

***TECHNICAL
INFORMATION***

**CITIZEN QUARTZ
Cal. No. 956 ✖**

 **CITIZEN**

CONTENTS

§ 1. OUTLINE	P1
§ 2. FEATURES	P1
§ 3. SPECIFICATIONS	P2
§ 4. BLOCK-SPLIT MULTIPLEX DRIVING SYSTEM	P3
§ 5. HANDLING INSTRUCTIONS	P5
§ 6. DISASSEMBLY/ASSEMBLY OF MODULE	P12
§ 7. TROUBLESHOOTING AND ADJUSTMENT	P14

§ 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

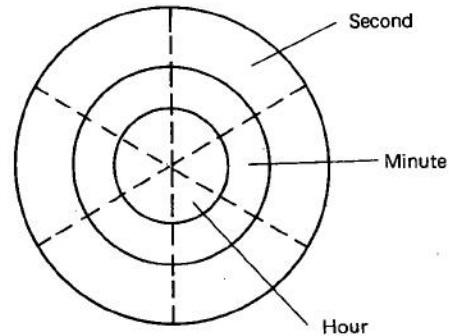
Caliber No.	9560	
Type	Digital Quartz Watch	
Module Size	Outer dia. (mm): 26.0 (3-9H) x 27.4 (12-6H) Thickness (mm): 5.05 ^t (Power cell part 5.85 ^t)	
Accuracy	±15 sec./month at normal temperatures	
Oscillation	32,768Hz	
Display system	FE (Field Effect) type nematic LC Analog part : 1-second step movement 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 <ul style="list-style-type: none"> •Switch of 12H/24H displays 	
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.

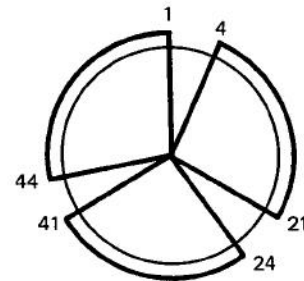
In other words, the following formulas are defined for each display.

- "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.

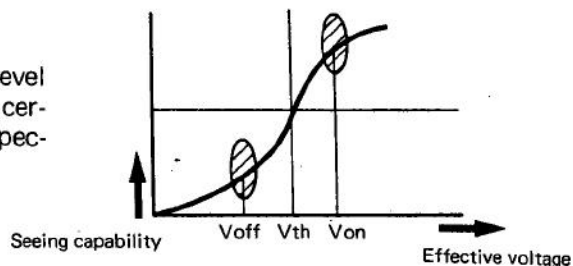
In the actual case of Cal. No. 9560, the "second" and "minute" are regarded as one element. As a result, the number of output terminals counts 22 pieces (= 2 × 6 + 10).

- 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)

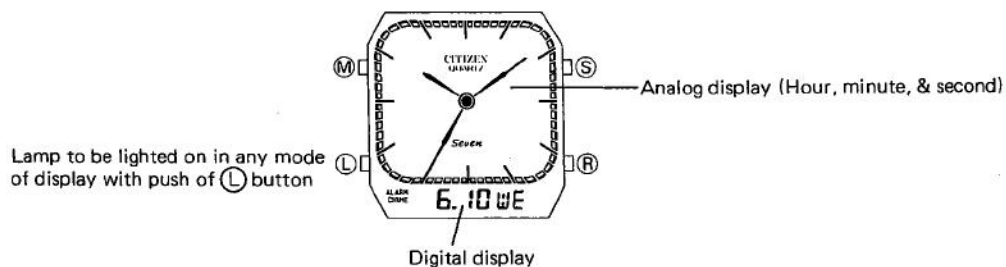
This V_{ON}/V_{OFF} ratio is expressed by $\frac{V_{ON}}{V_{OFF}} = \text{working margin} (\cong \text{contrast ratio})$.

Thus the larger 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 ○.)

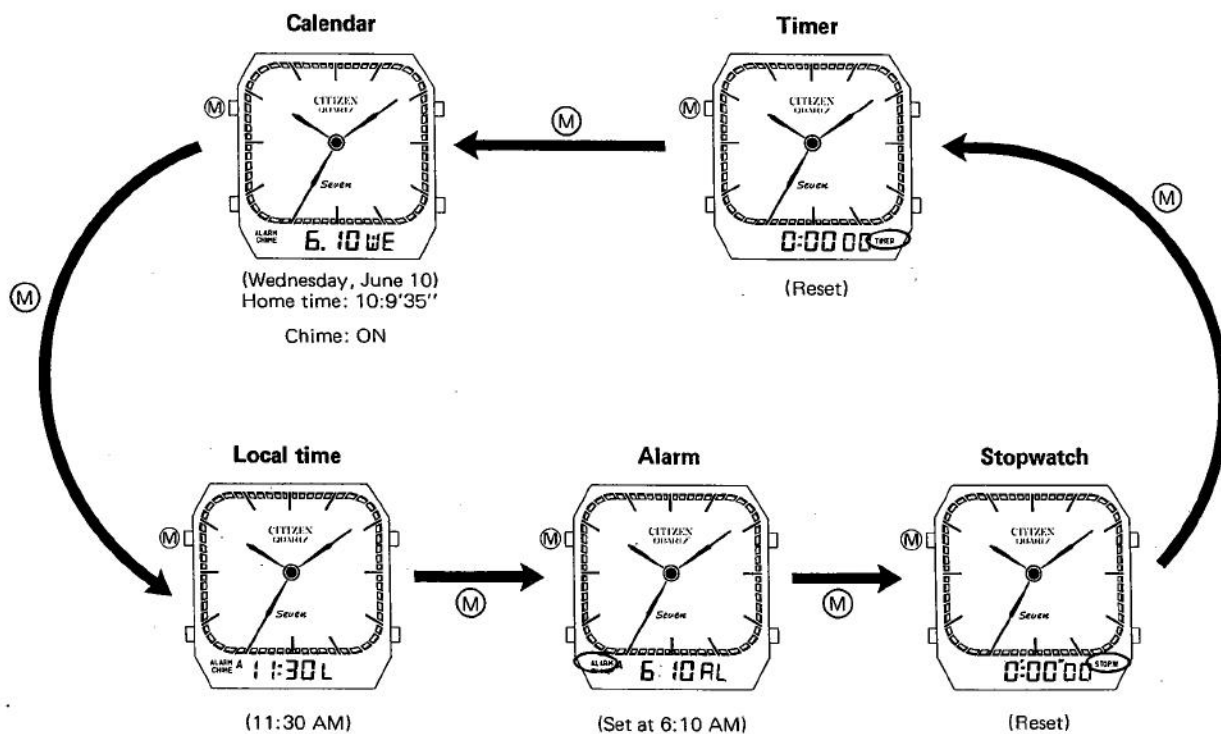
1) Name of each part



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

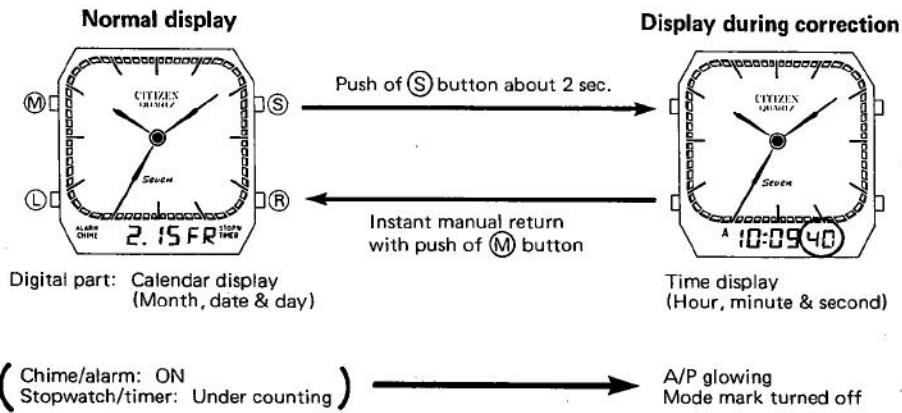
The alarm monitor is possible with a simultaneous push of both (R) and (S) buttons in the display modes of calendar and local time.

The following actions are given simultaneously.

In calendar display: ON/OFF switch of Chime

In local time display: Switch of 12-/24-hour displays

3) Setting of home time

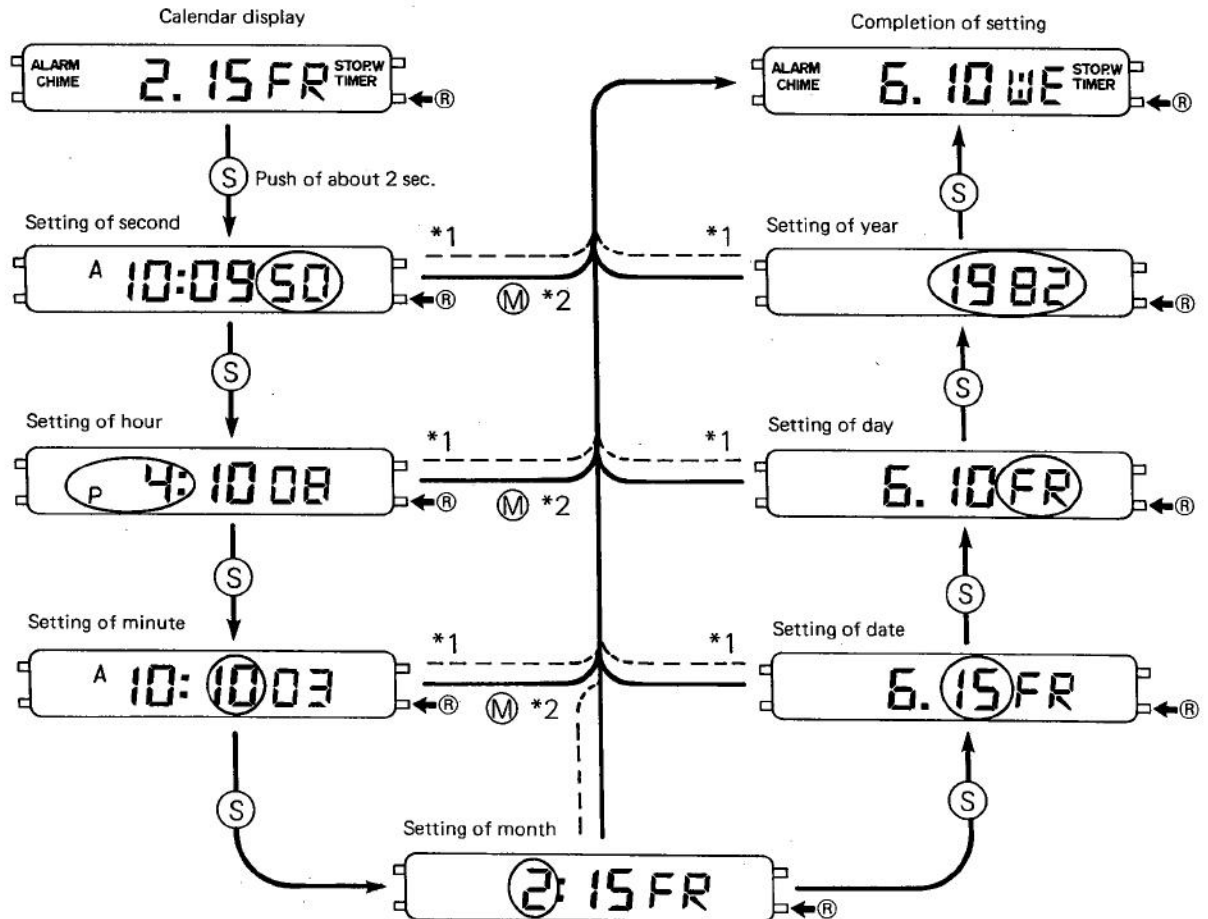


The time displayed at the digital part during a correction or setting is always synchronous with the home time of the analog part.

Thus a coupled correction/setting is given between the analog time and the digital time.

(1) Setting of time

(Ex.) 10:9'50" AM Friday, February 15 → 4:15'00" PM Wednesday, June 10



*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.)

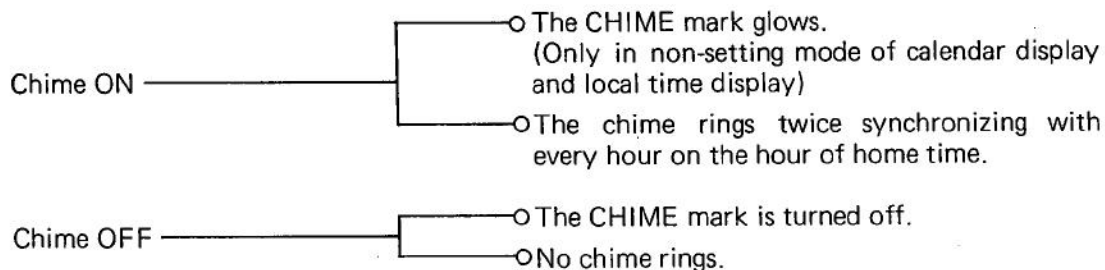
- ④ The carry-up is performed up to the highest digit by the time counting even in each setting mode like the normal display mode. However, no carry-up is performed toward the higher digits with operations of (R) button in each setting mode excepting the setting of second.

- 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

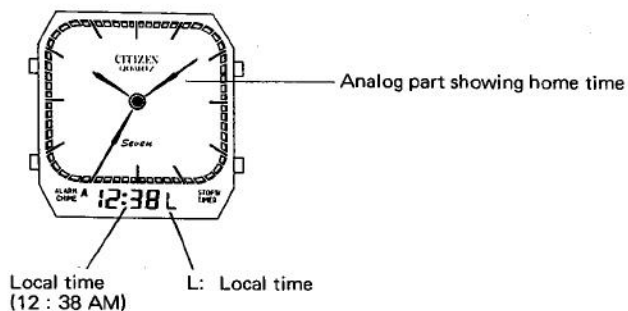
The ON and OFF are switched alternately for the chime in the calendar display mode with a simultaneous push of both (R) and (S) buttons.

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



4) Setting of local time

(Example of display)

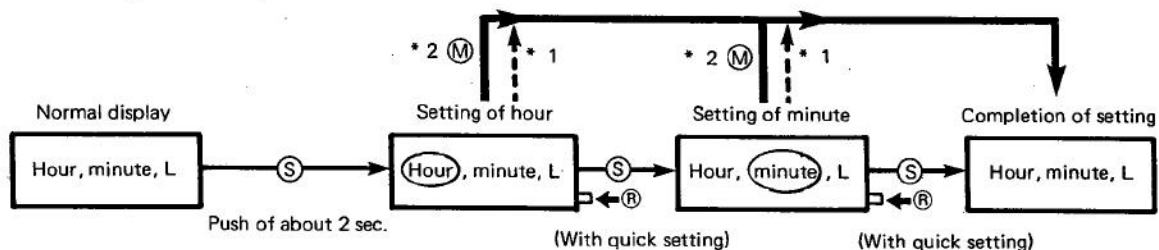


Each of the ALARM, CHIME, STOP. W and TIMER modes is displayed in the same way as the calendar display.

Chime/alarm: ON

Stopwatch/timer: Under counting

(1) Setting of time



*1 : Auto-return

*2 : Instant manual return

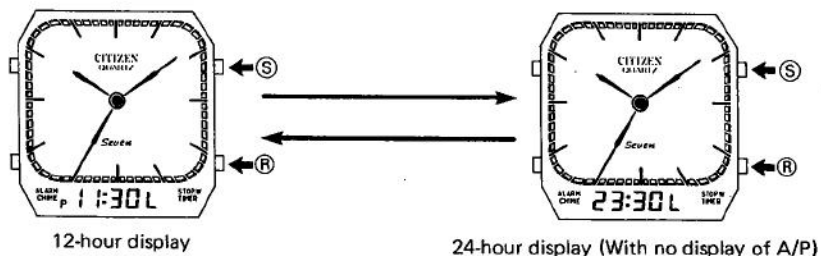
Other functions for alarm time setting follow ② and ④ of the home time setting.

(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.

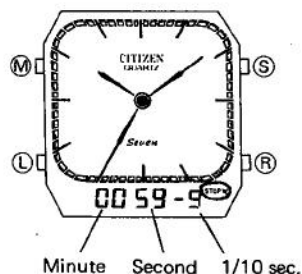
This switch of the local time couples to both the home time and the alarm each.

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



6) Operation of stopwatch

(Example of display)



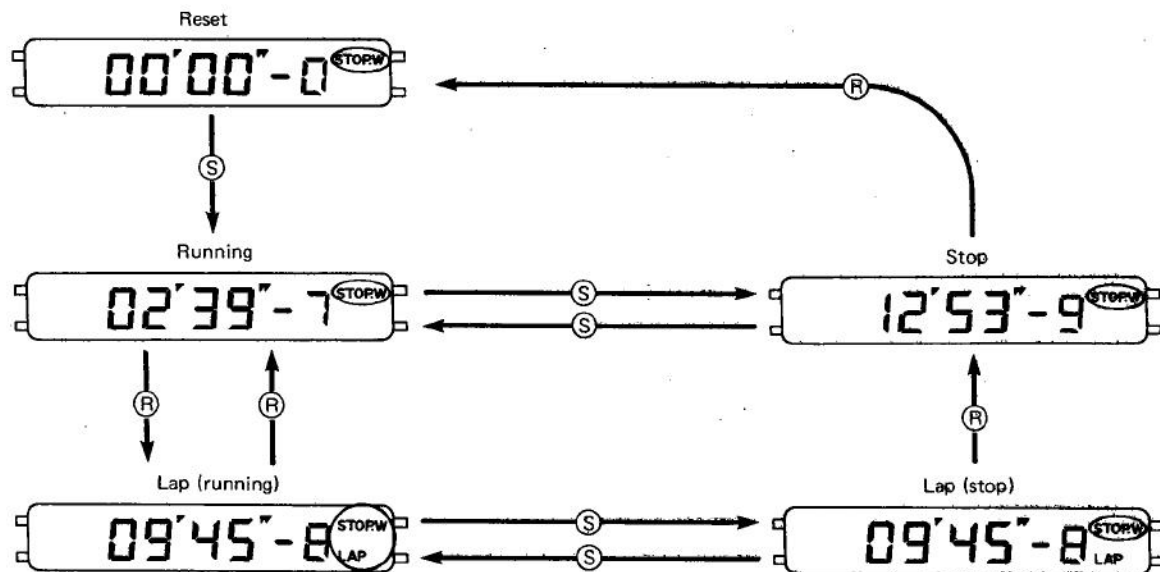
Unit of counting: 1/10 sec.

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



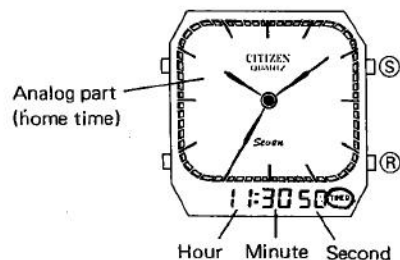
Note:

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

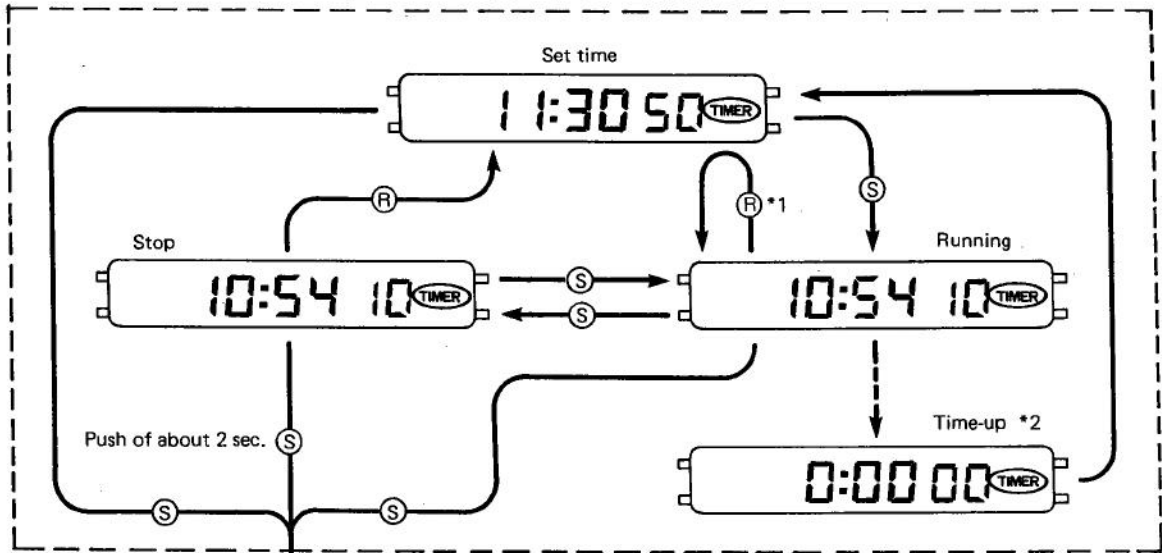
(Example of display)



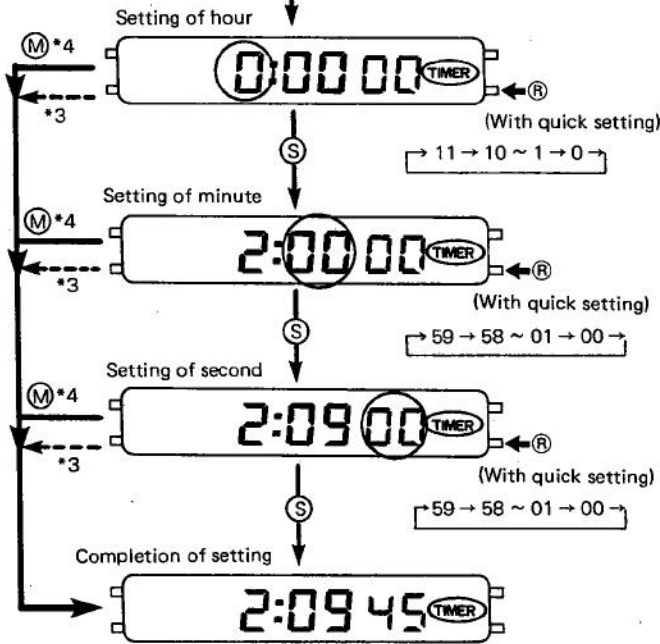
Unit of counting: 1 sec.

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 0:00:00.

- *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