

***TECHNICAL
INFORMATION***

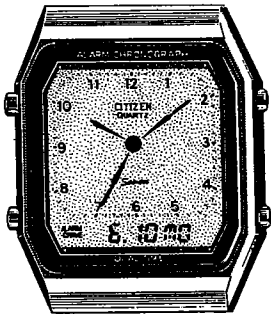
**CITIZEN QUARTZ
Cal. No. 956※**

 **CITIZEN**

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§1. OUTLINE



This fully electronic Ana-Digi watch has been developed rather in a short time to cope quickly with the present keen competition of the digital watches as well as expand the group of watches featuring a reasonable price.

The structure of this watch is based on the module of Cal. No. 8940 which is already on the market, having an analog display with center second by an LCD plus a digital display of 6 digits.

§2. FEATURES

- 1) A fully electronic watch that contains both the analog and digital display functions. The analog part shows constantly the home time of the wearer by the hour, minute and second hands with the 1-second step movement. The digital part has a display function with 6 digits plus 10 marks for the calendar, local time, alarm, stopwatch, timer and chime respectively.
- 2) A switching is possible between the 12-hour and 24-hour displays in the mode of the local time.
- 3) The analog display is carried out by the block-split multiplex driving, and the digital display is carried out by the 3-split multiplex driving respectively. Even in the multidisplay mechanism of the digital part, the connection is simplified between the LC display panel and the plate complete.

§ 3. SPECIFICATIONS

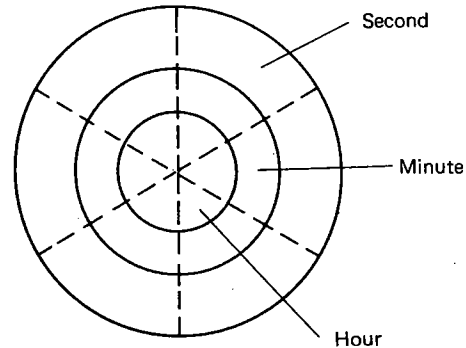
Caliber No.	9560	
Type	Digital Quartz Watch	
Module Size	Outer dia. (mm): 26.0 (3-9H) x 27.4 (12-6H) Thickness (mm): 5.05 ^t (Power cell part 5.85 ^t)	
Accuracy	±15 sec./month at normal temperatures	
Oscillation	32,768Hz	
Display system	FE (Field Effect) type nematic LC Analog part : 1-second step movement of hands with center second, 60 x 2 = 120 segments, block-split multiplex driving method Digital part : 6 digits plus 10 marks, 3-split multiplex driving method	
Integrated circuit	C/MOS-LSI (1 unit)	
Effective temperature range	±0°C ~ 55°C (32°F ~ 131°F)	
Display functions	Calendar	Normal display: Month, date & day Display during A/P hour, minute & second correction correction: (12H/24H switch coupling to local time)
	Local time	A/P, hour, minute & L Hour, minute & L
	Alarm	A/P hour, minute & AL (12H/24H switch coupling to local time) Alarm ON : Display of "Set time AL" Alarm OFF : Display of "OFF AL"
	Stopwatch	Hour, minute & 1/10 sec. (60-minute count)
	Timer	Hour, minute & second (Max. set time: 11H 59'59")
Additional functions	<ul style="list-style-type: none"> ●Chime ●Alarm monitor ●Illumination lamp ●Quick setting for correction ●Fully automatic calendar (1980 ~ 2019) ●Auto-return system ●Instant manual return system 	
Power cell (Silver oxide power cell)	Parts No. : 280-15 Cell code : SR1130W (Ag ₂ O/KOH) Capacity : 80mAH Nominal voltage: 1.55V Size (mm) : 11.6φ x 3.1 ^t Lifetime : About 20 months (25 sec. alarm ring, 24-time hourly chime and 3 sec. lamp lighting per day)	

§4. BLOCK-SPLIT MULTIPLEX DRIVING SYSTEM

- Block-split multiplex driving system

The block-split multiplex driving system (hereafter called "block-split system") is adapted newly to Cal. No. 9560 as an analog display system.

This block-split system is detailed as follows.



As shown in the above diagram, the center, intermediate and outer circumference circle zones are used for display of "hour", "minute" and "second" respectively.

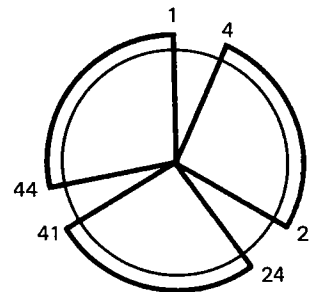
In other words, the following formulas are defined for each display.

- "Second" = "Hour" + "Minute" + "Second" }
- "Minute" = "Hour" + "Minute" }
- "Hour" = "Hour" }

At the same time, the analog display part is divided into 6 equal portions as shown by the dotted lines in the above diagram. And 10 pieces of display segments (equivalent to analog hour, minute and second hands each) are included into each range of 60°.

One of the 10 segments in each of the 6 equally divided portions is connected to each other.

(Ex.) As illustrated right, the segments equivalent to 1 (sec.), 4 (sec.), 21 (sec.), 24 (sec.), 41 (sec.) and 44 (sec.) each are connected mutually into a piece of line.



Accordingly, the 28 pieces (= 3 × 6 + 10) of output terminals are obtained. In this case, the figure 3 means "hour", "minute" and "second"; 6 means "6 divided portions"; and 10 is the number of segments respectively.

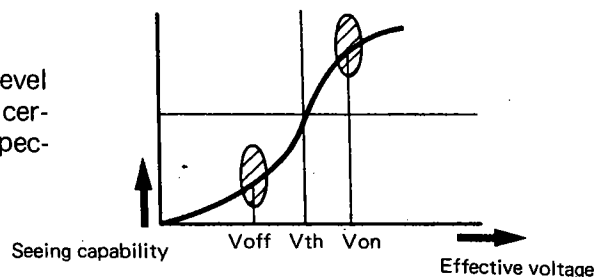
In the actual case of Cal. No. 9560, the "second" and "minute" are regarded as one element. As a result, the number of output terminals counts 22 pieces (= 2 × 6 + 10).

- LC driving voltage of Cal. No. 9560

The LC driving voltage of Cal. No. 9560 is set at 4.5V (3V for other ordinary calibers) in order to secure a high contrast between the ON and OFF of the LC display. Thus an easy-to-see display can be obtained.

The above reasons is detailed as follows.

The LC display panel is turned ON at a certain level of voltage V_{ON} (effective voltage) and OFF at a certain level of voltage V_{OFF} (effective voltage) respectively. (Fig. 1)



(Fig. 1)

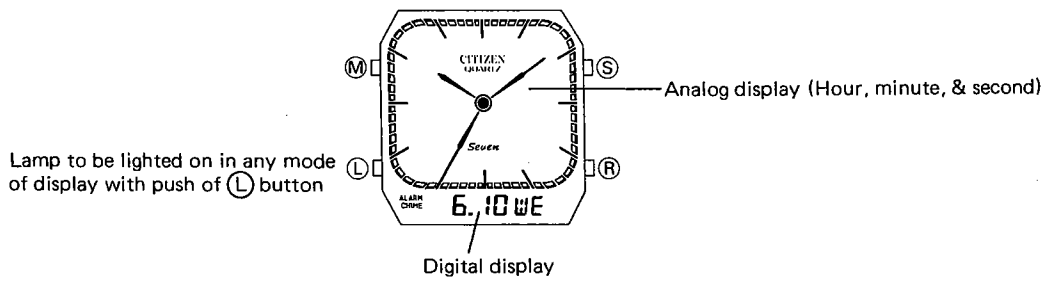
This V_{ON}/V_{OFF} ratio is expressed by $\frac{V_{ON}}{V_{OFF}} = \text{working margin} (\approx \text{contrast ratio})$.

Thus the large the working margin the higher the contrast of LC (liquid crystal) becomes. Then the higher the driving voltage the higher the contrast of LC display in case the working margin is constant. This is due to the fact that the higher the driving voltage the more suddenly V_{OFF} changes to V_{ON} .

In this connection, as mentioned first, the voltage is increased up to 4.5V to secure a sufficient ratio between V_{ON} and V_{OFF} and thus obtain a higher contrast of LC display.

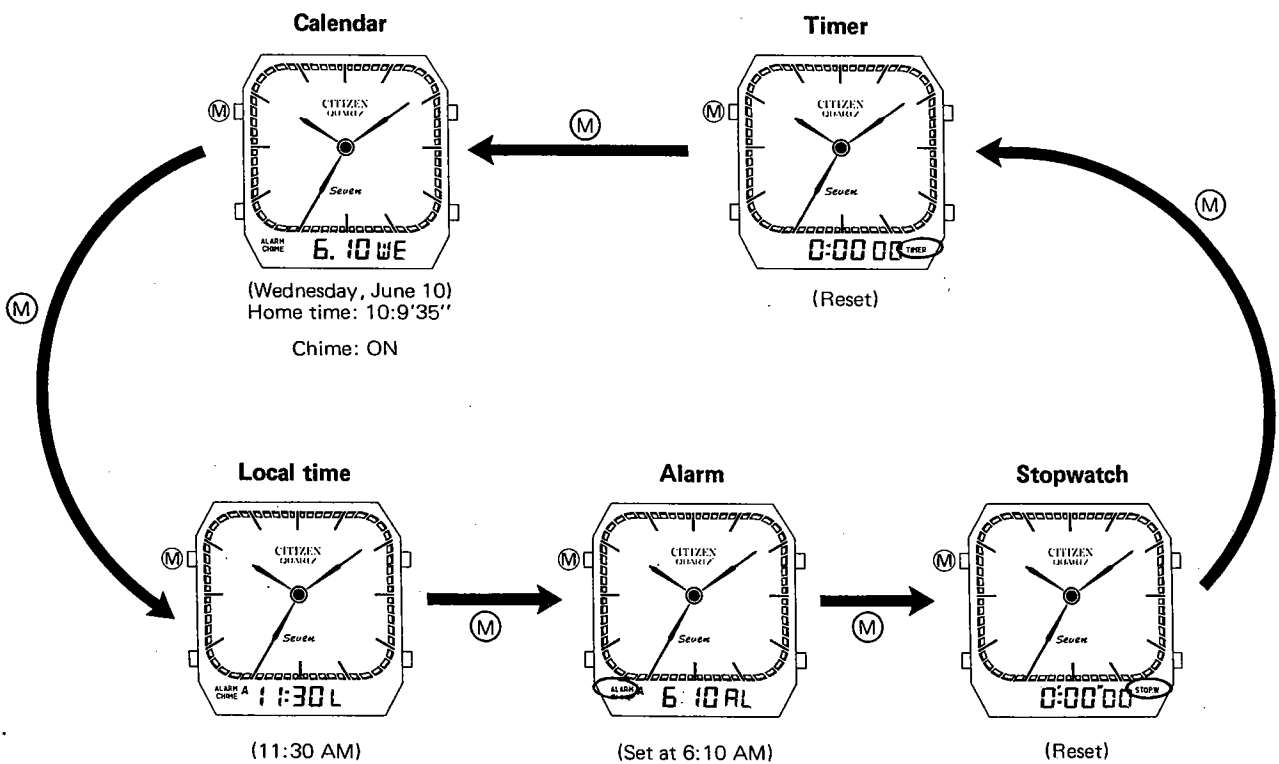
§5. HANDLING INSTRUCTION (The flashing area is shown by ○.)

1) Name of each part



2) Switching of display

The modes of display are switched in that order shown below with every push of (M) button. The analog shows the home time constantly regardless of a mode switch in the digital part. (The time shown by the analog watch is called home time.)



•Alarm monitor

The alarm monitor is possible with a simultaneous push of both (R) and (S) buttons in the display modes of calendar and local time.

The following actions are given simultaneously.

- In calendar display: ON/OFF switch of Chime
- In local time display: Switch of 12-/24-hour displays

*1: Auto-return

The mode is returned automatically in 1~2 minutes to the calendar display from any other mode.

*2: Instant manual return

The calendar display is reset from each setting mode with push of (M) button.

●Other functions for home time setting

- ① In the setting of second, one minute is carried up if the 0-second reset is given with push of (R) button while the second reads 30~59. At this moment, the analog second is also reset to 0 coupling to the digital second.

A synchronous setting is always given between the analog and digital sections for the hour, minute and second each.

- ② A quick setting (8Hz) is possible in each setting mode by pushing (R) button for about 2 seconds or more. In this instant, the flashing is stopped for the digit to be corrected. In the same way, a quick setting can also be given to a correction of the local time, alarm and timer each.

In each setting mode excepting the 0-second reset, the figure (day) can be advanced one by one for the flashing digit to be corrected with every push of (R) button.

- ③ The switch between the 12-/24-hour displays of the home time couples to that of the local time.

(Thus this switch is also possible in the display of a local time.)

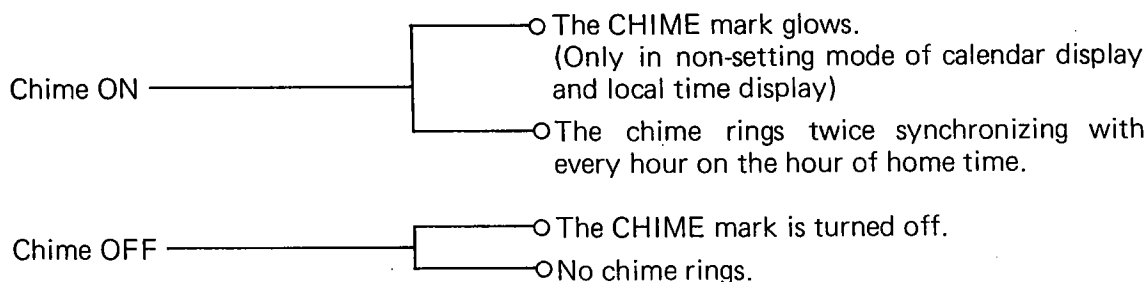
- ④ The carry-up is performed up to the highest digit by the time counting even in each setting mode like the normal display mode. However, no carry-up is performed toward the higher digits with operations of (R) button in each setting mode excepting the setting of second.

- ⑤ A non-existing day, if set, is changed automatically to the first day of the next month when the mode is reset to the calendar display.

(2) ON/OFF of chime

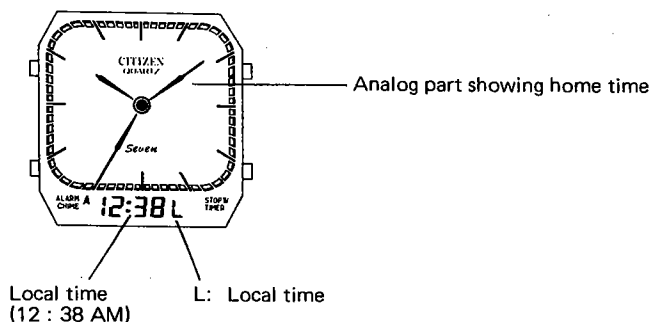
The ON and OFF are switched alternately for the chime in the calendar display mode with a simultaneous push of both (R) and (S) buttons.

The alarm rings for an alarm monitor during a simultaneous push of (R) and (S) buttons.



4) Setting of local time

(Example of display)

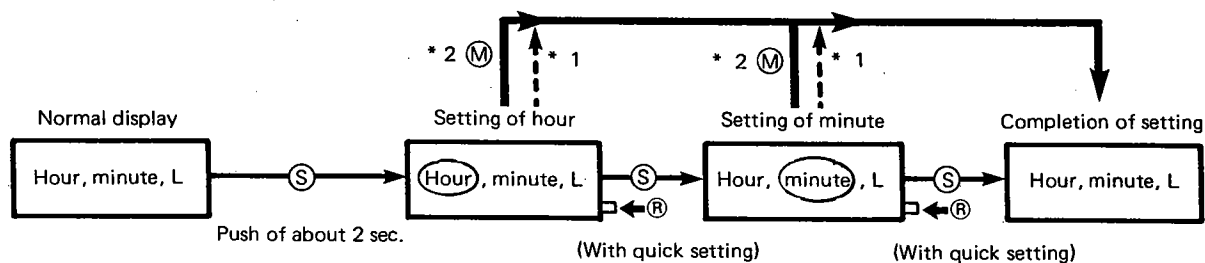


Each of the ALARM, CHIME, STOP. W and TIMER modes is displayed in the same way as the calendar display.

Chime/alarm: ON

Stopwatch/timer: Under counting

(1) Setting of time



*1 : Auto-return

*2 : Instant manual return

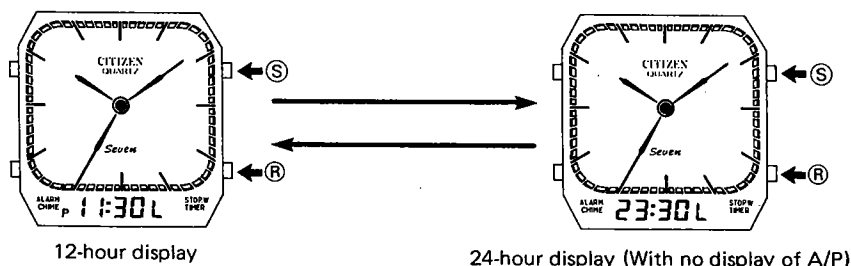
Other functions for alarm time setting follow ② and ④ of the home time setting.

(2) Switch between 12-/24-hour displays

In the non-setting mode of local time display, a switch is possible between the 12- and 24-hour displays with every simultaneous push of both (R) and (S) buttons.

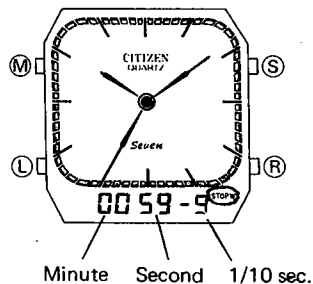
This switch of the local time couples to both the home time and the alarm each.

The alarm rings for an alarm monitor during a simultaneous push of (R) and (S) buttons.



6) Operation of stopwatch

(Example of display)



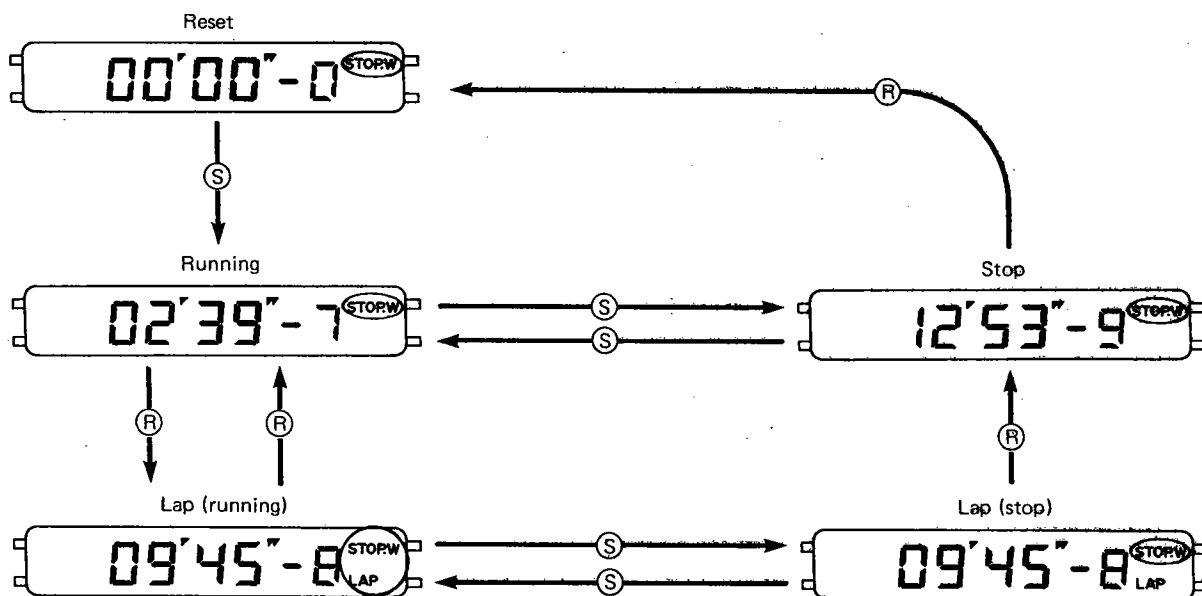
Unit of counting: 1/10 sec.

Time of counting: 59'59"9 (60-min. count)

(The counting is reset to 0 again beyond 59'59"9 to continue counting.)

The ALARM, CHIME and TIMER marks are all turned off.

•Method of operation



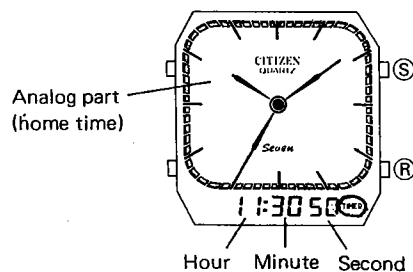
Note:

The lap function works only in the mode of stopwatch display. The lap state is cancelled when the stopwatch display is given again after the lap (running) or lap (stop) mode is switched to another mode with push of (M) button. Then the lap (running) and the lap (stop) are turned into the running and stop modes respectively.

*No sound of confirmation is given at the start/stop.
(And so is with the timer display.)

7) Operation of timer

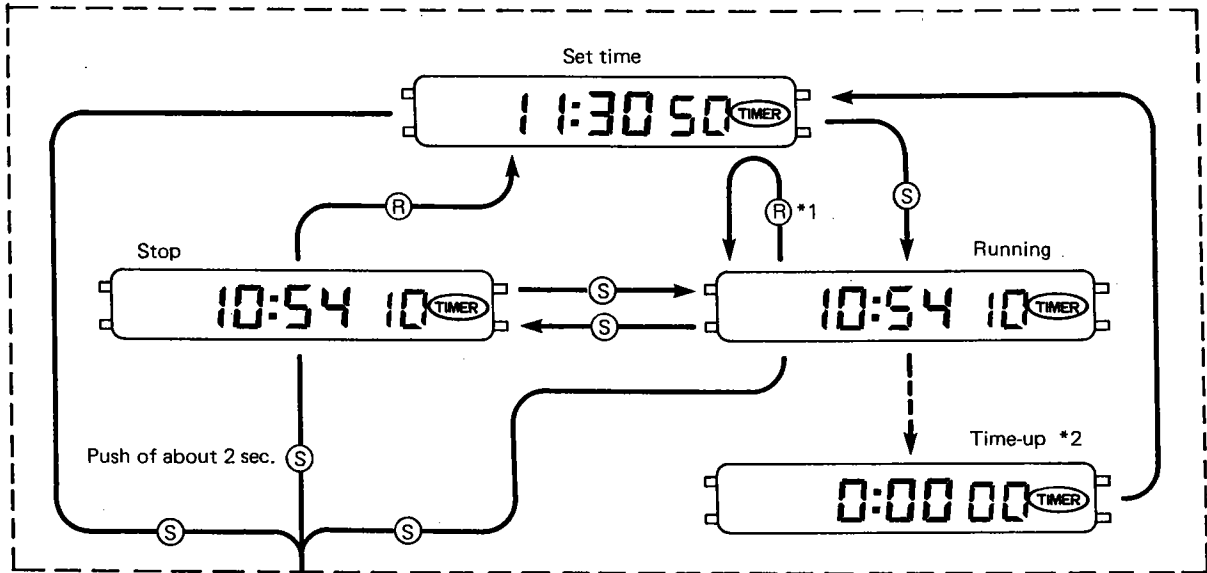
(Example of display)



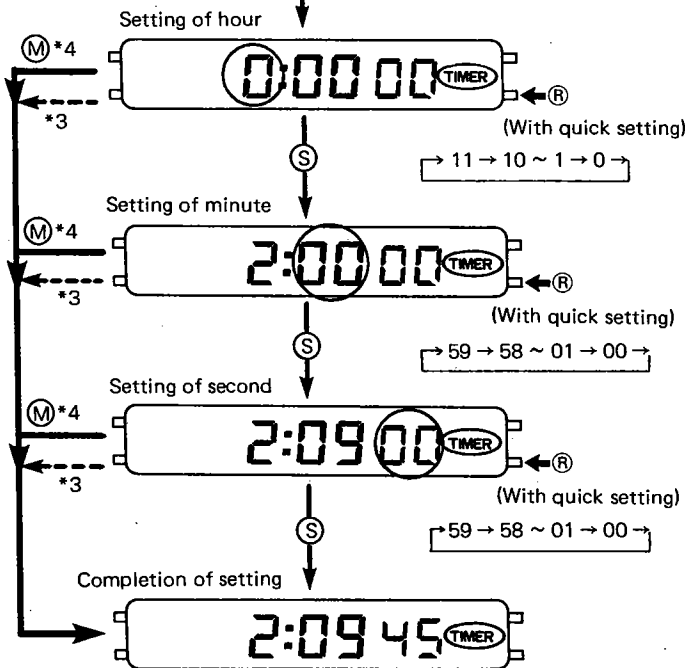
Unit of counting: 1 sec.

Max. set time: 11:59'59"

The ALARM, CHIME and STOP.W marks are all turned off.



(Ex.) Timer to be set at 2H 9'45"



- All corrections are done by a subtraction system.
- Push (S) button for about 2 sec. only for call-out of the hour setting mode. In this instant, the display is reset to 0:0000.

*1: Flyback function

The time once set is stored until the next setting of time (by a memory function).

The set time is reset with push of (R) button in the running mode to start a count-down action again.

*2: Time-up

The alarm rings 10 seconds, and then the set time is reset.

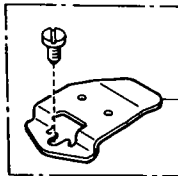
*3: Auto-return

*4: Instant manual return

§ 6. DISASSEMBLY/ASSEMBLY OF MODULE

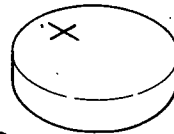
Disassembly : ① → ⑫

Assembly : ⑫ → ①



Power cell strap for checking:

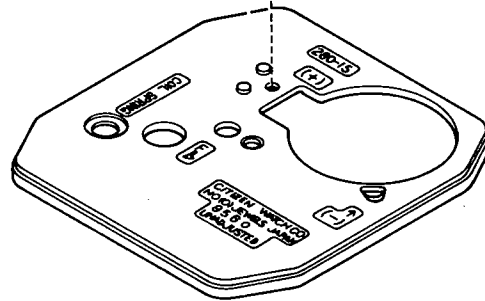
This strap is used tentatively for a check of the module to prevent a floating of the power cell. Thus this strap must be removed without fail when setting the movement into a case.



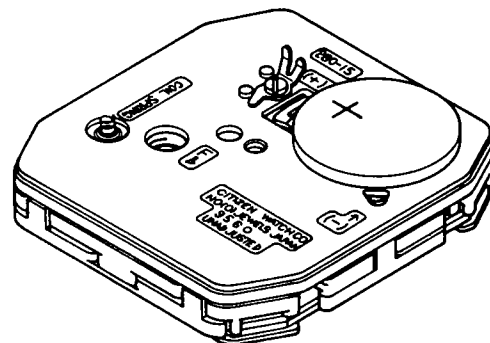
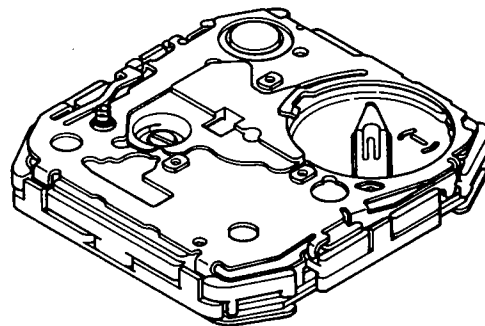
① Power cell



② Contact spring for vibrating plate



③ Device cover



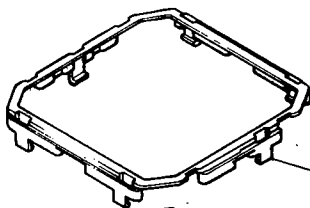
The following examples of "non-existing" displays may often be given when putting a power cell into the module of Cal. No. 9560 for a replacement of power cells and other purposes.

- 1) Digital display (mode unfixed particularly with display of timer, calendar and others) with no analog display.
- 2) No digital display with display of 4 or more pieces in analog display.

In the case of the above examples, either one of the S , R and M buttons is pushed to secure an "all reset" mode (mode of start) as follows.

- 1) Digital display: Calendar display (1.1 SUN)
- 2) Analog display: 12:00'00"

Thus a correct time can be set in this "all reset" mode.



④ LC display panel supporter

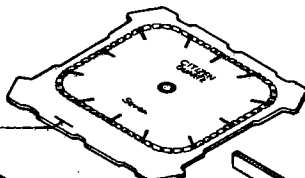
When attaching, the hook parts at the outer circumference must be fixed tight. The hook part is pried open lightly for detachment.



⑤ LC display panel

This gold electrode part is positioned in the 2-o'clock direction for attachment of the LC display panel.

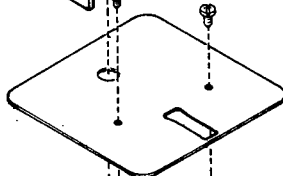
Five types of light diffusing plates are available in different designs and colors. And each proper parts No. is written at this portion of the plate. For details refer to the parts catalog.



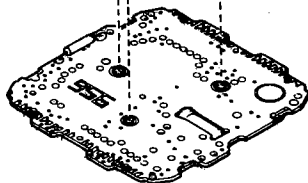
⑥ Light diffusing plate



⑦ LC display panel connection rubber

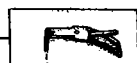


⑧ Shield plate

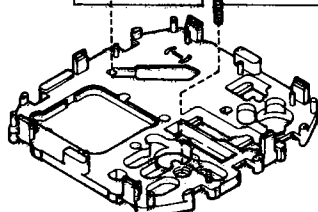


⑨ Plate complete

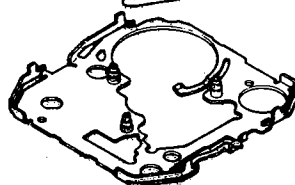
This power call connector requires no detachment in the normal disassembly and assembly process.



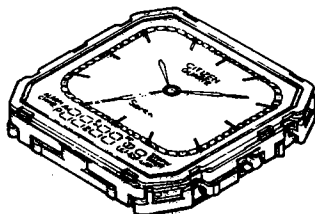
⑩ Buzzer contact spring

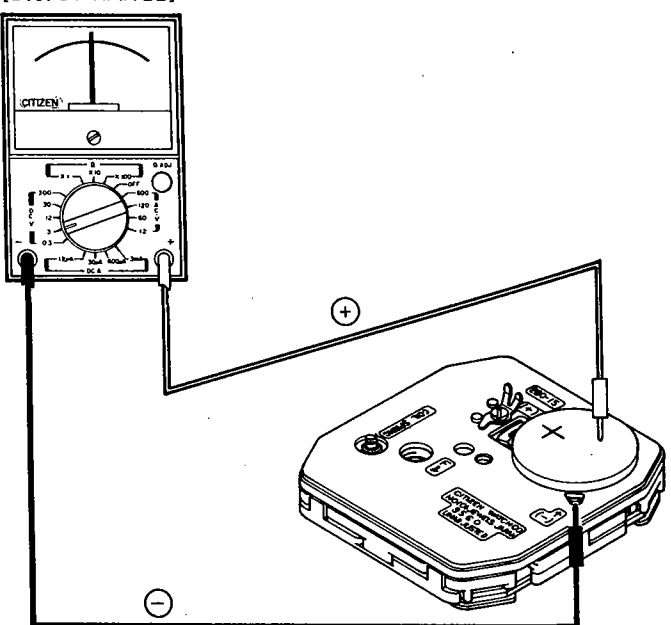

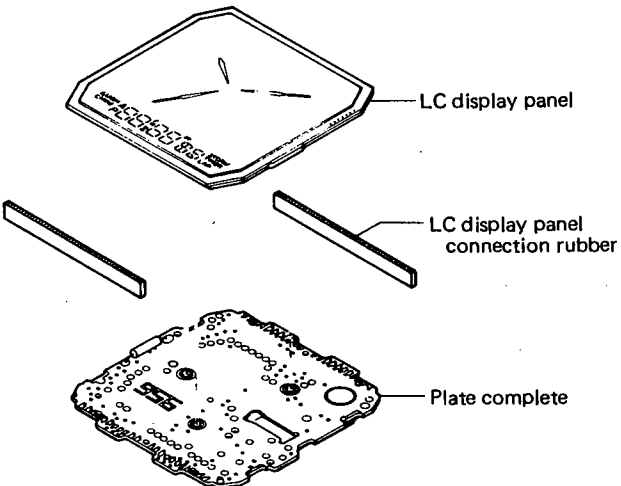


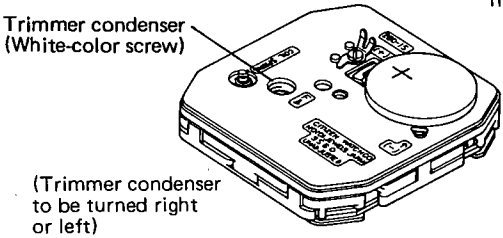
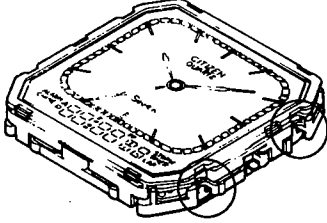
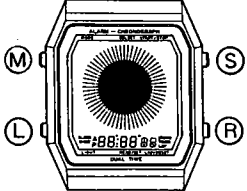
⑪ Supporter for plate complete (I)

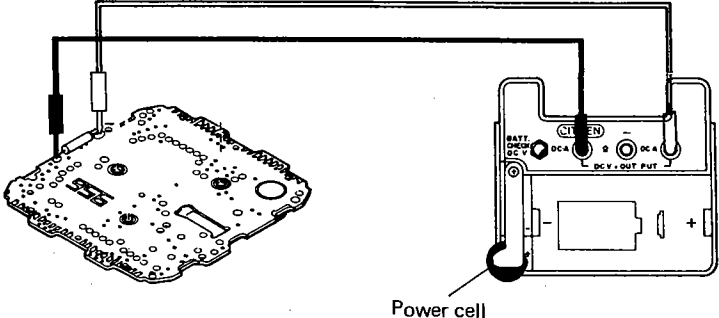
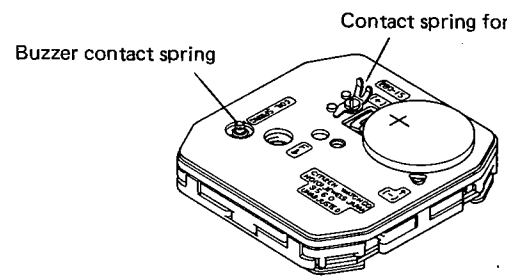


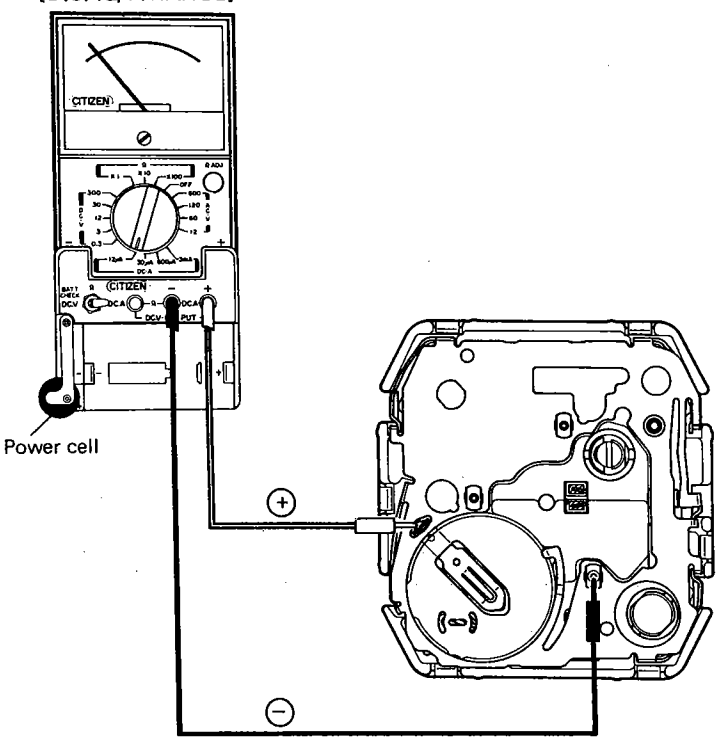
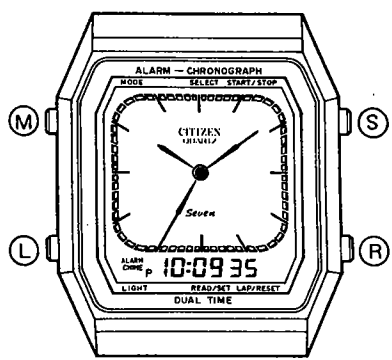
⑫ Supporter for plate complete (II)



Checking items	How to check	Result and treatment
<p>1 Measurement of power cell voltage</p>	<p>[D.C. 3V RANGE]</p> 	<p>Over 1.5 V → O.K.</p> <p>Under 1.5 V → Replacement of power cell</p>
<p>2 Check of LC display panel connection parts</p>	<p>(Full-segment glow check)</p> <ul style="list-style-type: none"> • The all segments of display glow with a simultaneous push of (M), (R) and (S) buttons. • Check the defective segments under a full-segment glow state <p>*The full-segment glow state is changed to the normal display mode with push of either one of the four push-buttons.</p>  <p>(Connection check among LC display panel, LC display panel connection rubber and plate complete)</p> <ul style="list-style-type: none"> • Make sure that each of these three parts is set completely and in good order. • Make sure that each connection is completely free from the dust, stains, break, crack and other flaws. 	<p>Dust or stains → To be cleared away</p> <p>LC display panel cracked → To be replacement</p> <p>No defect detected through above checking → Replacement of LC display panel</p> <p>Correction impossible yet → Replacement of plate complete</p>

Checking items	How to check	Result and treatment
<p>3 Measurement/adjustment of time rate</p>	<p>a. Measurement of time rate b. Adjustment of time rate</p> <p>*When performing an adjustment of time, the "measurement time" of a timing machine must be set at "10 sec."</p>  <p>Trimmer condenser (White-color screw)</p> <p>(Trimmer condenser to be turned right or left)</p>	
<p>4 Confirmation of using condition of watch</p>	<p>Check how the user of the watch has been using his watch, for instance, whether he made some mistake or not in handling of watch.</p>	
<p>5 Check of switch mechanism</p>	<ul style="list-style-type: none"> ● This check is given to an assembled module. ● Make sure that the supporter for plate complete (II) is set completely with no defect. ● Make sure that a correct contact is secured between the switch part of the supporter for plate complete (II) and the contact part of the plate complete. <p>An attachment of dust, stains and other foreign matters must also be examined well.</p>  <p>An inspection is given to the push-buttons.</p> <ul style="list-style-type: none"> ● An inspection is given to the malformation, stains and other factors for both push-buttons and the case. <p>*Never fail to apply the silicone oil to the push-buttons to ensure a water resistance and a smooth operation of buttons.</p> 	<p>Malformation of switch part → To be corrected</p> <p>Dust, stains → To be cleared away</p> <p>Malformation of button → Replacement of button</p> <p>Dust, stains → To be cleared away</p>

Checking items	How to check	Result and treatment
<p>6 Check of lamp</p>	<p>As illustrated below, the adaptor of a Multitester is used to apply the tester lead terminals across a lamp attached to the plate complete. Thus a lighting of the lamp is checked. (The lamp has no definition between the plus and minus polarities.)</p>  <p style="text-align: center;">Power cell</p>	<p>No lighting of lamp → Replacement of plate complete</p>
<p>7 Check of alarm mechanism</p>	<ol style="list-style-type: none"> 1. Check of vibrating plate Make sure that a white piezoelectric element adhered to the vibrating plate has a tight adhesion with no break nor crack. 2. A check is given to the contact spring for vibrating plate and the buzzer contact spring. Make sure that these contact springs have a correct contact to the vibrating plate each with no malformation nor wear.  <p style="text-align: center;">Buzzer contact spring Contact spring for vibrating plate</p>	<p>Element cracked or broken → Replacement of vibrating plate</p> <p>Malformation or wear of contact spring → Replacement of contact spring</p> <p>No defect detected in the above check → Replacement of plate complete</p>

Checking items	How to check	Result and treatment
<p>8 Measurement of power consumption</p>	<ul style="list-style-type: none"> ● The power consumption must be measured in the time display mode (with an assembled module). ● The power consumption is measured with the LC display panel removed (with the plate complete only). <p>[D.C. 12μA RANGE]</p>  <p>Power cell</p> <p>In case the tester pointer swings up to a full limit, the range of the tester is increased up to "DC3mA" while applying the tester lead terminals to the module.</p> <p>Thus the pointer will be steady at "0". After this, the range is set back to the original "DC12μA" or "30μA" to start a measurement again.</p>	<p>Under 5μA</p> <p>→ Adjustment of time rate</p> <p>Over 5μA</p> <p>→ Measurement of power consumption with plate complete only</p> <p>Under 4.5μA</p> <p>→ Replacement of LC display panel connection rubber or LC display panel</p> <p>Over 4.5μA</p> <p>→ Replacement of plate complete</p>
<p>9 Check of appearance conditions and functions</p>	<p>The following points are checked with a complete watch.</p> <ul style="list-style-type: none"> ● The display is free from any defect. ● Each of the push-buttons can be smoothly operated with no trouble. ● The display screen of LC display panel is free from any dust or stain. 	

CITIZEN WATCH CO., LTD.
Tokyo, Japan