

§1. OUTLINE

This watch has a radio wave receiving function that automatically corrects the time/calendar by receiving the radio wave of standard time in the Middle Europe.

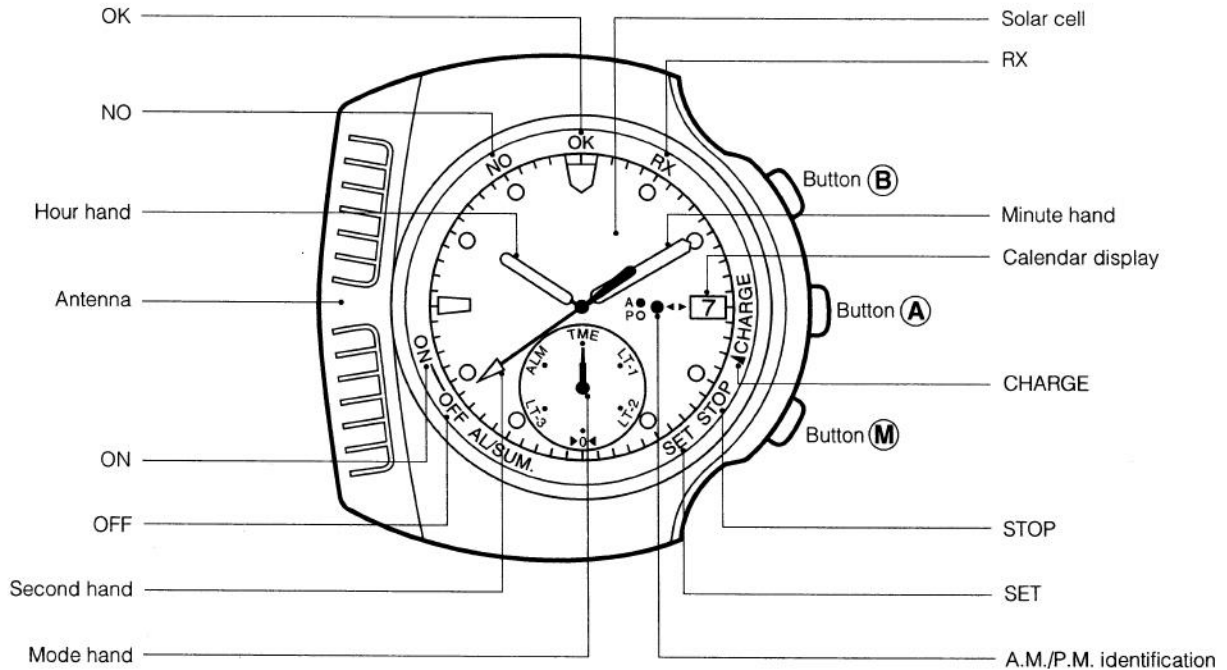
§2. SPECIFICATIONS

Caliber NO.		9410M/9415M
Type		Analog solar power watch with radio wave reception
Module size (mm)		ø31.0 × 6.5
Accuracy (at normal temperature)		Within ± 15 sec/month (Normal temperature range of 5°C/41°F~35°C/95°F)
Operating temperature range		-10°C~+60°C (14°F~140°F)
Time adjustment function		Not installed
Measurement gate		10 sec
Indicating function		• Time : Hour, Minute, second, a.m./p.m. • Calendar : Date (automatic calendar)
Additional functions		• Radio wave reception • Charge function • Alarm on 24-hour basis • Local time; with time difference correction by hours • Switchover to summertime
Secondary battery	Part NO.	295-31
	Code	MT1620
	Remarks	*Secondary battery block (With welded lead plate at (-) side)

Difference between CAL. 9410 and CAL. 9415

CAL. 9415 is based on CAL. 9410, but the former has a titanium case. Since the radio wave receiving sensitivity is affected by the material of the case, the electronic circuits of these two models are designed differently from each other. The operation methods of these models are the same, however.

§3. NAME OF PARTS



CHARGE: If the watch is insufficiently charged, the second hand stops at the point of CHARGE to indicate the active charge warning.

STOP: If the watch stops due to insufficient charging, the second hand points at the STOP position to indicate the active stop warning.

SET: If the watch is once stopped and resumes the operation (the time is wrong), then the second hand points at the SET position to indicate that the time setting warning is active.

RX: The second hand points at RX during reception.

OK: If the reception completed when the result is checked, the second hand points at OK.

NO: If the reception is not completed when the result is checked, the second hand points at NO.

ON: When the alarm is set ON in the alarm mode, or when the summer-time is set ON with the summer-time monitor, the second hand points at ON.

OFF: When the alarm is set OFF in the alarm mode, or when the summer-time is set OFF with the summer-time monitor, the second hand points at OFF.

§4. BEFORE USING

When the watch does not operate according to the instruction manual, it is insufficiently charged. Charge the secondary battery of the watch for more than 10 hours, approximately 20cm away from the fluorescent lamp as light source.

When charging the secondary battery, do not put it too close to the light source.

*When charging the watch under direct rays of the sun, charge for more than an hour.

(1) Radio Wave Reception

For the purpose of good reception

- Radio waves may be hard to receive due to blockage by a metallic object. In a reinforced concrete building and so on, reception should be performed as close to a window as possible.
- To obtain stable reception, do not move the watch carelessly during reception.
- Preferably, you should find out an easy receivable position by moving the watch or changing the direction of the watch to ensure good reception.

Places where radio waves are hard to receive

It may be impossible to receive radio waves under the following environmental conditions:

- ① Inside a building or in the valley between tall building
- ② In a car, train and airplane
- ③ Near high tension wires or railroad overhead wires
- ④ Near household electric appliances such as TV sets, refrigerators, personal computers, facsimiles, etc.

A rough reference of the receivable area

The area where this watch can receive the radio wave of standard time is as shown in the table below.

This area may vary depending on time zone and the season.

Receive mode	TME
Standard time transmitter station	DCF77
Place of transmitter station	Mainflingen, Germany (25 km to the southeast of Frankfurt)
Standard receivable area	Within a radius of approx. 900 km (But, it may be unreceivable in the vicinity of Lake, Leman in Switzerland.)

Standard Receivable Area

This map shows the standard receivable area. However, they may not apply in some particular locations.



(2) Charge Function

This watch uses a secondary battery to store electrical energy. **This secondary battery does not use noxious substances at all and therefore it is a clean battery. Once fully charged, the watch will continue to run for about 5 months without further charging.**

How to use this watch well

In order to use this watch well and work completely its radio wave receiving function, alarm function, etc., keeping an ample charge is important. However often this watch is charged, you need not worry about overcharge (the watch is provided with overcharge prevention).

Daily charging is recommended.

Care for long term use

It is advisable to charge the watch routinely.

If you wear a long-sleeved clothes, the cloth may hide the watch and prevent the watch from being exposed to light. Thus the charge is liable to be short, so take care. When the watch is removed, try to put it in a place as bright as possible. To do so makes the watch operate accurately at all times.

Caution

A secondary battery (titanium-lithium ion battery) is used in this watch.

Any other type of battery shall not be used definitely.

Even if another type of battery is installed in the watch, the watch structure does not permit the operation. In case a different battery such as a silver battery is rashly used and charged, overcharge may occur and eventually the battery will burst. There is a danger of watch breakdown or injury to human body. When the secondary battery is replaced, be sure to use the specified secondary battery (titanium-lithium ion battery, 295-31)

Notes on charge

- **Avoid charging under high temperature (over 60°C), since it will cause malfunctioning.**

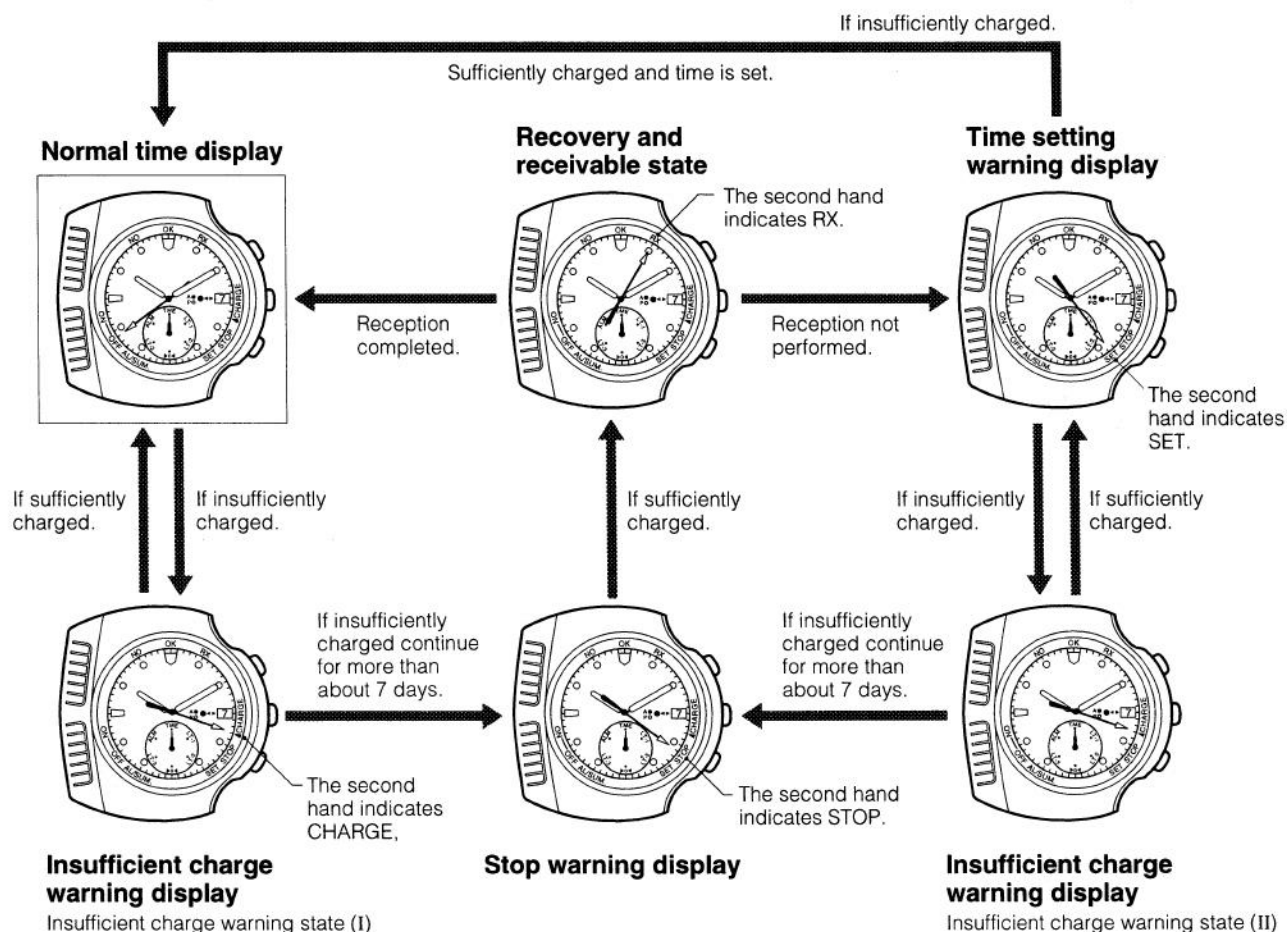
Example) Charging by putting the watch close to a light source that is may become hot, such as an incandescent lamp or a halogen lamp. Or charging by placing the watch on a dashboard whose temperature may become very high.

- Weak light hardly achieves the full charge, so be careful.
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§5 VARIOUS WARNING FUNCTIONS OF SOLAR POWER WATCH

When this watch becomes insufficiently charged, one of these warning functions will activate and the second hand will indicate one of the specific warning states.

- For the details of the warning functions and the actions that follow the specific warning indications, see "Description of the Various Warning Functions of Solar Power Watch".



Description of the Various Warning Functions

~Actions that follow the specific warning indications~
Read the following, referring to the illustration shown.

Insufficient Charge Warning Function

When in any mode, the hour and minute hands change to the time display in TME mode. The second hand stops at the point of CHARGE (in the position that corresponds to 18 seconds) to indicate that the watch is charged insufficiently. (Insufficient charge warning state I or II). In these state, the receiving and alarm functions are not performed.

Insufficient Charge warning state I:

The time runs accurately, and thus the normal time display can recover by exposure to the light for charge.

Insufficient Charge warning state II:

The time is incorrect. Expose the watch to light until it is charged sufficiently. Then set time by free reception or manual operation.

Stop Warning Function

The second hand stops at the point of STOP (in the position that corresponds to 21 seconds) to indicate that the watch stops due to the insufficient charge (Stop warning display). In this state, all functions are not performed.

Expose the watch to light until it is charged enough to put it in the recovery and receivable state.

*(For charge time, see "Time required for charge" on Page 7.)

Recovery and reception function

As the watch is charged sufficiently after the stop warning display, the watch automatically begins to receive radio waves (the recovery and receivable state). However, note that this function of recovery to reception is disabled if button **M** is pulled.

- If the reception completed: The watch begins to run, keeping correct time. Then the watch can be used as it is.
- If the reception is not completed: The watch gives the indication of time setting warning. In this case, set the watch with the right time by free reception or manual operation.

Time setting warning function

In case the reception does not work in the recovery and receivable state, the time remains incorrect. **The second hand stops at the point of SET (in the position that corresponds to 24 seconds) to indicate that the time is wrong (time setting warning).**

In this state, set the watch to the TME mode and set to the correct time by free reception or manual operation. Then the normal time display recovers. If the watch becomes insufficient charged, with the indication of time set warning display, switch to insufficient charge warning state (II). To prevent this, make sure the watch is exposed to light for sufficient period.

§6 TIME REQUIRED FOR CHARGE

Time required for charging may vary according to the design (color of the dial etc.) and operating environment. The following table will serve you as a rough reference.

* Charge time is a total time when light irradiates the watch continuously.

Illuminance (lux)	Environment	Time required		
		Charge time of one day usage	Charge time from the stop state to recovery and automatic reception	Full charge time
500	Inside an ordinary office	4 hours	51 hours	27 days
1000	60-70cm under a fluorescent light	1 hour 30 minutes	22 hours	12 days
3000	20cm under a fluorescent light	30 minutes	7 hours 30 minutes	86 hours
10000	Exterior cloudy	8 minutes	2 hours 30 minutes	24 hours
100000	Exterior, summer, sunny	2 minutes	1 hour	6 hours

Full charging time: Time for charging the watch from its stop state to the maximum charge.

Charge time for one day usage: Charge time required to allow the watch to run all day.

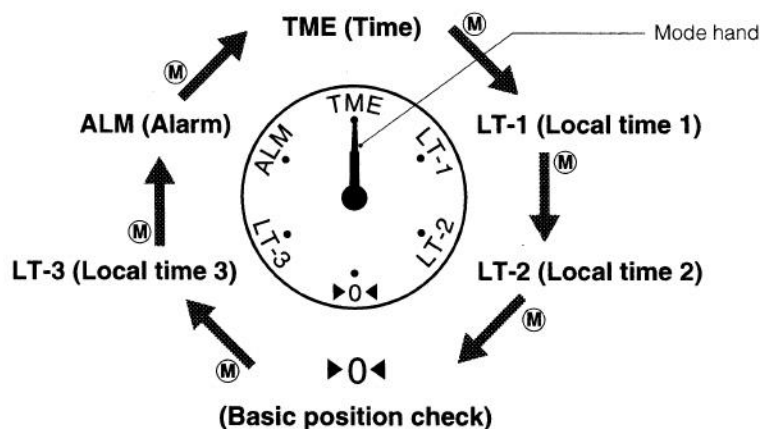
* **Once charged fully, this watch continues to operate for about 5 months without further charging.**

However, once the watch stops (with the indication of stop warning), it takes a considerable time to charge the battery enough to run the watch again as shown above. Daily charging is recommended.

§7. OPERATING THE WATCH

A. How to Change Modes

■ This watch has 6 basic functions. Each time button (M) is pressed, the mode changes in the following order. The current mode can be checked by the mode hand position.



B. Setting the Time/Calendar

To set the time/calendar of this watch, use either of the following two methods:

1. Radio wave reception
2. Manual operation

1. Setting the Time/Calendar by Radio Wave Reception

There are three methods of radio wave reception that this watch provides. When radio waves of time are received, the time/calendar of this watch is automatically corrected.

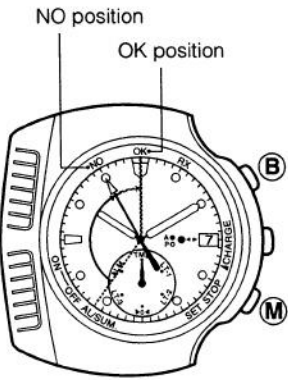
- 1) Automatic reception: The watch automatically receives time radio waves at 3 a.m. everyday.
- 2) Free reception: The reception can be arbitrarily caused.
- 3) Recovery and receive: After the watch gives the indication of stop warning, as irradiation makes the watch charged to some extent, automatic reception of time radio waves begins.

Notes on radio wave reception

- 1) Only when the reception completed, the time/calendar is corrected by received radio waves. If the reception is not completed, the time display remains the same. (In case the watch recovery and receivable state only, it will change to time setting warning display.)
- 2) To carry out stable reception, do not move the watch during reception.
- 3) It takes about 2 - 10 minutes to receive time radio waves. In case the reception is not performed, the watch will return to the normal display in several tens of seconds.
- 4) During the indication of any warning due to insufficient charge (the second hand stops in one of the warning display), radio wave reception is disabled. After the watch is charged sufficiently, carry out free reception.

Setting the Time/Calendar by Radio Wave Reception

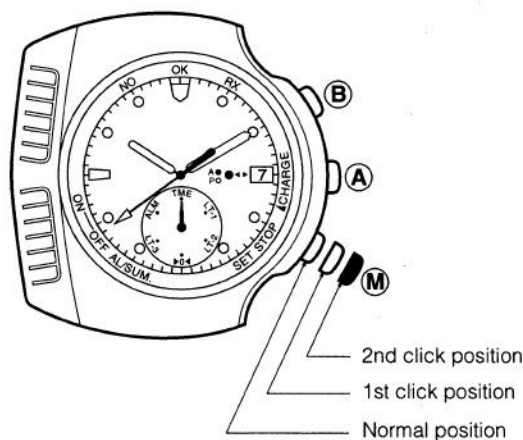
	Automatic reception	Free reception	Illustration
① Select mode	Press button (M) to set the mode hand to TME mode.		
② Receiving method	At 3 a.m. everyday, the second hand points at the RX position (points 5 seconds and the watch begins automatic reception.	Depress button (B) until a beep sound occurs once. The second hand stops in the RX position which corresponds to 5 seconds and reception begins.	
③ Reception result indication	If the reception completed, the watch shows correct time. If the reception is not completed, the watch returns to the unchanged time display as before.	If the reception is completed; a beep sound occurs twice and the watch shows correct time. If the reception is not completed, a beep sound occurs once and the watch returns to the previous time display as before.	

* Cancel reception	To cancel the receiving function during automatic or free reception, press button (M) to change the mode or depress any other button for 1 second or more. Then the reception is canceled.	
* Reception result check function	Reception result check can be performed only in TME mode. 1. Press button (M) to set the mode hand to TME mode. 2. Press button (B). The second hand indicates the reception result for 10 seconds. * If the second hand points at OK (0-second position), the reception completed. * If the second hand points at NG (55-second position), the reception is not completed.	

2. Setting the Time/Calendar by Manual Operation

Adjusting the Time/Calendar by Manual Operation

The time/calendar can be set by manual operation as well.



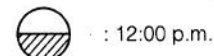
☆ A.M./P.M. identification

Blue (a.m.)



Yellow (p.m.)

Yellow (p.m.)



Blue (a.m.)

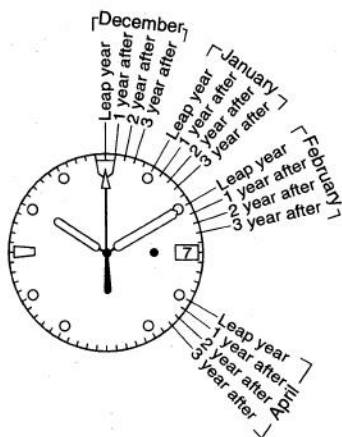
Setting the time

- (1) Pull button **(M)** out to the 2nd click.
- (2) Press button **(A)** to set the second hand.
- (3) Press button **(B)** to set the hour and minute hands to the correct time.

* Check the A.M./P.M. identification to confirm whether it is set appropriately to A.M. or P.M.

- (4) Upon completion of setting, press button **(M)** to return to its normal position.

Setting the calendar



- (1) Pull button **(M)** out to the 1st click.
- (2) Press button **(A)** and set the second hand in position associated with the month and years elapsed from the leap year.

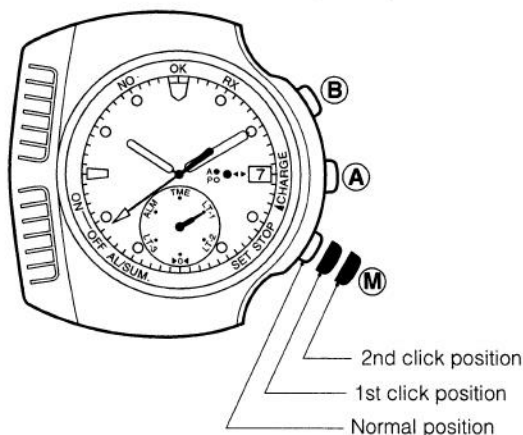
Example 1) If the month is December and it's the leap year, set the second hand on zero-second position.

Example 2) If the month is April and it's 3 years after the leap year, set the second hand on 23-second position.

* This setting permits the watch to be used as an automatic calendar. Thus, modification at the end of months is not needed.

- (3) Press button **(B)** and set the date.
- (4) Upon completion of setting, Press button **(M)** to return to its normal position.

C. Using Local Time



This watch is provided with three local time modes that the watch can be set with time in different areas in addition to the time in TME mode. Correction of time difference is permitted in an hour for local time.

Setting the local time

The same setting procedure is used for local time 1, 2 and 3. As an example, the case of local time 1 is described below.

- (1) Press button **(M)** to the LT-1 mode.
- (2) Pull button **(M)** out to the 1st or 2nd click.
- (3) Press button **(A)** or **(B)** to set the time.
Pressing button **(A)**: moves the hands to counterclockwise direction. Pressing button **(B)**: moves the hands to clockwise direction.
- (4) Upon completion of setting, press button **(M)** to return to the normal position.

(Note) Radio wave reception is not performed in local time mode.

D. Summertime display function



Switch to the summertime display

This watch allows switchover to summertime display that is performed separately in each mode (TME, LT-1, 2 and 3).

- (1) Press button **(M)** to the mode (TME, LT-1 2 and 3) that switchover to summertime.
- (2) Press button **(A)** for about 2 seconds or more, then summertime is set on or off.
 - * When the second hand points at ON, summertime is set on.
 - * When the second hand points at OFF, summertime is canceled.

Summertime monitor

This monitor function shows whether summertime or normal time is applied in the time display.

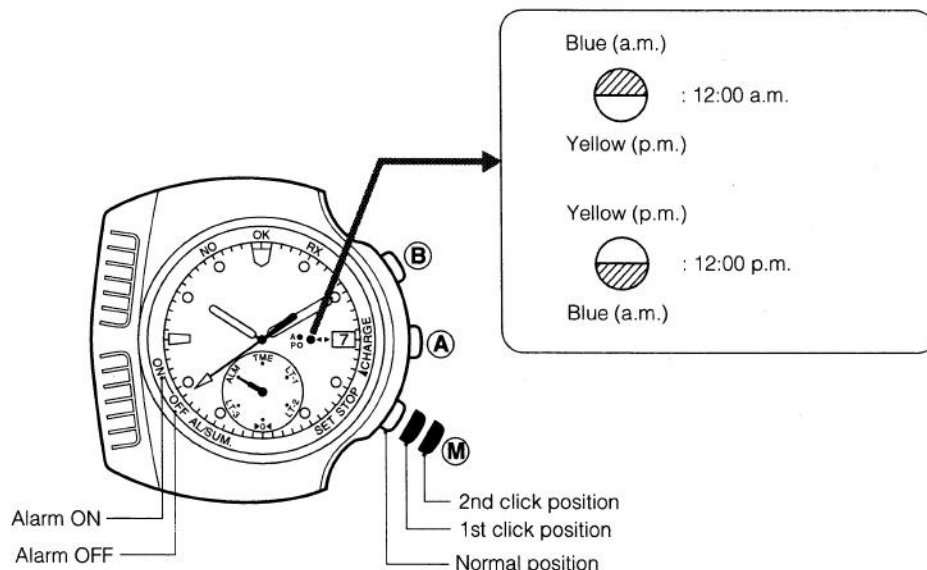
- (1) With mode (TME, LT-1, 2 and 3) indicated, press button **(A)**.
 - * When the second hand points at ON, the summertime is shown.
 - * When the second hand points at OFF, the normal time is shown.

E. How to Use the Alarm

Once alarm is set, the alarm rings for about 15 seconds at a set time everyday. Alarm setting is on the 24-hour basis.

- (1) Press button **(M)** to set to the ALM mode.
- (2) Pull button **(M)** out to the 1st or 2nd click.
 - Pulling button **(M)** turns the alarm function ON automatically.
- (3) When button **(A)** is pressed, hour and minute hands will move to counterclockwise direction. When button **(B)** is pressed, they will move to clockwise direction.
 - Check the A.M./P.M. identification to confirm whether it is set appropriately to A.M. or P.M.
- (4) Upon completion of setting, press button **(M)** to return to the normal position.

☆ A.M./P.M. identification



Alarm ON/OFF

- (1) Press button **(M)** to set to the ALM mode.
- (2) Whenever button **(A)** is pressed, alarm is switched between ON and OFF with a confirmation beep.
 - When alarm is turned ON, a beep sound occurs twice and the second hand points at ON.
 - When alarm is turned OFF, a beep sound occurs once and the second hand points at OFF.

Using the alarm

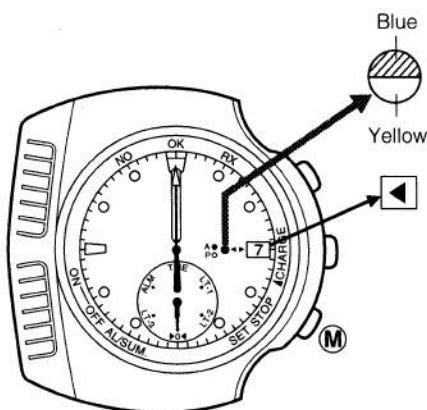
After alarm is set, the alarm rings at the set time in the normal time/TME/LT-1/LT-2/LT-3/alarm set.

Example) Alarm is set at 7 a.m.:

- With TME mode indicated, the alarm will ring at 7 a.m. With LT-1 mode indicated, the alarm will ring at 7 a.m. regardless of time difference from the TME mode.
- * To stop the alarm sound, Press button **(A)** or **(B)** once.

F. Confirm the basic position

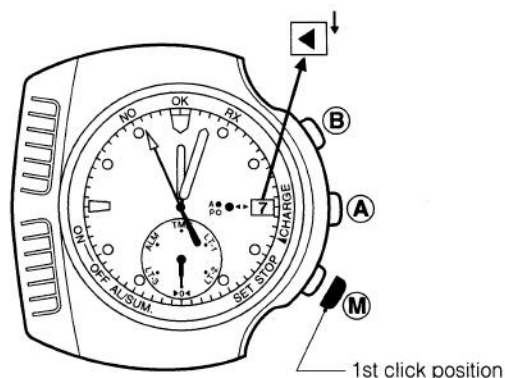
The display may malfunction, due to the effect of static electricity, strong shock applied to the watch. In such cases, be sure to check the positions of the hands (in basic position), AM/PM identification mark and calendar in this mode.



How to check

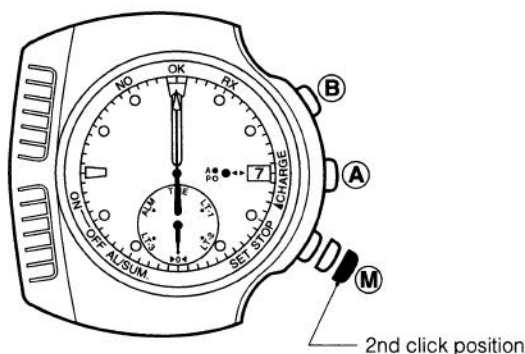
- (1) Press button **(M)** to set the mode hand **▶0◀** mode. Check to ensure that the hands, the AM/PM identification and the calendar display are as follows:
 - Second hand **→** Zero-second position
 - Hour and minute hands and A.M./P.M. identification **→** 12:00 a.m.
 - Calendar display **→** ◀ mark
- (2) If the correct (basic) position is shown, set the time/calendar by radio wave reception or manual operation.

If the wrong position is shown, set them to basic position according to the following procedure.



How to set in basic position

- (1) Press button **(M)** to set the mode hand to **▶0◀** mode.
- (2) Pull button **(M)** out to the 1st click.
- (3) Press button **(A)** or **(B)** repeatedly until ◀ mark of the calendar display appears. (basic position)
Pressing button **(A)** rotates the calendar display to the counterclockwise direction.
Pressing button **(B)** rotates the calendar display to the clockwise direction.



- (4) Pull button **M** out to the 2nd click.
- (5) Pressing button **A** sets the second hand to the "0" position (12 hour).
- (6) Pressing button **B** sets the hour and minute hands to the "0" position (12 hour).
- (7) Push button **M** to return to the normal position.
- (8) After the hands are set completely, press button **M** to set the mode hand to TME mode and then set the time and calendar by free reception.
If the watch is in receivable environment, current time and date will be shown a few minutes later. In unreceivable environment, set the time/calendar by manual operation.

§8. IN THESE CASES

In this case	Check items	Treatment
The watch cannot be put in the receivable state.	Check whether the second hand stops at the following position: • Charge warning position which corresponds to 18 seconds. • Stop warning position which corresponds to 21 seconds.	If the second hand stops at these positions, the secondary battery is insufficiently charged. After charging the battery sufficiently, retry reception. • See "Various Warning Functions of Solar Power Watch".
Reception cannot be performed.	• Is TME mode selected? • Is your watch out of the receivable area? • Check whether an object that blocks radio waves or generates noise exists near your watch. • Is your watch on the margin of the receivable area?	• Press button M to switch to TME mode, then retry reception. • See "Standard Receivable Area". • See "Place where radio waves are hard to receive". Then retry reception.
Reception cannot be performed. (even within the receivable area)	• Check whether an object that blocks radio waves or generates noise exists near your watch.	• See "For the purpose of good reception" and "Place where radio waves are hard to receive". • Check whether the receiving environment is changed by modifying room arrangement and so on.
Radio wave reception performed, but the watch is not showing the correct time.	• Check whether the hands are at basic position by switching the mode to the basic position check mode.	• According to "Basic Position Check" described in this instruction manual, set the hands in basic position.