TECHNICAL GUIDE
AND
PARTS LIST

CAL. Y651A

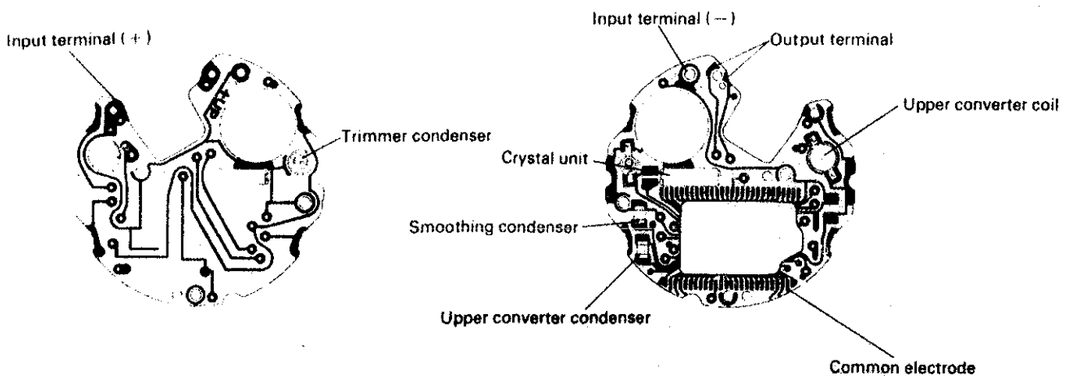
DIGITAL QUARTZ

CONTENTS

I. SPECIFICATIONS

Item \ Cal. No.	Y651	
	Analogue section	**Digital section**
Display medium	2-hand (Moves at 30 sec intervals)	Nematic liquid crystal, FEM (Field Effect Mode)
Driving system	Step motor (2 poles)	
Time indication		• Time display • Calendar display • Dual zone time display • Alarm time display • Stopwatch display
Additional mechanism		Time signal function
Loss/gain	Loss/gain at normal temperature range Monthly rate: less than 15 seconds	
Casing diameter	ϕ28.0 mm	
Height	3.4 mm (3.9 mm: including battery)	
Regulation system	Trimmer condenser	
Quartz tester measuring gate	Any gate is available	
Battery	Silver oxide battery: Toshiba WG-3 or Maxell SR41W Voltage: 1.55V Battery life: approx. 2 years (Alarm function within 20 seconds a day and light illumination within 5 seconds a day)	
Jewels	2 jewels	

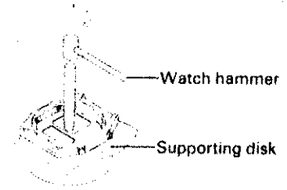
II. CIRCUIT SCHEMATIC



III. DISASSEMBLING AND REASSEMBLING OF CASE

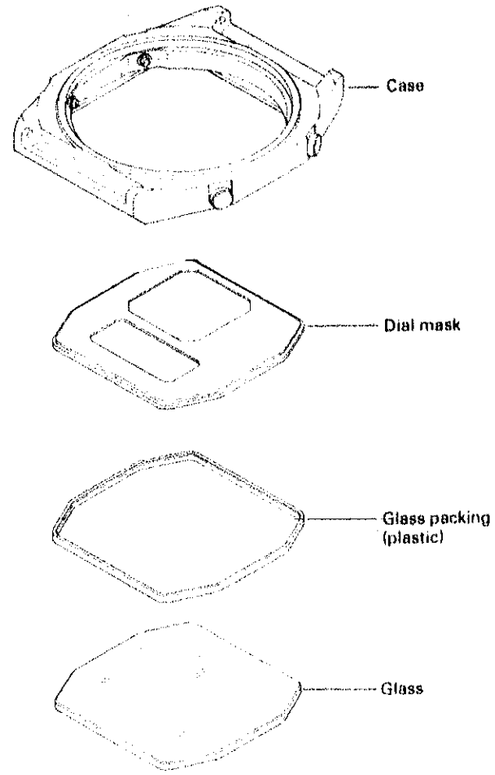
Replace the glass as follows.

- How to remove the glass
  Place the case on the supporting disk. Apply a Softstick on the glass surface and gently tap with a watch hammer.
- Always use a supporting disk whose diameter is larger than that of the glass.



Note: Be careful not to push the dial ring.

- How to install the glass
  Place the case on the supporting disk and always depress the whole surface of the glass to install it.



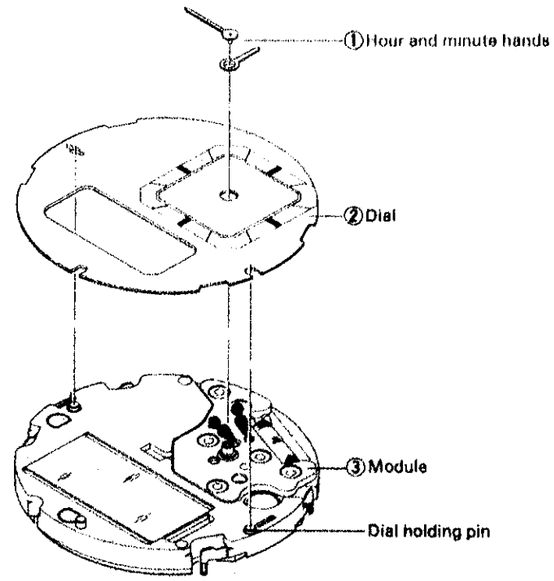
IV. DISASSEMBLING, REASSEMBLING AND LUBRICATING

1. Indicating system

Disassembling procedures: Figs. ① ~ ⑬
Reassembling procedures: Figs. ⑬ ~ ①

Lubricant	Lubricant quantity
●● Moebius A	○○ Standard quantity
○○ S-6	

- Dial
  The dial is fixed to the liquid crystal panel frame dial holding pins. Grasp the dial with fingers and pull it out.



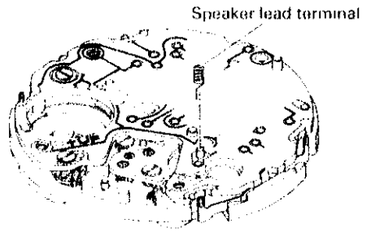
2. Electronic circuit and liquid crystal panel

Battery clamp
The battery clamp can be divided into two types. Take care not to confuse them.

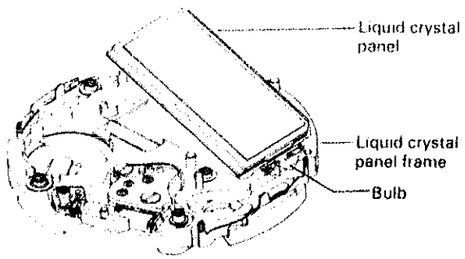
Water Resistant Reinforced Water Resistant

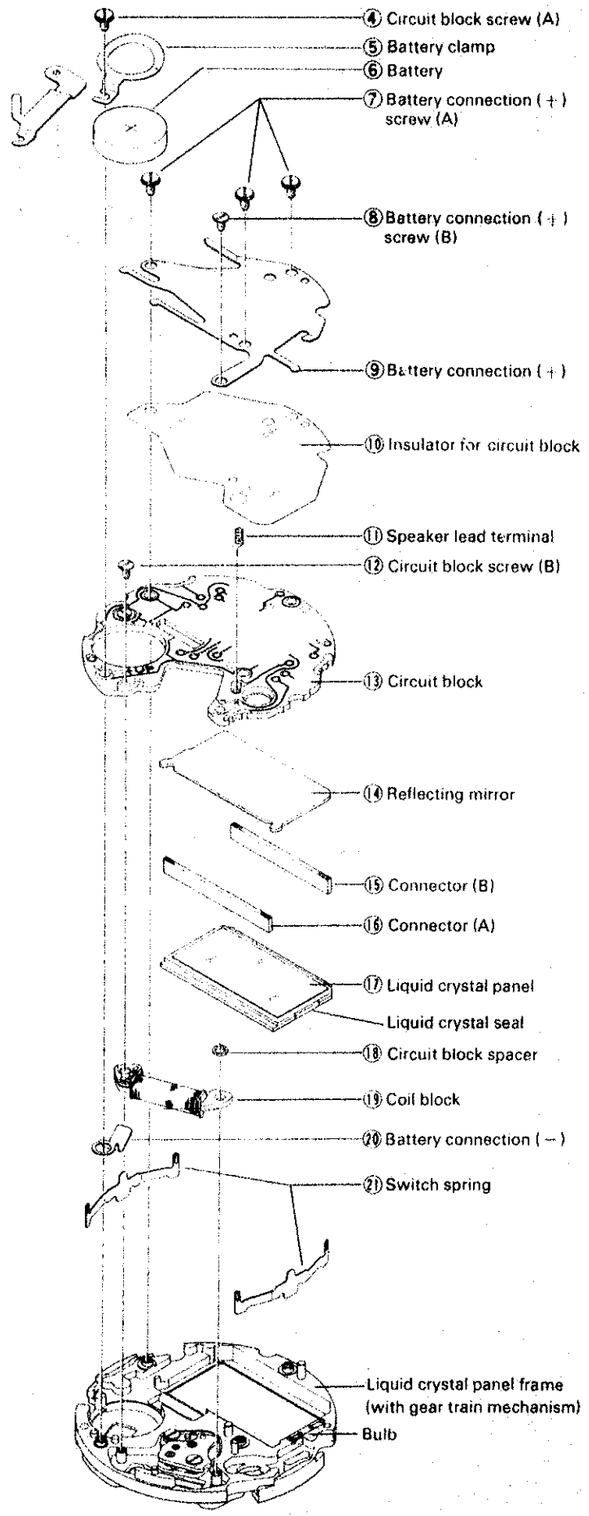
- Speaker lead terminal
  Insert the speaker lead terminal spring onto the pin and the tip into the circuit block hole securely.

The speaker lead terminal can be divided into two types:
Water resistant: Gold
Reinforced water resistant: White
Take care not to confuse them.

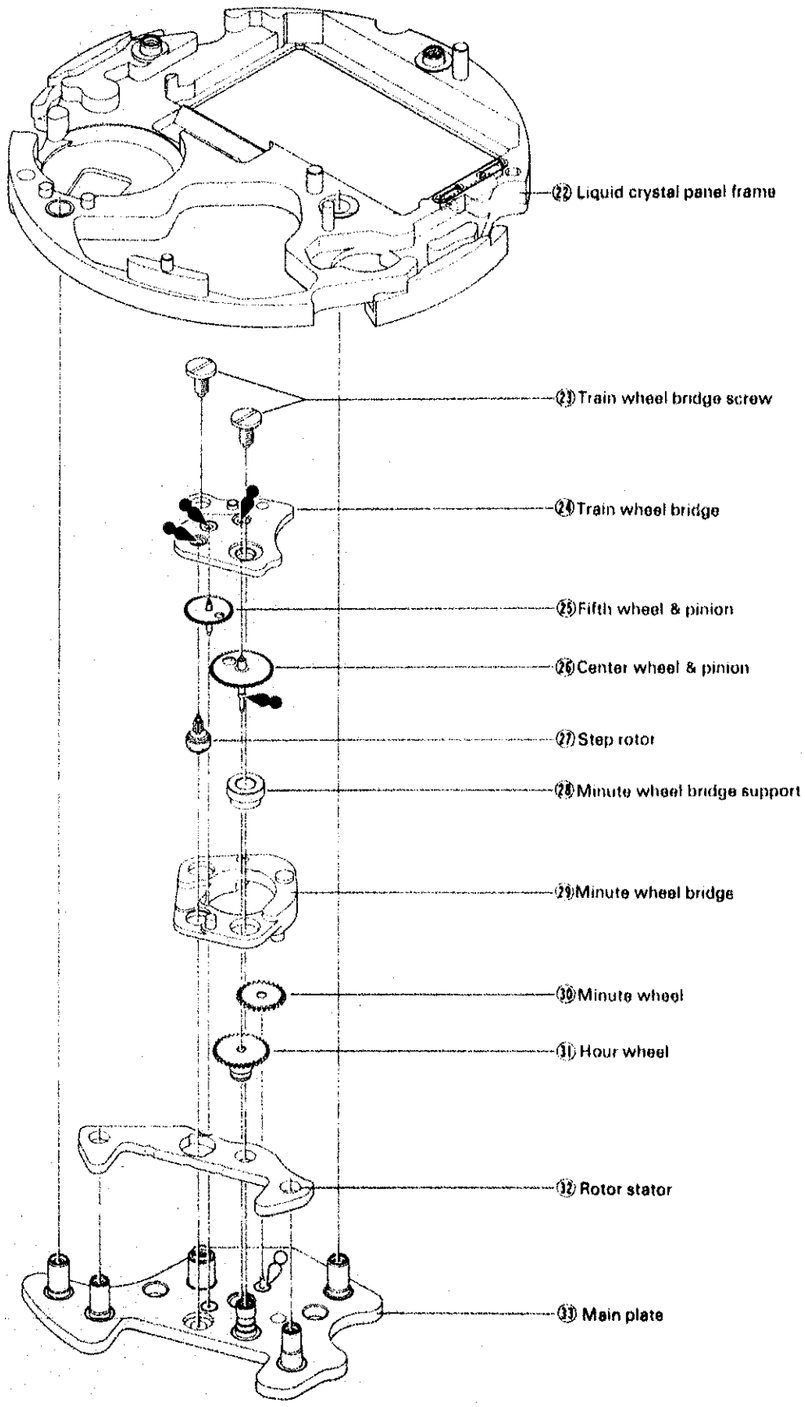


- Liquid crystal panel
  Insert the liquid crystal panel seal below the bulb and install the liquid crystal panel.



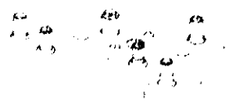


3. Gear train mechanism



V. CLEANING

1. How to clean

Name of parts	Cleaning	Drying	Solution	Remarks
Main plate  Step rotor 	Rinse or wash with a soft brush	Warm air	Benzene	Be careful not to deform or remove the parts fixed to the main plate. Use a clean solution as the step rotor is magnetized and may attract foreign metal particles. Any foreign matter which cannot be removed by cleaning should be removed with rodico.
Connector 	Rinse or wash with a soft brush	Warm air	Alcohol	Never use benzene or trichloroethylene as these will melt the parts. Do not set the connector until it is completely dry.
Plastic parts Liquid crystal panel frame Circuit block insulator Minute wheel bridge	Rinse or wash with a soft brush	Warm air	Alcohol, benzene	
Other parts (excluding parts that must not be cleaned)	Clean with a cleaner, rinse or gently wash with a soft brush.	Warm or hot air	Benzene, trichloro-ethylene, alcohol	

2. Parts that must not be cleaned


Circuit block


Liquid crystal panel


Reflecting mirror


Bulb


Coil block

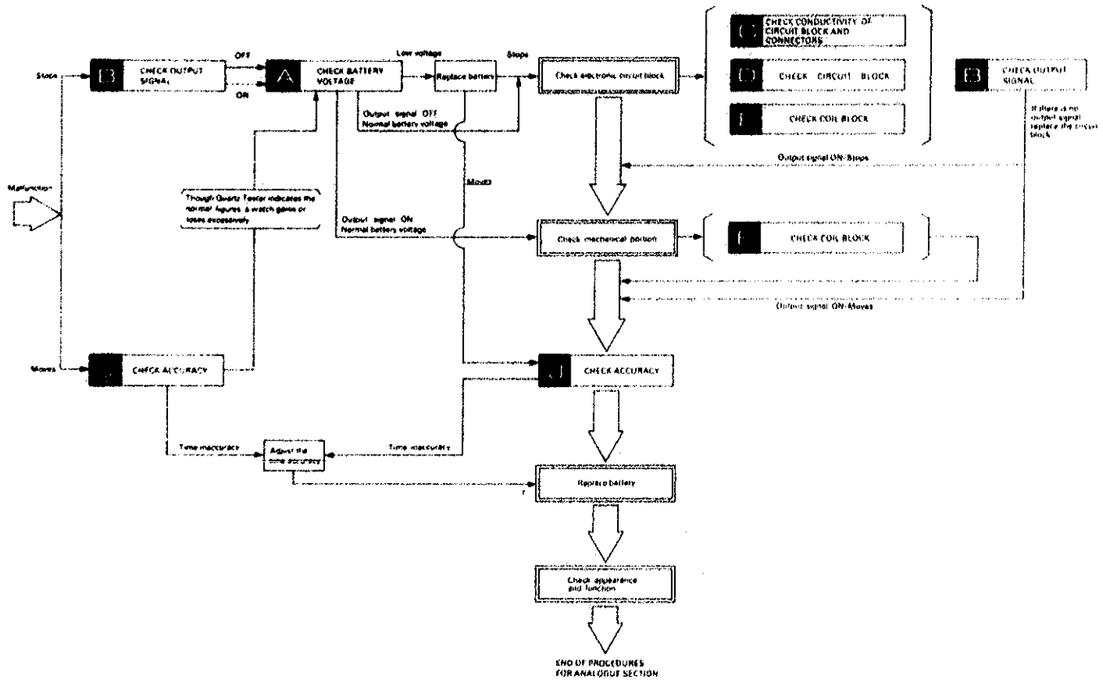

Battery

- Only the conductive portions should be wiped with a cloth moistened with benzene or alcohol and dried with warm air.
- Remove dust and lint with a brush

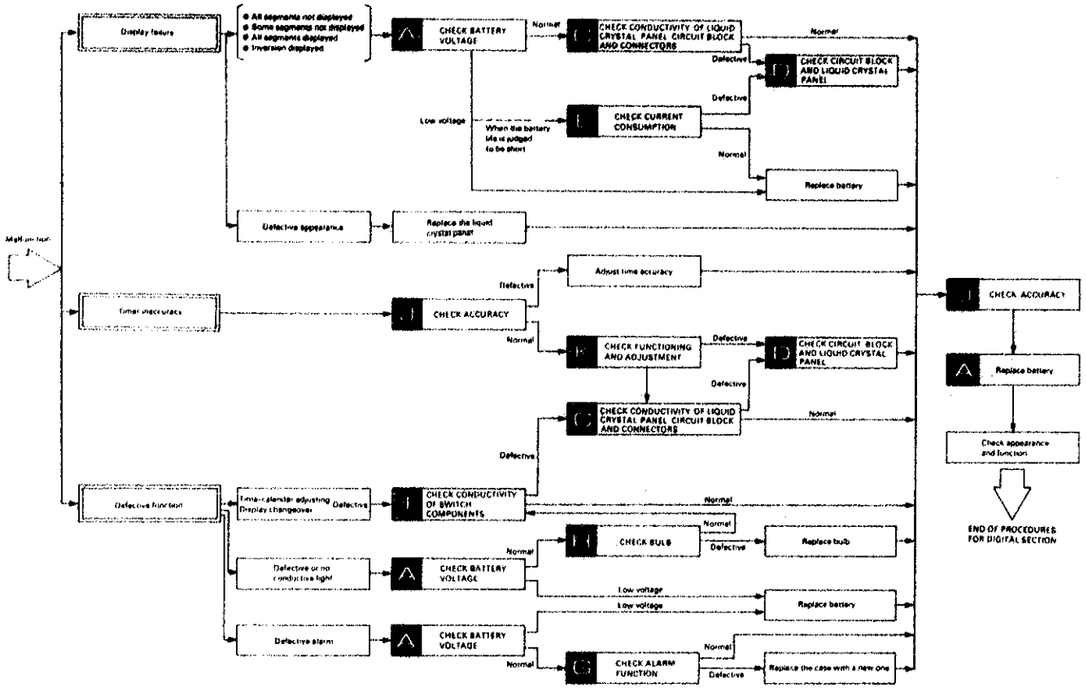
VI. CHECKING AND ADJUSTMENT

1. Guide table for checking and adjustment

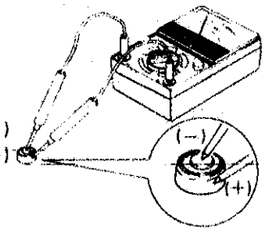
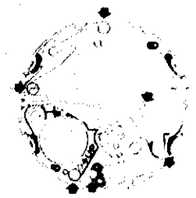
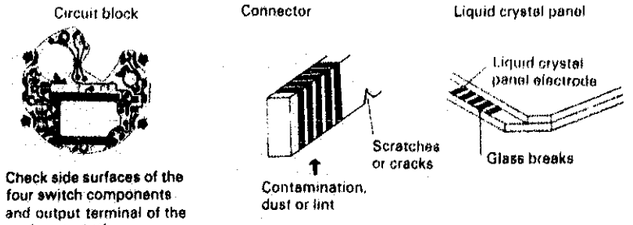
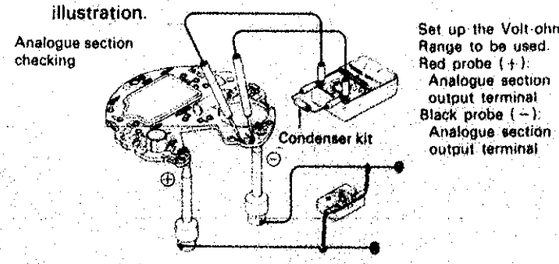
(Analogue section)

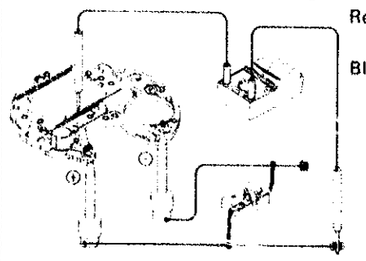
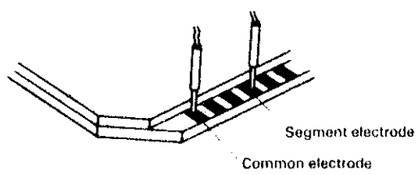
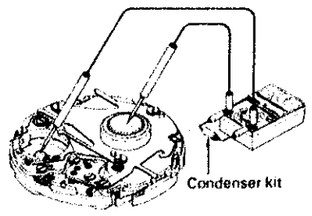


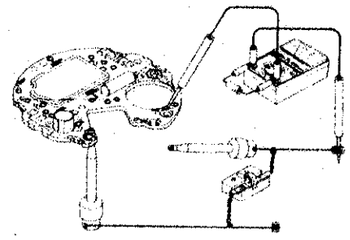
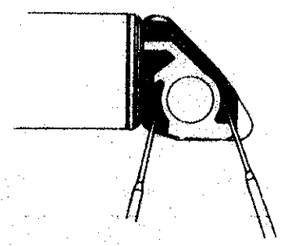
(Digital section)

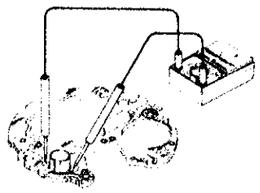
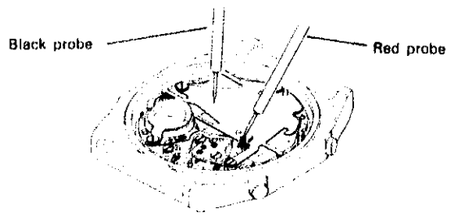
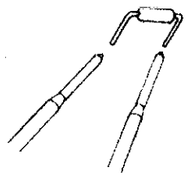


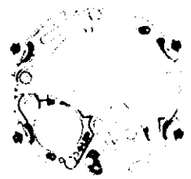
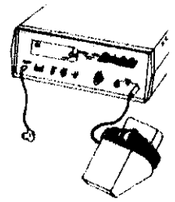
2. Procedures for checking and adjustment

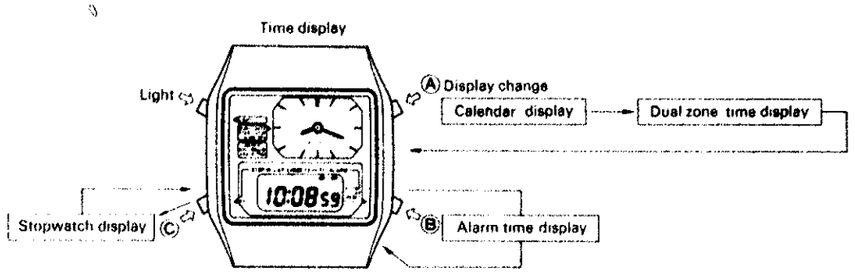
	Procedure	Results and repair
A CHECK BATTERY VOLTAGE	Check the battery voltage. ● Set up the Volt-ohm-meter. Range to be used: DC3V ● Measuring Red probe (+)..... Battery surface (+) Black probe (−).... Battery surface (−) 	1.5V or more: Normal Less than 1.5V: Defective Replace the battery with a new one.
B CHECK OUTPUT SIGNAL	Check for output signal of the watch by checking to see if the input indicator blinks. ● Set up the Quartz Tester. ● As the hand moves in 30 second intervals on Cal Y651, the Quartz Tester input indicator blinks every 30 seconds.	30-second blinking: Normal No 30-second blinking: Defective
C CHECK CONDUCTIVITY OF LIQUID CRYSTAL PANEL CIRCUIT BLOCK AND CONNECTORS	(1) Check the screws for tightness. 	No loose screws: Normal Proceed to 2. Loose screws: Defective Retighten.
	(2) Check for dust, lint, scratches, cracks and breaks of the liquid crystal panel and connector and for any contamination of the circuit block. 	Uncontaminated: Normal Contaminated. Defective Wipe off any foreign matter. No scratches, cracks or breaks: Normal Scratched, cracked or broken: Defective Replace the parts with new ones.
D CHECK CIRCUIT BLOCK AND LIQUID CRYSTAL PANEL	Check the circuit block output. (1) Remove the circuit block from the module. (2) Attach the electricity supplier and Volt-ohm-meter as shown in the illustration. 	The pointer swings every 30 seconds: Normal The pointer does not swing every 30 seconds: Defective Replace the circuit block with a new one.

	Procedure	Results and repair
D CHECK CIRCUIT BLOCK AND LIQUID CRYSTAL PANEL	Digital section checking Set up the Volt-ohm-meter. Range to be used: DC3V Red probe (+): Electricity supplier (+) terminal Black probe (−): Circuit block output terminal (Digital section) 	0.8V or more: Normal Less than 0.8V: Defective Replace the circuit block with a new one.
	Check the liquid crystal panel for broken wires and short-circuits. (1) Place the liquid crystal panel up-side down. (2) Set up the Volt-ohm-meter. Range to be used: OHMS R × 1 Any range will do if more than 3V is applied to the terminal of the Volt-ohm-meter. (3) Attach the probes to the common electrode and segment electrodes. (Either red or black probe will do.)   Segment electrode Common electrode	Displayed: Normal Not displayed: Defective Replace the liquid crystal panel with a new one.
M CHECK CURRENT CONSUMPTION	Check if the current consumption is normal. (1) Set up the Volt-ohm-meter. Range to be used: DC12 μV (2) Measuring Red probe (+)..... Battery connection (−) Black probe (−).... Battery surface (−) Measure the current consumption as follows.  Condenser kit	

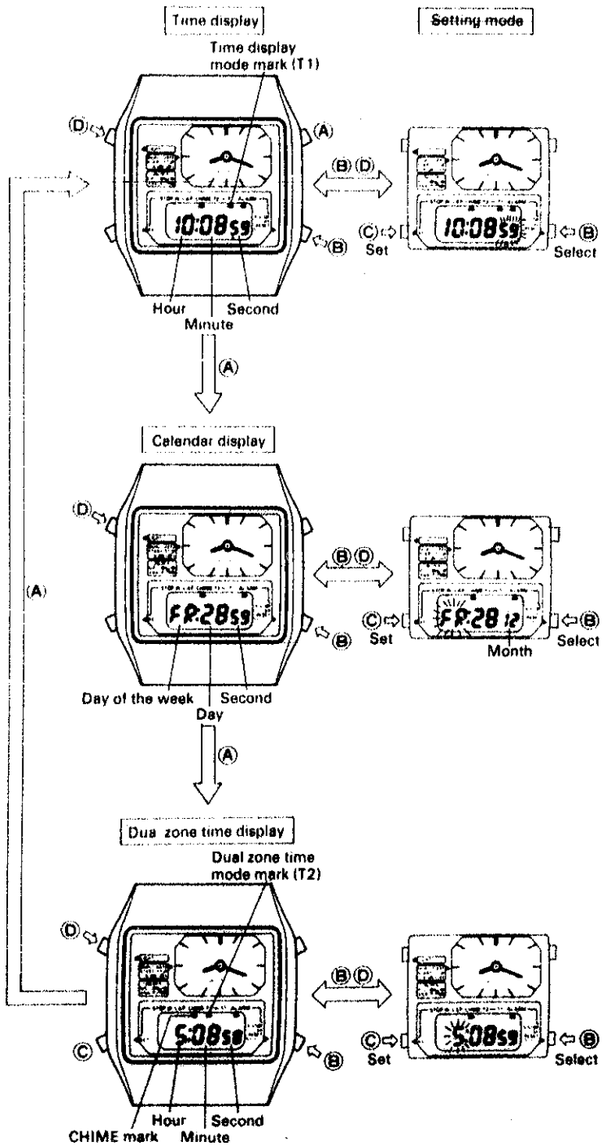
	Procedure	Results and repair
E CHECK CURRENT CONSUMPTION	Precautions As this watch moves at 30-second intervals, the pointer of the Volt-ohm-meter swings once every 30 seconds when measuring the current consumption. When the (+) and (−) probes of the Volt-ohm-meter are applied to the battery connection and battery surface, the pointer moves slightly, indicating that the current is flowing in the IC (including liquid crystal panel). Every 30 seconds, the pointer swings again as the motor driving current flows besides the current flowing in the IC. The current consumption is calculated as follows. **Example:** Assuming that IC current = 1.3 μA and IC current + motor driving current = 3.9 μA, the driving current required only for the motor is 2.6 μA, which shows the value when the watch moves at 30-second intervals. Therefore, the value is required to be converted into the value at 1-second intervals in order to obtain the current consumption. Reduce the value (2.6μA) into 1/30 and the current consumption necessary only for driving the motor is about 0.1μA. Accordingly the value of current consumption by this watch is as follows. 1.3 μA + 0.1 μA = 1.4 μA	Less than 2.5 μA: Normal 2.5 μA or more: Defective
	● Checking for large current consumption (1) Measure the current consumption of circuit block only. 	Less than 2.0 μA: Normal ⇨ (2) 2.0 μA or more: Defective Replace the circuit block with a new one.
	(2) Remove the coil block from the movement and measure the current consumption.	Less than 2.3 μA: Normal Check the gear train and converter. 2.3 μA or more: Defective Replace the liquid crystal panel with a new one.
F CHECK COIL BLOCK	Check the coil block for broken wire and short circuit. (1) Set up the Volt-ohm-meter. Range to be used: OHMS R × 100 (2) Checking Apply (+) and (−) probes of the Volt-ohm-meter to the two lead terminals of the coil. 	2.2 kΩ ~ 2.6 kΩ: Normal Less than 2.2 kΩ: Defective (Short circuit) 2.6 kΩ or more: Defective (Broken wire) Replace the coil block with a new one.

	Procedure	Results and repair
G CHECK ALARM FUNCTION	● Checking upper converter coil Measure the upper converter coil resistance to check for broken wire or short-circuits. Set up the Volt-ohm-meter. Range to be used: OHMS R × 1  ● Checking the alarm output Check the circuit block for normal alarm output. (1) Set the watch so that the alarm starts sounding after 1 ~ 2 minutes. (2) Remove the case back and attach the probes of the Volt-ohm-meter as shown in the illustration below. Range to be used: DC3V or DC12 μA  ● Checking piezo electric element If the alarm does not sound even when the alarm output is normal, check the piezo electric element for cracks and speaker lead terminals for conductivity.	70Ω ~ 95Ω: Normal Less than 70Ω: Defective (short circuit) 95Ω or more: Defective (Broken wire) Replace the circuit block with a new one. The pointer continuously swings after 1 ~ 2 minutes: Normal Replace the case. The pointer does not swing after 1 ~ 2 minutes: Defective Replace the circuit block with a new one.
H CHECK BULB	Check that the bulb is not defective. (1) Set up the Volt-ohm-meter. Range to be used: OHMS R × 1 (2) Checking Attach the probes to the bulb leads. Either black or red probe will do. 	Lights up: Normal Does not light: Defective Replace the bulb with a new one.

	Procedure	Results and repair
I CHECK CONDUCTIVITY OF SWITCH COMPONENTS	Check to see if the switch spring functions correctly. Check the conductivity of the switch components with the movement reassembled.  (1) Confirm that the four portions of the switch spring (A, B, C and D) come in contact with the circuit block lead terminals when the four portions are depressed with tweezers. Confirm that the clearance is provided between the switch spring and circuit block lead terminal when released. (2) Check for dust, lint and other contamination of the connecting portions.	Functions correctly: Normal Does not function correctly: Defective Repair the switch spring, or replace the switch spring with a new one. Uncontaminated: Normal Contaminated: Defective Wipe off any foreign matter.
J CHECK ACCURACY	Check gain and loss of time by using the Quartz Tester. (1) Set up the Quartz Tester. Use the Electric-field detection microphone for liquid crystal panel watch. (2) Measuring 	Does not lose or gain: Normal Loses or gains. Defective Adjust the time accuracy by turning the trimmer condenser. (Gain or loss of this watch is less than 15 seconds/Month.)



Display change by button Ⓐ



How to set the TIME

- Depress buttons Ⓑ and Ⓓ simultaneously to set the watch to setting mode.
- Depress button Ⓑ to change the digit to be set.

Second → Minute → Hour

- The digit to be set flashes and changes each time button Ⓒ is depressed.
- After setting the digits, depress buttons Ⓑ and Ⓓ simultaneously to lock the watch.

How to set the CALENDAR

- Depress buttons Ⓑ and Ⓓ simultaneously to set the watch to setting mode.
- Depress button Ⓑ to change the digit to be set.

Day of the week → Day → Month → Year

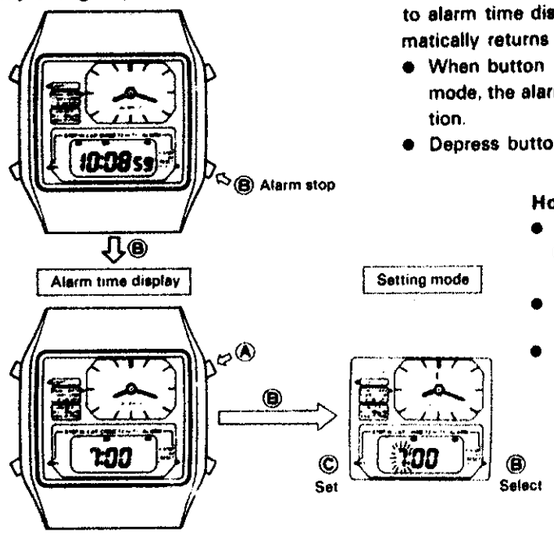
- The digit to be set flashes and changes each time button Ⓒ is depressed.
- After setting the digits, depress buttons Ⓑ and Ⓓ simultaneously to lock the watch.

How to set the DUAL ZONE TIME

- Depress buttons Ⓑ and Ⓓ simultaneously to set the watch to setting mode. At this time, hour digit flashes.
- The digit to be set each time button Ⓒ is depressed.
- In the dual zone time display, when buttons Ⓒ and Ⓓ are depressed simultaneously, the chime time can be set or released. When the chime time is set, the CHIME mark appears.

In each setting mode, depressing button Ⓒ will change the digit quickly.

Display change by button Ⓑ



In the time display, depress button Ⓑ to set the watch to alarm time display. (After 2 seconds, the display automatically returns to the current time display.)

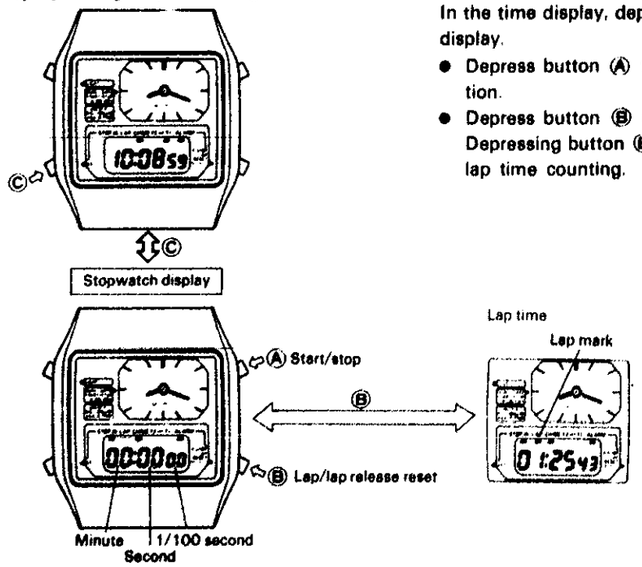
- When button Ⓐ is depressed in the alarm time display mode, the alarm mark disappears and alarm will not function.
- Depress button Ⓑ to stop the alarm sound.

How to set the ALARM TIME

- In the alarm time display, depress button Ⓑ to set the watch to setting mode. At this time, the hour digit flashes.
- The digit to be set flashes and changes each time button Ⓒ is depressed.
- Depress button Ⓑ to change the digit to be set.

Hour → Minute → Returns to current time display

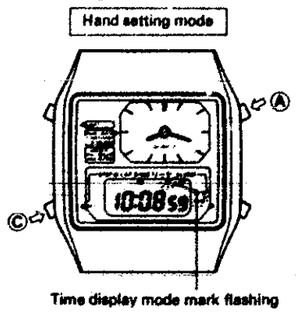
Display change by button Ⓒ



In the time display, depress button Ⓒ to set the stopwatch display.

- Depress button Ⓐ to start or stop the stopwatch function.
- Depress button Ⓑ to reset the stopwatch.
  Depressing button Ⓑ during stopwatch function enables lap time counting.

Hand setting



In the time display, depress button Ⓒ while depressing button Ⓐ to set the watch to setting mode. At this time, the time display mode mark flashes.

- The hand is corrected by 30-second intervals each time button Ⓒ is depressed.
  When button Ⓒ is depressed for more than 3 seconds, the minute hand advances continuously.
- After setting the hand, depress button Ⓒ while depressing button Ⓐ to lock the watch.

VII. PARTS LIST

Cal. Y651A

PART NO.	PART NAME	PART NO.	PART NAME
* 125 005	Train wheel bridge	4408 026	Circuit block spacer
221 481	Center wheel & pinion	4510 ···	Liquid crystal panel
261 480	Minute wheel	4621 026	Reflecting mirror
271 481	Hour wheel	4530 230	Bulb
387 008	Minute wheel bridge	011 541	Upper hole jewel for step rotor
426 001	Train wheel bridge support	011 541	Lower hole jewel for step rotor
~~701 480~~	~~Fifth wheel & pinion~~	012 168	Train wheel bridge screw
4001 196	Circuit block	012 168	Circuit block screw (B)
4002 480	Coil block	012 168	Battery connection (+) screw (B)
4146 480	Step rotor	012 470	Circuit block screw (A)
4216 062	Insulator for circuit block	012 470	Battery connection (+) screw (A)
4225 025	Battery clamp	017 203	Tube for train wheel bridge (A)
4225 030	Battery clamp (100m watter resistance)	017 206	Tube for train wheel bridge (B)
4239 480	Rotor stator	017 283	Liquid crystal panel frame guide pin
4245 037	Switch spring	017 284	Coil block guide pin (A)
4246 013	Speaker lead terminal (Gold)	017 285	Coil block guide pin (B)
4246 018	Speaker lead terminal (silver)	017 286	Tube for battery connection (+) screw
4270 033	Battery connection (−)	•MAXELL SR41W •SONY EVEREADY 392 SEIZAIKEN TR41W	Silver oxide battery
* 4271 002	Battery connection (+)		
4313 031	Connector A		
4313 032	Connector B		
4398 207	Liquid crystal panel frame		

REMARKS:

* Train Wheel Bridge for Pulsar Watches

  125480 (Pulsar marking)

* Battery connection(+) for Pulsar Watches

  4271008 (Pulsar marking)