing. Every click turn of crown reverses the minute hand by 30 seconds.
- Hour setting is executed by consecutive reverse driving pulse the as same as fine adjustment. Hour hand reverses one hour at a time. (While time setting hands move at half speed of normal operation.)

* Time setting with forward rotation of the step motor.

- Fine adjustment with minute hand is performed by three forward driving pulses. Every click turn of crown advances minute hand by 30 seconds.
- Hour setting is executed by consecutive forward pulse, the same as fine adjustment with minute hand. Hour hand moves one hour at a time.

IV. DISASSEMBLING, REASSEMBLING AND LUBRICATING

Disassembling procedures: Figs (1) - (9)

Reassembling procedures: Figs (9) - (1)

Lubrication:

○ Moebius Synt-A-Lube

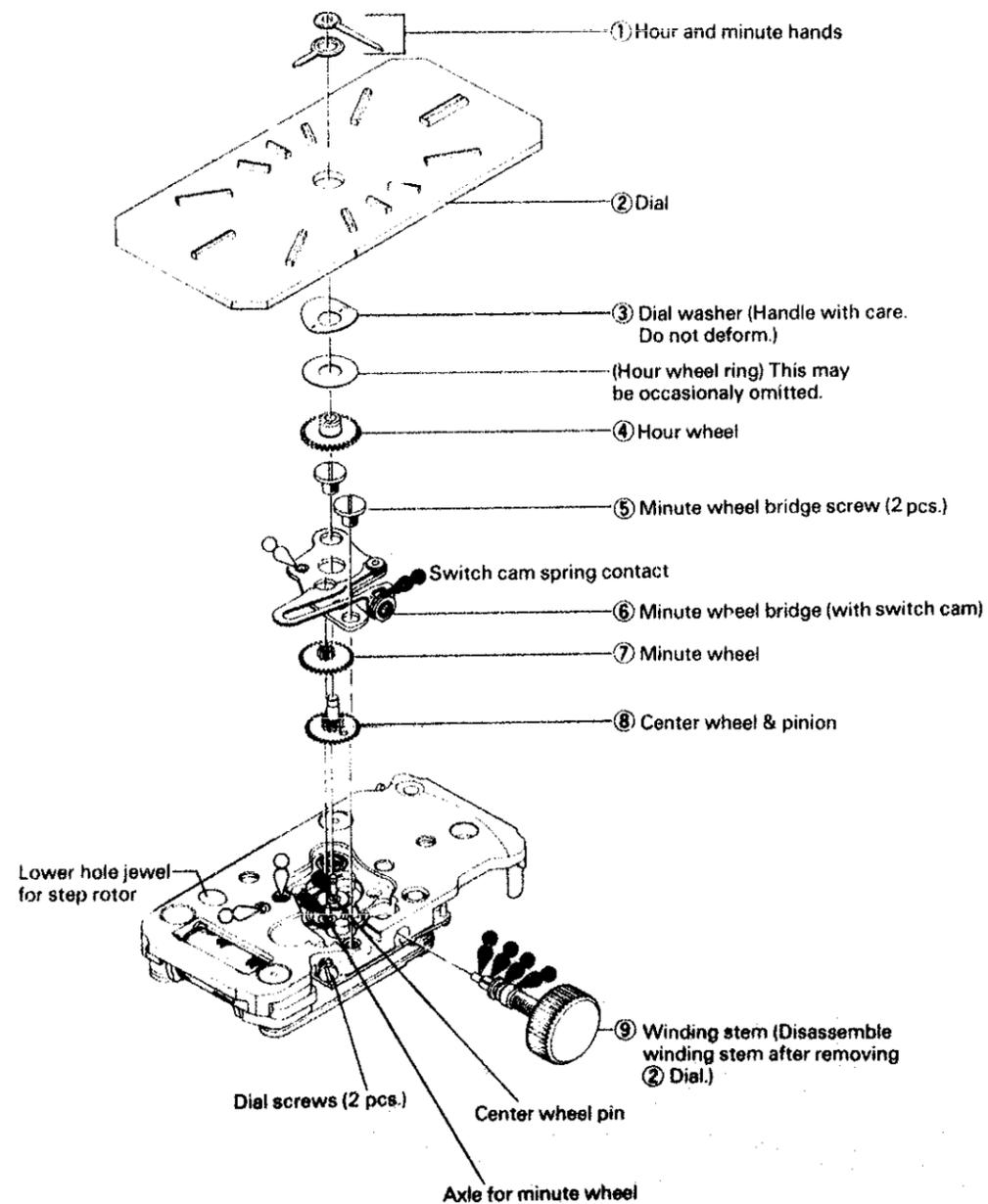
● Moebius Synt-V-Lube

Quantity

● Normal

● Very small amount

1 Indication system



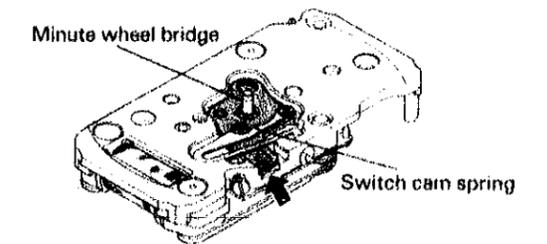
[Cautions in disassembling and reassembling]

(1) Mounting hands

- Remove battery before mounting hands.
- Mount both hands at 12 o'clock position.
- Check if hands are at exact 12 o'clock position. Advance minute hand approx. 15 - 30 minutes clockwise according to time setting procedures and manually return it counterclockwise to 12 o'clock position. Recheck hands position.

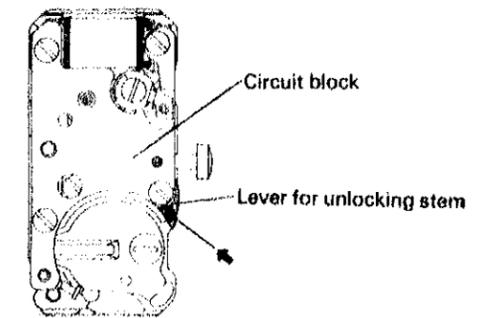
(6) Minute wheel bridge

- Minute wheel bridge can be removed by inserting tweezers through a cutout on main plate at winding stem side (Ref. arrow in the right figure). Do not hold switch cam spring with tweezers.

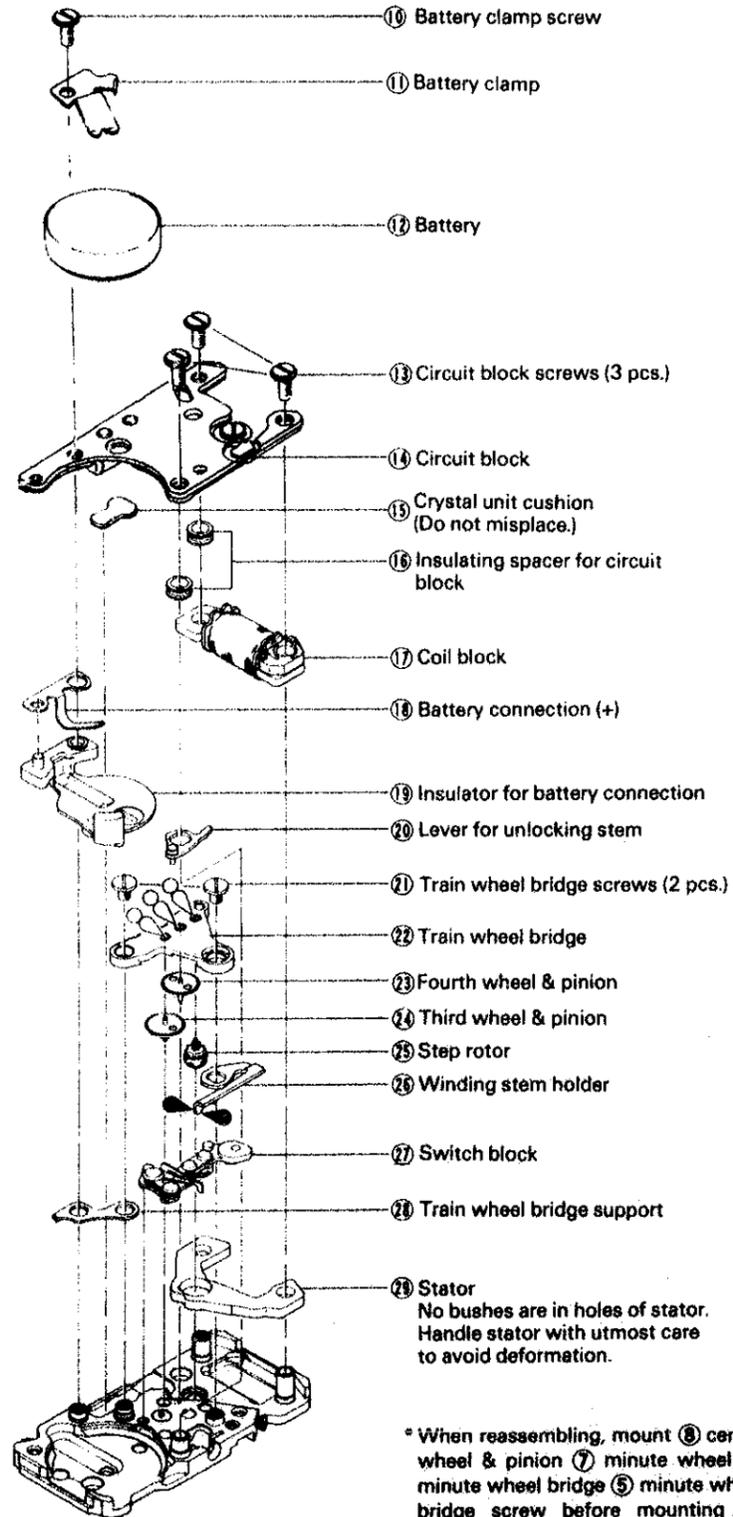


(9) Winding stem

- Removing/reinstalling winding stem. Depress lever for unlocking stem to remove or reinstall winding stem. Unless the lever for unlocking stem is depressed, winding stem cannot be removed or reinstalled.

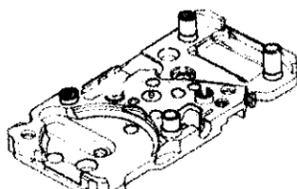


2 Electronic circuit and gear train mechanism

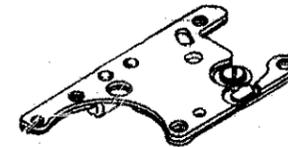


* When reassembling, mount ⑧ center wheel & pinion ⑦ minute wheel ⑥ minute wheel bridge ⑤ minute wheel bridge screw before mounting ② stator and third wheel can be easily mounted.

V. CLEANING

Name of parts	Cleaning	Drying	Cleaning solution	Remarks
Main plate  Step rotor 	Rinse or scrub with a soft brush	Warm air	Benzene	<ul style="list-style-type: none"> ● Be careful not to deform or remove the parts fixed to the main plate. ● As step rotor is magnetized, use fresh cleaning solution. Use rodico to remove foreign matter still remaining after cleaning.
Other parts (excluding parts that must not be cleaned.)	Clean with a cleaner, rinse or gently scrub with a soft brush.	Warm air	Benzene	

Parts that must not be cleaned



Circuit block



Coil block

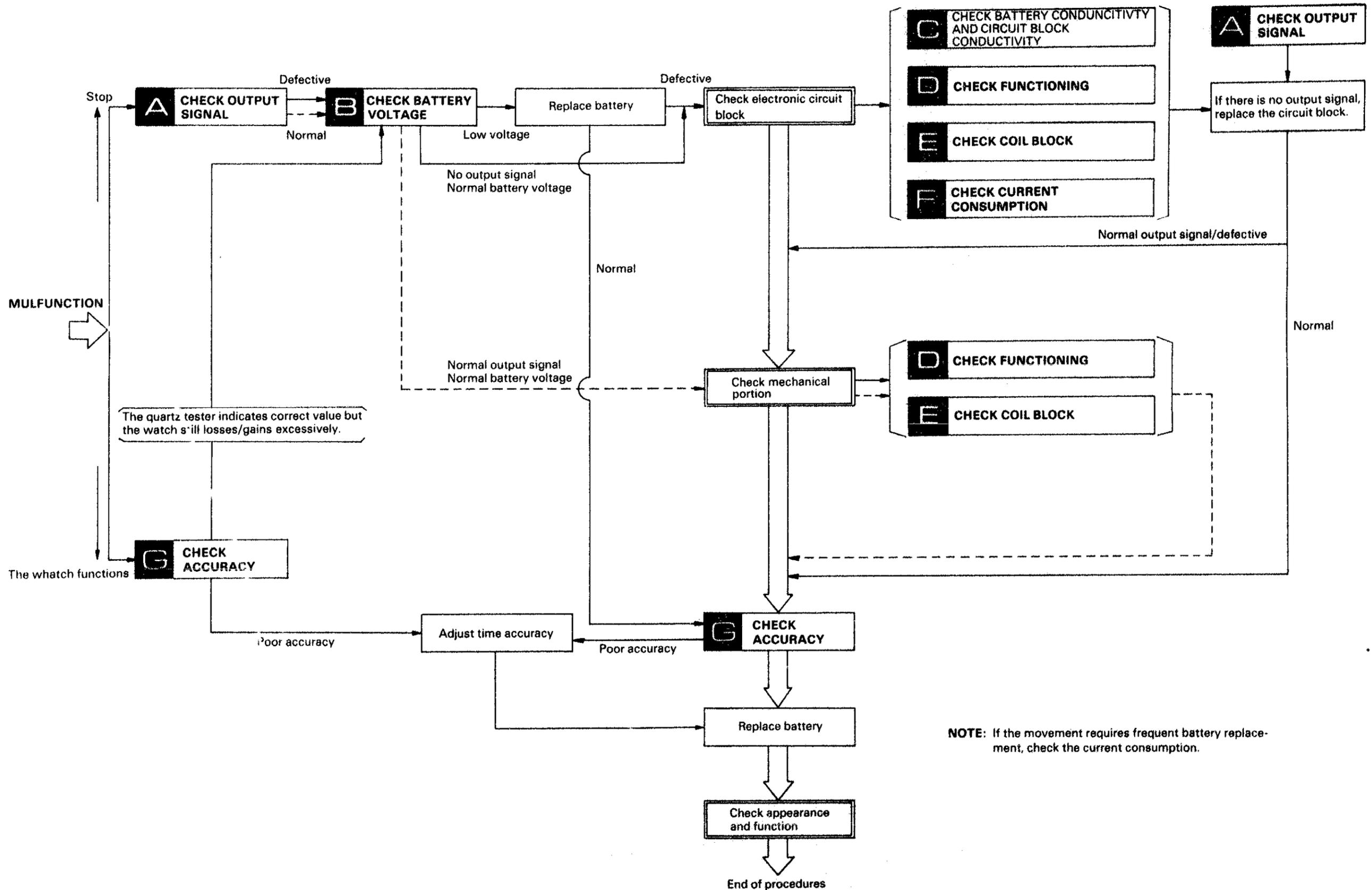


Crystal unit cushion

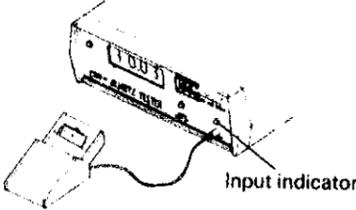
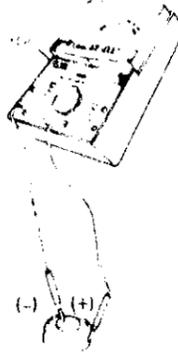
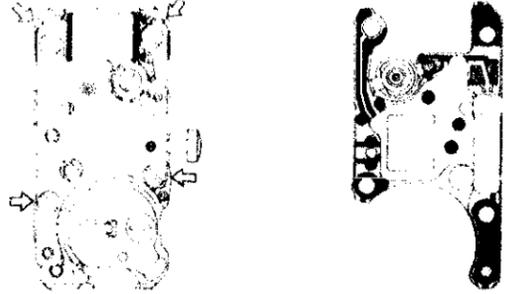
- Be sure to clean only stains on the conductive portions (circuit block, etc.) with a cloth moistened with benzene or alcohol and dry them with warm air.
- Rinse the switch block with only benzene. Take care not to deform spring and lead terminal.

VI. CHECKING AND ADJUSTMENT

1 Guide table for checking and adjustment



(2) Procedures for checking and adjustment

	Procedure	Result and repair
CHECK OUTPUT SIGNAL	<ul style="list-style-type: none"> Check for output signal of the watch by checking to see if the input indicator blinks. This will determine whether the trouble is mechanical or electrical. <ol style="list-style-type: none"> Set up the Quartz Tester. Check for blinking input indicator.  <p>Note: Check the output signal with the crown in the normal position.</p>	<p>10-second blinking: Normal No 10-second blinking: Defective Check the battery voltage.</p>
CHECK BATTERY VOLTAGE	<ul style="list-style-type: none"> Check battery voltage. <ol style="list-style-type: none"> Set up the Volt-ohm-meter. Range to be used DC 3V. Measuring Red probe (+)...Battery surface (+). Black probe (-)...Battery surface (-). <p>NOTE: When handling the battery, use plastic or bamboo tweezers or fingercots.</p> 	<p>1.5V or more: Normal Less than 1.5V: Defective Replace the battery.</p>
CHECK BATTERY CONDUCTIVITY AND CIRCUIT BLOCK CONDUCTIVITY	<ul style="list-style-type: none"> Check if the battery current flow to the circuit block is normal. Check for short circuit and defective conductivity of the conductive portions of the circuit block. <ol style="list-style-type: none"> Check the screws for tightness. (Circuit block screw, coil block screw, etc.) Check for any contamination on battery surface and battery connection (-). Check for broken wire, short circuit, contamination and solder peeling off of the circuit block pattern. 	<p>No loose screws: Normal Loose screws: Defective. Retighten the screws. Uncontaminated: Normal Contaminated: Defective Wipe off any foreign matter. Conductive: Normal Not conductive: Defective Wipe off any foreign matter. For other defects replace the circuit block.</p>

	Procedure	Result and repair
CHECK FUNCTIONING	<p>Rotate crown and check that the train wheel correctly moves accordingly.</p> <ul style="list-style-type: none"> Mount battery on the movement with dial and secure it with battery clamp. All procedures shown below must be performed with crown pulled out. <ol style="list-style-type: none"> Hour setting <ol style="list-style-type: none"> Turn crown clockwise by two clicks in half second. Turn crown counterclockwise by two clicks in half a second. Turn crown one click clockwise or counterclockwise while hands are moving. Minute setting <ol style="list-style-type: none"> Turn crown clockwise by one click. Turn crown counterclockwise by one click. <p>If any of above check items are defective, check following items.</p> <ol style="list-style-type: none"> Switch block. Circuit block conductivity 	<p>Minute hand advances one turn and hour hand advances by one hour: Normal.</p> <p>Minute hand moves back one turn and hour hand moves back by one hour: Normal.</p> <p>Both minute hand and hour hand stop: Normal. Note: Hands will not stop if additional turn is made within first one second.</p> <p>Minute hand advances by 30 seconds: Normal.</p> <p>Minute hand moves back by 30 seconds: Normal.</p> <p>Deformation and/or contamination of Switch lead terminals (A) and (B) and Switch spring: Defective Replace the switch spring. Wipe off any foreign matter.</p> <p>Loose screw: Defective Retighten the screw</p> <p>Poor conductivity: Defective Replace the circuit block.</p>
CHECK COIL BLOCK	<p>Check for broken coil wire and short circuit of the coil block.</p> <ol style="list-style-type: none"> Set up the Volt-ohm-meter. Range to be used: OHMS R x 100 Checking Apply the red and black probes of the Volt-ohm-meter to the two coil lead terminals. 	<p>1.4 kΩ - 3.4 kΩ: Normal. Less than 1.4 kΩ (Short circuit): Defective More than 3.4 kΩ (Broken wire): Defective Replace the coil block.</p>

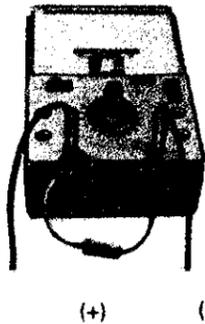
Procedure

In case a frequent battery change is required, a current consumption test is recommended. Use the following procedures.

- Set up the Volt-ohm-meter.
 - Range to be used: DC 12 μ A (DC 0.03 mA)
- Set up the condenser of 200 ~ 500 μ F as shown in the photo.
- Measuring

Red probe (+)...Battery connection (-)
Black probe (-)...Battery surface (-)
- Result

Less than 0.6 μ A... Normal
More than 0.6 μ A... Check the electronic circuit block.



NOTE:

If the pointer of the Volt-ohm-meter scales out and the current consumption cannot be measured reset its range (e.g. at DC 30 mA). Next, when the pointer is stabilized, return the range to DC 12 μ A (DC 0.03 mA) and read the value indicated with the probes of the Volt-ohm-meter applied.

Remarks for measuring the current consumption.

- This watch steps at 10-second intervals. When measuring the current consumption, the pointer of the Volt-ohm-meter swings once every 10 seconds.
- When the probes (+) and (-) of the Volt-ohm-meter are applied as shown in the illustration above, the pointer of the Volt-ohm-meter swings slightly, indicating that the current is flowing through the IC. The pointer of the Volt-ohm-meter swings at 10-second intervals and the motor driving current flows in addition to the current running through the IC.
- Calculate the current consumption as follows:

Example:
Suppose that IC current = 0.3 μ A and IC current + Motor driving current = 0.7 μ A, then the current only for driving the motor is 0.4 μ A. However, it is the value at 10-second stepping. Therefore, it is required to reduce 0.4 μ A to the value at 1-second stepping. Consequently, the current consumption only for the motor is 0.04 μ A. Accordingly the current consumption for this watch is calculated as: 0.3 μ A + 0.04 μ A = 0.34 μ A.
- Also when the Micro Test is used, calculate the current consumption just in the same manner.

Check gain and loss of time.

- Set up the Quartz Tester.

Be sure to set the measuring time selection switch at "10 second".
- Checking

PARTS LIST

CAL. Y434A

Cal. Y434A		Cal. Y434A	
PART NO.	PART NAME	PART NO.	PART NAME
125 131	Train wheel bridge	4239 130	Rotor stator
*221 130	Center wheel & pinion	4270 130	Battery connection (-)
*221 131	Center wheel & pinion	4303 130	Switch block
231 130	Third wheel & pinion	4408 131	Insulating spacer for circuit block
241 303	Fourth wheel & pinion	4446 140	Insulating seat
261 130	Minute wheel	011 541	Lower hole jewel for step rotor
*271 130	Hour wheel	011 552	Upper hole jewel for step rotor
*271 131	Hour wheel	012 155	Dial screw
351 130	Winding stem (8.49mm)	012 199	Circuit block screw
		012 199	Battery clamp screw
387 131	Minute wheel bridge	012 465	Train wheel bridge screw
400 130	Lever for unlocking stem	012 465	Minute wheel bridge screw
426 131	Train wheel bridge support	017 161	Tube for train wheel bridge (A)
491 130	Dial washer	017 162	Tube for train wheel bridge (B)
493 130	Hour wheel ring (0.03mm Gold)	017 163	Tube for circuit block (A)
493 131	Hour wheel ring (0.05mm Silver)	017 164	Tube for circuit block (B)
493 132	Hour wheel ring (0.07mm Gold)	017 165	Tube for circuit block screw (A)
735 130	Winding stem holder	017 166	Tube for circuit block screw (B)
4001 189	Circuit block	017 873	Axle for minute wheel
4002 130	Coil block	MAXELL BR621SW	
4146 130	Step rotor	SEIZAIKEN TR621SW	Battery
4219 130	Battery connection insulator		
4225 131	Battery clamp		

Remarks:

- ★ Center wheel & pinion and Hour wheel
There are two different types as specified below.

Combination:

Type	Center wheel & pinion	Hour wheel
a	*221 130	*271 130
b	*221 131	*271 131