TECHNICAL INFORMATION

CITIZEN QUARTZ

Cal. No. A413

CITIZEN

Please use this watch after charging sufficiently by placing in light.

In the case the watch is unable to be operated according to the instruction manual, it is likely that the watch is insufficiently charged. Use the watch after first recharging by placing the watch about 20 cm (8 in) under a fluorescent lamp (30 W) for about 11 hours. At that time, be careful not to place the watch too close to the light source since this can cause the watch to become excessively hot.
* The watch can also be recharged by exposing to direct sunlight for about 4 hours.

This watch is a radio wave watch that automatically corrects the time and date by receiving the standard time radio wave (time information) transmitted in Germany. In addition, this watch also functions as an analog solar-powered watch equipped with a photoelectric power generation function that drives the watch by converting light energy into electrical energy. It is also equipped with other useful functions, including a power save function that reduces power consumption of the watch when the solar cell is not exposed to light.

*** Locations Where Radio Wave Reception may be Difficult**

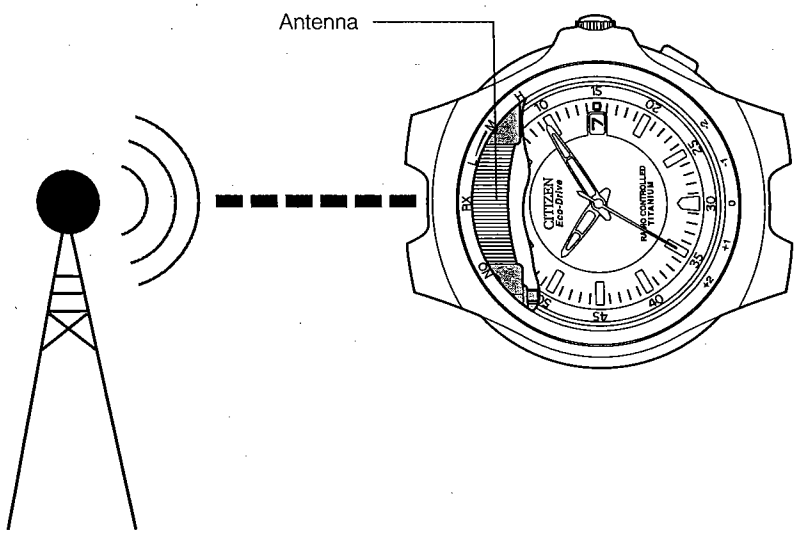
- It may be difficult to receive radio waves in certain locations. The time and date are not set correctly if radio waves are unable to be received.
- There rarely may be times when the time and date are not set correctly even if radio waves are received.
  When this happens, carefully read the section on page 1 entitled, "Radio Wave Receiving Function" and then try repeating the procedure for receiving radio waves (either manually or automatically).

§1. BEFORE USING

A. Radio Wave Receiving Function

<For Good Reception>

- This watch incorporates an antenna for receiving radio waves at the 12:00 position inside the case. For good reception, it is ideal to have the 12:00 position of the watch facing in the direction of the radio wave transmitter station.
- Try receiving radio waves using the reception level function while changing the orientation of the watch or location, Finding the location and direction at which radio waves can be received easily results in more reliable reception.
- To obtain stable reception, do not move the watch during reception.
- Radio waves may be hard to receive due to blockage by a metallic object or the environment. When inside a building and so on, reception should be performed as close to a window as possible.



Radio waves may be unable to be received in close proximity to the radio wave transmitter station (within a distance of about 10 km). In addition, radio waves may not be received properly even if they are able to be received. If this happens, either change the orientation of the watch antenna to 45 degrees to 90 degrees relative to the radio wave transmitter station or move to a location farther away from the radio wave transmitter station (more than about 10 km away), and then try receiving radio waves again.

<Locations where Reception may be Difficult>

It may not be possible to properly receive radio waves at the following locations susceptible to generation of radio wave noise or under the following environment conditions that cause difficulty in receiving radio waves.

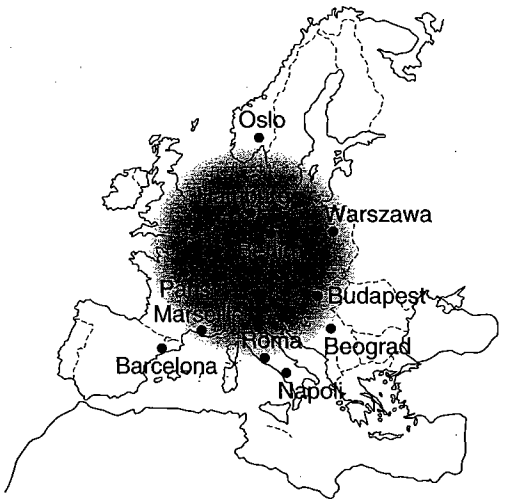
(1) Locations subject to extremely high or low temperatures.
(2) Inside a reinforced concrete building, between tall buildings or in valleys between mountains or underground.
(3) In a car, train or airplane.
(4) Near high-tension wires (power lines), railroad overhead wires or airports (communication facilities).
(5) Near a cellular telephone in use.
(6) Near household electric appliances or OA equipment such as TV sets, refrigerators, personal computers, fax machines, etc.

* Radio waves cannot be received properly while walking or traveling in a motor vehicle, etc.

<General Reference for Receiving Areas>

A general reference for the areas where the watch can receive standard time radio waves is as follows. However, these areas may vary depending on the time zone, seasonal variations and weather (presence of lightning, etc.). Since this map only provides a general reference of the standard receiving areas, it may not apply in some particular locations even within the range shown on the map.

Standard time radio wave transmitter station	Location of transmitter station	General reference for areas where radio waves can be received
DCF77	Mainflingen, Germany (25 km southeast of Frankfurt)	Radius of about 900 km from radio wave transmitter station (radio waves may not be able to be received in the vicinity of Lake Leman)



B. Photoelectric Power Generation Function

This watch uses a secondary battery to store electrical energy. Once fully charged, the watch will continue to keep the correct time for about 8.7 years (in the power Save 2 state) without further charging.

Power Save: When power generation stops as a result of the solar cell not being expose to light, the power save function is activated to reduce the Power consumption of the watch. (For more details, please refer to section §8-A entitled, "Power Save Function".).

<For Optimum Use of this Watch>

In order to use this watch comfortably, try to keep the watch charged at all times. There is no risk of overcharging no matter how often the watch is charged (overcharging prevention function).

Expose the dial (solar cell) to light when charging.

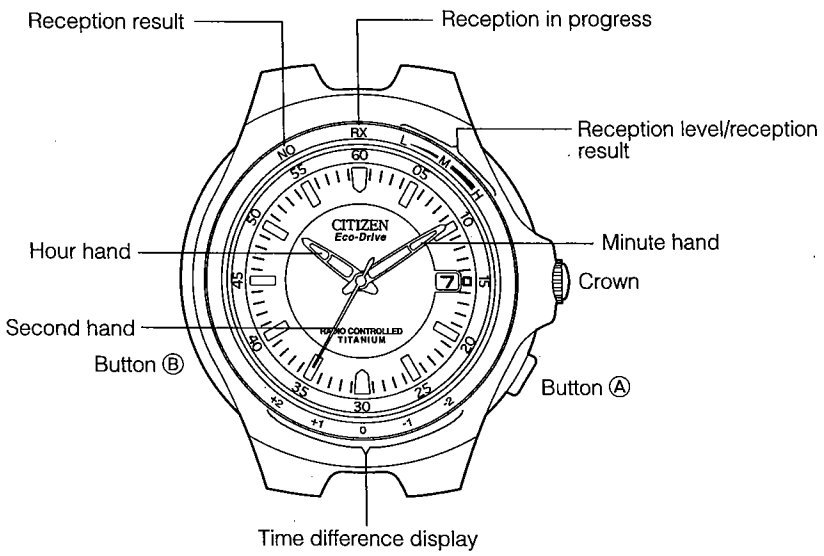
<Try to Keep the Watch Charged at all Times>

- If you wear long sleeves, the fabric may cover the watch and prevent it from being exposed to light resulting in the watch becoming insufficiently charged.
- When the watch is removed, try to place it in as bright a location as possible. This will enable the watch to continue to run properly at all times.

§2. SPECIFICATIONS

Caliber No.		**A413**
Type		Analog solar-powered watch
Movement size (mm)		ø30.8 x 6.35t
Accuracy (At normal temperature)		±15 seconds per month on average (when not receiving radio waves) when worn at normal temperatures of +5°C to +35°C/41°F to 95°F
IC		1 unit of C/MOS-LSI
Operating temperature		−10°C to +60°C (14°F to 140°F)
Converter		Bipolar step motor
Time adjustment		No adjustment terminal for use in market
Measurement gate		10 sec.
Display functions	Time	Hours, minutes, seconds
	Calendar	Date
Additional functions		Radio wave receiving function (automatic reception, free reception)
		Reception result confirmation function
		Reception level indication function
		Time difference correction function [Time difference correction (1), Time difference correction (2)]
		Photoelectric power generation function
		Power save function (Power Save 1, Power Save 2)
		Insufficient charge warning function
		Time setting warning function
Continuous Operating time	From fully charged to stopped	Approx. 8.7 years (when in the Power Save 2 state)
	From insufficient charge warning display to stopped	Approx. 11 days
Battery		Secondary battery 1 pc.

§3. NAME OF COMPONENTS



The design may differ slightly depending on the model.

§4. RECEIVING RADIO WAVES

There are two ways to receive radio waves, namely automatic reception (regular automatic reception, return automatic reception and recovery automatic reception) and free reception. When radio waves are received properly, the time (hours, minutes, seconds, daylight savings time) and date (month, day, year) are corrected automatically.

1. Regulator Automatic Reception:
   Radio waves are received automatically twice a day between the hours of 3:00 AM and 4:00 AM.
2. Free Reception: Radio waves can be received at any time.
3. Return Automatic Reception:
   Radio waves are received when the watch automatically returns to the reception state after the Power Save 2 state has been canceled.
4. Recovery Automatic Reception:
   The watch switches to the recovery automatic reception state and receives radio waves when the watch is sufficiently charged after having stopped due to being insufficiently charged.

[Data Received from German Standard Time Radio Wave]

- Time information: Hours, minutes, seconds, daylight savings time
- Date information: Month, day, year

§5. SETTING THE TIME AND DATE BY RADIO WAVE RECEPTION

It is recommended to try receiving radio waves while changing the direction and location of the watch to find the location and direction at which reception is easiest while referring to the reception level. Do not move the watch when receiving radio waves.

A. Radio Wave Reception (Regular Automatic Reception and Free Reception)

	Regular automatic reception	Free reception
(1) Reception method	The second hand automatically moves to the RX (reception in progress) position (0 seconds position) at the hours of 3:00 AM and 4:00 AM every day, after which the watch begins to receive radio waves.	When button Ⓐ is pressed after about 2 seconds, the second hand rapidly moves to the RX (reception in progress) position (0 seconds position), after which the watch begins to receive radio waves. **Note:** If button Ⓐ is continuously depressed for 10 seconds or more, the watch changes to the "Reference Position (0 position/12:00 position) Check".
(2) Hand location during reception	After the second hand has indicated that reception is in progress (RX), It moves to the reception level. The minute hand stops at the location corresponding to the second hand.	
(3) Reception results	If reception is successful: The time (including daylight savings time) and date are corrected automatically based on the results of reception. If reception has failed: The watch returns to the time and date display stored in the watch prior to reception.	
(4) Confirmation of reception result	When button Ⓐ is pressed after receiving, the second hand rapidly moves to the reception result (reception level) and stops. • The watch automatically returns to the current time after 10 seconds. In addition, the watch can also be returned to the current time by pressing button Ⓐ. However, if button Ⓐ is continuously depressed for 2 seconds or more, the second hand moves to the RX position indicating that reception is in progress and free reception begins. **Note:** Reception results cannot be confirmed even if button Ⓐ is pressed while each hand is returning to the current time following completion of reception. Confirm reception results by pressing button Ⓐ only after each hand has returned to the current time.	

B. Indication of Reception Level during Radio Wave Reception

During radio wave reception, the second hand waits at the reception position corresponding to the reception status and indicates the reception level (degree of ease of radio wave reception).

Reception level	Symbol	Second hand reception level indication position
When radio wave reception level is high	H	9 minute position
When radio wave reception is moderately high	M	6 minute position
When radio wave reception is low	L	3 minute position

C. Indication of Radio Wave Reception Result

Reception level can be confirmed following reception of radio waves.

<Confirmation of Reception Result>

- When button Ⓐ is pressed, the second hand rapidly moves to the position corresponding to the reception result and indicates the reception level for 10 seconds.

Note: Free reception begins if button Ⓐ is pressed for 2 seconds or more.

- The watch automatically returns to the current time after 10 seconds. In addition, the watch can also be returned to the current time by pressing button Ⓐ. However, if button Ⓐ is continuously depressed for 2 seconds or more, the second hand moves to the RX position indicating that reception is in progress and free reception begins.

Reception level	Symbol	Second hand reception level indication position
When reception was successful		
· When radio waves were received at a high reception level	H	9 minute position
· When radio waves were received at a moderate reception level	M	6 minute position
· When radio waves were received at a low reception level	L	3 minute position
When reception failed	NO	55 minute position

D. Return Automatic Reception

When the Power Save 2 state (during which the second hand and minute hand are stopped) is canceled, the watch automatically changes to the reception state after rapidly returning to the time stored in memory, and begins to receive radio waves.

- When reception has been successful: The time and date are corrected automatically and the watch begins to run.
- When reception has failed: The watch returns to the time and date display stored in memory prior to reception and begins to run.

E. Recovery Automatic Reception

When the watch is sufficiently recharged after having stopped as a result of being insufficiently charged, the watch automatically performs one cycle of recovery automatic reception.

- When reception has been successful: The time and date are corrected automatically and the watch begins to run. The watch can be used normally at this time.
- When reception has failed: The time setting warning function (irregular 2-second interval movement) is activated. In this case, either perform free reception or set the time and date manually.

§6. TIME DIFFERENCE CORRECTION FUNCTION

This watch is equipped with two types of time difference correction functions.

<Time Difference Correction Function (1)>

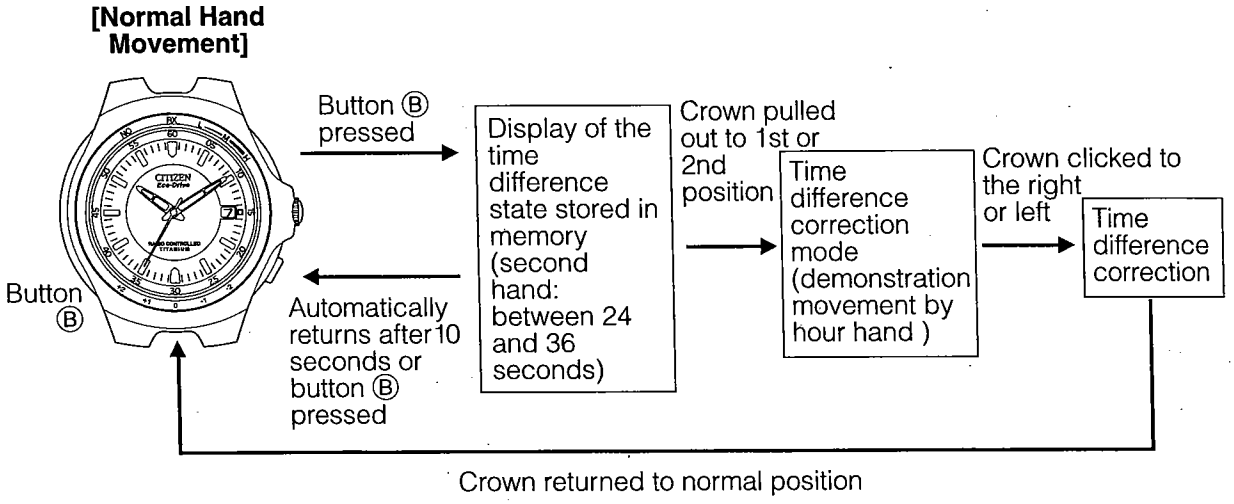
- The time difference can be set in 1 hour units relative to the German standard time that has been received by the watch.
- The setting range is from –2 hours to +2 hours.

<Time Difference Correction Function (2)>

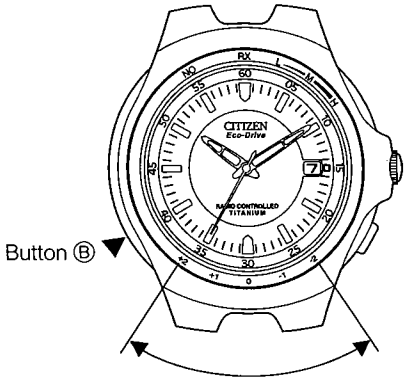
- The time difference can be set to an arbitrary time in 1 hour units by correcting the hour hand manually.
- The time difference can be set in areas where the German standard time radio wave is unable to be received. In the case of having received the German standard time radio wave (either by free reception or regular automatic reception) after setting the time difference using the time difference correction function (2), the time difference is automatically corrected to the German standard time.

A. Setting Procedure for Time Difference Correction (1)

The correction state changes as shown below as a result of operating the crown and buttons.



[Time Difference Display]



Range over which time difference can be set relative to German standard time

(1) When button (B) is pressed during normal hand movement, the second hand changes to the time difference display, and indicates the time difference stored in memory.

(2) When the crown is pulled out to the first or second position, the hour hand performs a demonstration movement after which it indicates the current time and stops.

(3) The time difference is corrected when the crown is clicked in either direction.

- The second hand moves by +1 hour (3 seconds) when the crown is clicked once to the right. After the second hand moves (time difference display state), the hour hand moves by 1 hour.
- The second hand moves by –1 hour (3 seconds) when the crown is clicked once to the left. After the second hand moves, the hour hand moves by 1 hour.

Notes:

- The time difference is not corrected even if the crown is clicked while the hands are moving. In the case of correcting the time difference continuously, only operate the crown after confirming that the hands have stopped moving.
- The time difference is not corrected if the setting range (–2 to +2 hours) has been exceeded even if the crown is operated.

(4) Return the crown to the normal position after correcting the time difference.

[Time Differences of Major Countries Relative to Germany]

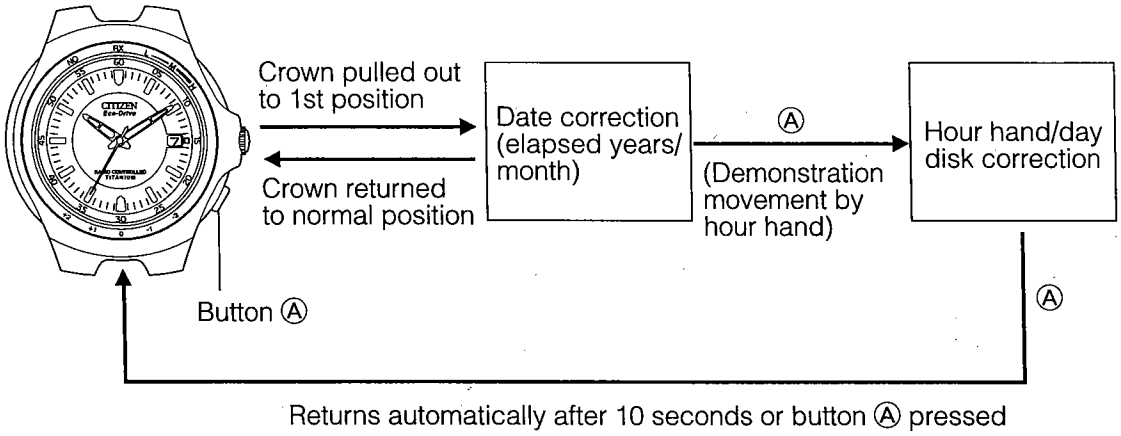
Countries having the same time difference as Germany	Use of daylight savings time	Time difference from Germany of -1 hour	Use of daylight savings time
Norway	Yes	Ireland	Yes
Sweden	Yes	Iceland	No
Denmark	Yes	England	Yes
Netherlands	Yes	Portugal	Yes
Czech	Yes		
Slovakia	Yes		
Belgium	Yes		
France	Yes		
Spain	Yes		
Switzerland	Yes		
Italy	Yes		
Austria	Yes		
Poland	Yes		

Time difference from Germany of +1 hour	Use of daylight savings time	Time difference from Germany of +1 hour	Use of daylight savings time
Finland	Yes	Iraq	Yes
Belarus	Yes	Kuwait	No
Ukraine	No	Saudi Arabia	No
Romania	Yes	Russia (Moscow)	Yes
Bulgaria	Yes		
Greece	Yes		
Turkey	Yes		
Lebanon	Yes		
Israel	Yes		
Jordan	Yes		

Note: Since daylight savings time is contained in the standard time radio wave and corrected automatically, it is not required to be corrected. However, correction is required in the case of using in areas where daylight savings time is not used.

B. Setting Procedure for Time Difference Correction (2)

The time difference can be corrected for 30 seconds after pressing button Ⓐ or for 30 seconds following completion of hand movement after the crown has been pulled out to the first position. The date also changes in coordination with the hour hand.



(1) Pull the crown out to the first position.

- The second hand moves to the position of the "year" and "month" stored in memory and then stops.

(2) When button Ⓐ is pressed, the hour hand performs demonstration movement after which the watch changes the "hour" and "date" time difference correction state.

- The second hand rapidly returns to the current time and the watch begins to run.

(3) Turn the crown to set to the "hour" of the region for which time difference is to be set.

a. If turned to the right (by one click), the hour hand moves forward (clockwise) by one hour.
b. If turned to the left (by one click), the hour hand moves backward (counter-clockwise) by one hour.

- Turning the crown continuously (by two clicks or more) causes the hour hand to move continuously.
- Continuous movement can be interrupted by clicking the crown by one click to the left or right.

Note: When correcting the time difference, pay attention to AM and PM in the region for which time difference is to be set. The time when the date changes is AM. The date changes between the hours of 10:00 PM and 3:00 AM.

(4) Return the crown to the normal position after correcting the time difference.

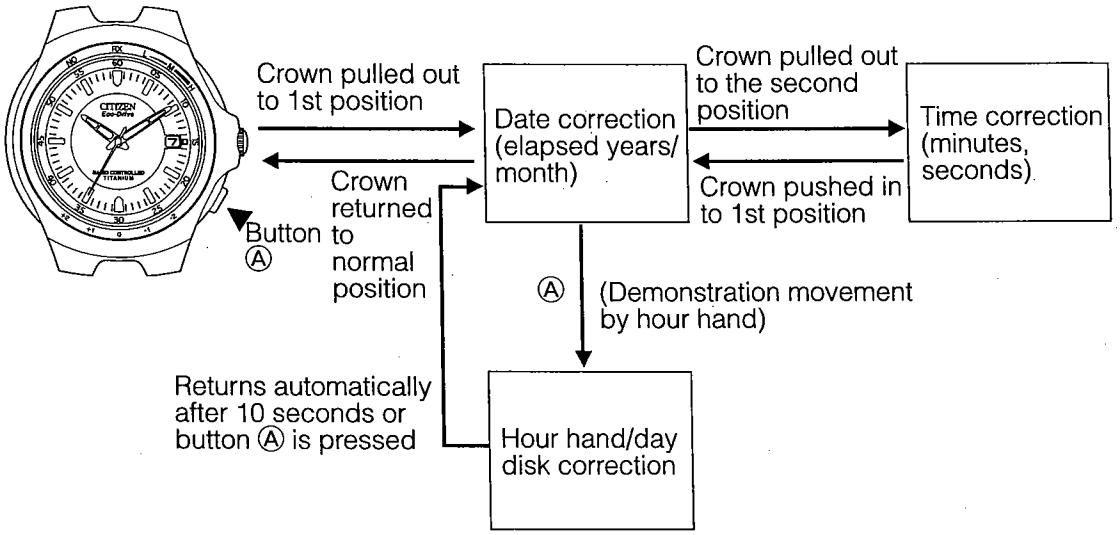
§7. MANUALLY SETTING THE TIME AND DATE

This watch also allows the time and date to be set by manual operation when radio waves are unable to be received.

A. Changing the Display

The correction state is changed in the manner shown below by operating the crown and buttons.

[Normal Hand Movement]



B. Correcting the Seconds and Minutes

(1) When the crown is pulled out to the second position, the second hand rapidly moves to the 0 seconds position and stops.

- If the second hand does not stop at the 0 seconds position, check the "Reference Position" and perform the procedure for "Setting the Reference Position".

(2) Turn the crown to set the minutes.

a. When the crown is turned to the right (by one click), the second hand makes one revolution while moving in the clockwise direction, and the minute hand advances by one minute.

b. When the crown is turned to the left (by one click), the second hand makes one revolution while moving in the counter-clockwise direction, and the minute hand moves back by one minute.

- Turning the crown continuously (by two or more clicks) causes the second hand and minute hand to move continuously.
- Turn the crown to the left or right by one click to interrupt continuous movement of the hands.

Notes: Since the hour hand moves in coordination with the minute hand, the hour hand can be set by continuous movement of the second hand and minute hand. In addition, the date also changes in coordination with the hour hand.

- The watch automatically advances past non-existent dates such as February 30 or April 31. While the watch is advancing the second hand and minute hand wait at the 12:00 position, while the hour hand moves automatically to pass by the non-existent date.

(3) Return the crown to the normal position in synchronization with a telephone or other time service.

C. Correcting the Elapsed Years and Month

When the crown is pulled out to the first position, the second hand changes to an indication of the number of years that have elapsed since the most recent leap year (elapsed years) and the month.

(1) When the crown is pulled out to the first position, the second hand moves to the year and month stored in memory and stops.

(2) Turn the crown to set the year and month

a. Turn the crown to the right (by one click) to align the second hand at the position corresponding to the number of years that have elapsed since the most recent leap year and the month.

b. When the crown is turned to the left (by one click), the second hand moves backwards.

- Turning the crown continuously (by two clicks or more) causes the second hand to move continuously.
- Turn the crown to the left or right by one click to interrupt continuous movement of the second hand.

Note: When the second hand makes two revolutions continuously, it rapidly returns to the position of the original year and month.

Examples:

Case of December in a leap year: Align the second hand at the 0 second position.

Case of April in the third year after the most recent leap year:

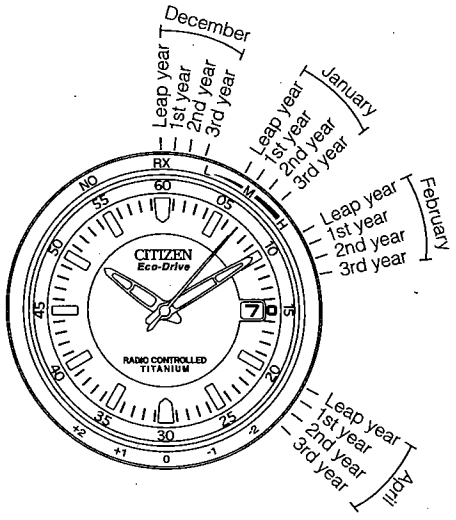
Align the second hand at the 23 seconds position (between 4:00 and 5:00).

(3) After correcting the year and month, return the crown to the normal position.

The second hand returns to the current time and the watch begins to run.

<Setting to a Non-Existent Date>

If the month has been changed after setting the date causing the date to be set to a non-existent date, the date is automatically changed to the first day of the following month when the crown is returned to the normal position from the correction position.



<Reading the Month and Year>

- Reading the Month

  January: Between 1:00 and 2:00

  February: Between 2:00 and 3:00

  :

  December: Between 12:00 and 1:00

- Reading the Year

  Leap year: 1st graduation of each month zone

  1st year after leap year: 2nd graduation of each month zone

  2nd year after leap year: 3rd graduation of each month zone

  3rd year after leap year: 4th graduation of each month zone

<Quick Reference Chart for Number of Years Since Leap Year>

Year	Elapsed year	Year	Elapsed year
2000	Leap year	2004	Leap year
2001	1st year	2005	1st year
2002	2nd year	2006	2nd year
2003	3rd year	2007	3rd year

D. Correcting the Hours and Date

Since the date changes in coordination with the hour hand, it cannot be corrected independently. The date is changed by continuously advancing the hour hand. The hour hand and date can be corrected for 30 seconds after pressing button Ⓐ or for 30 seconds after the hour hand has stopped moving.

(1) Pull the crown out to the first position.
- The second hand moves to the position of the year and month stored in memory and stops.

(2) When button Ⓐ is pressed once, the hour hand performs a demonstration movement and then changes to the hour and date correction state.
- The second hand rapidly returns to the current time and begins to move

(3) Turn the crown continuously to continuously advance the hour hand and set the date.
- The date changes between the hours of about 10:00 PM and 3:00 AM.
- In the case the month is set to a month with less than 31 days, a non-existent date is automatically passed by and the watch indicates the first day of the following month even if the date is changed from the 30th to the 31st.

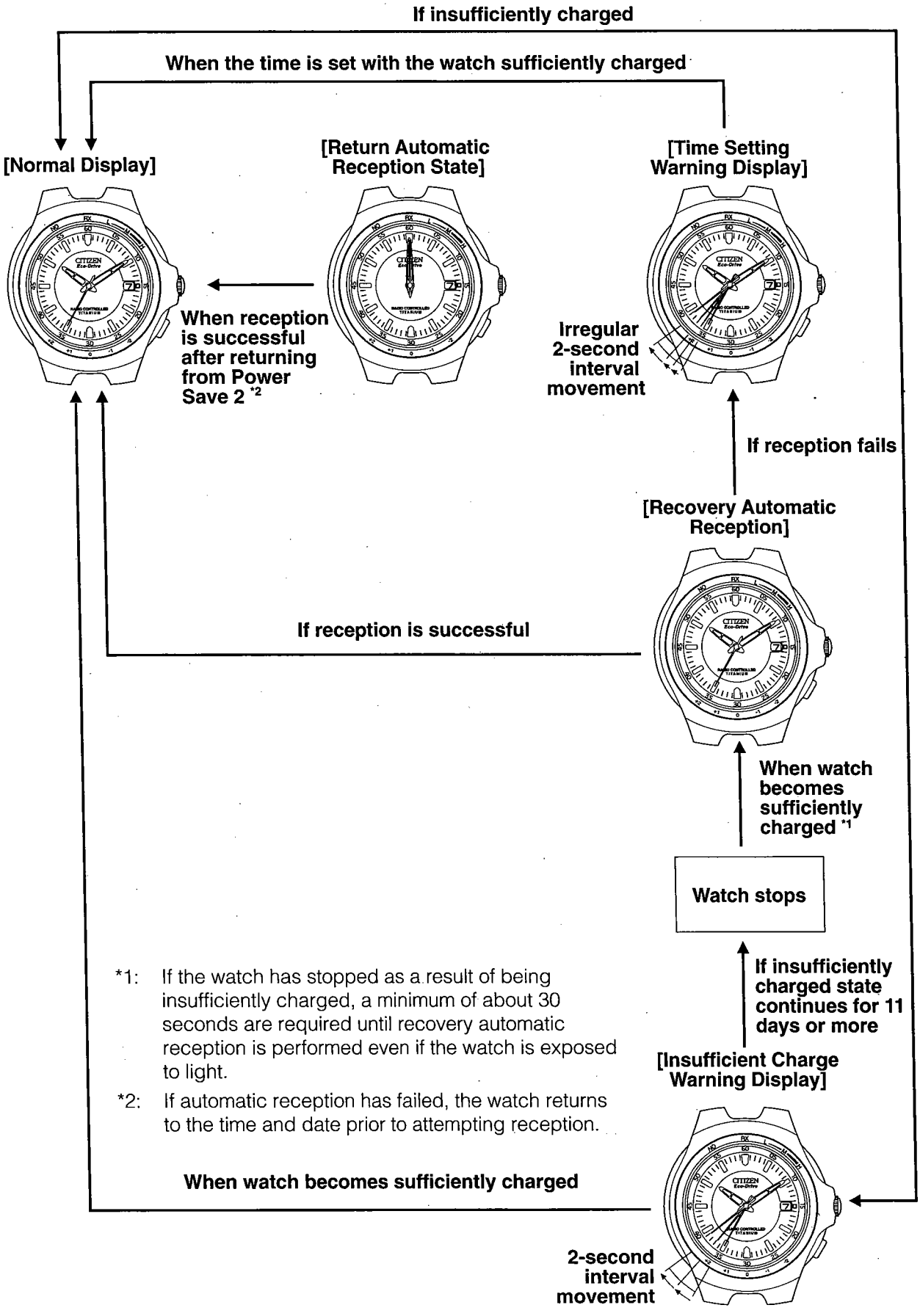
(4) Turn the crown to set the hours.
a. When the crown is turned to the right (by one click), the hour hand advances (in the clockwise direction) by one hour.
b. When the crown is turned to the left (by one click), the hour hand moves back (in the counter-clockwise direction) by one hour.
- Turning the crown continuously (by two or more clicks) causes the hour hand to move continuously.
- Turn the crown to the left or right by one click to interrupt continuous movement of the hour hand.

Note: When correcting the time, set the time while paying attention to AM and PM. The time when the date changes is AM.

(5) After correcting the time, always make sure to return the crown to the normal position.

§8. UNIQUE FUNCTIONS OF SOLAR-POWERED WATCHES

When the watch becomes insufficiently charged, a warning function is activated and the display changes as shown below.



*1: If the watch has stopped as a result of being insufficiently charged, a minimum of about 30 seconds are required until recovery automatic reception is performed even if the watch is exposed to light.

*2: If automatic reception has failed, the watch returns to the time and date prior to attempting reception.

A. Power Save Function

<Power Save 1>

The second hand stops to save power when it reaches the 0 seconds position if the solar cell is not exposed to light and power is not generated for two consecutive hours.

- The minute hand stops at the position corresponding to the second hand.
- The hour hand and date change from normal movement (3-minute interval movement) to 1-hour interval movement.

Note: Reception can still be performed either by regular automatic reception or free reception. However, in the case of performing free reception, Power Save 1 is canceled due to the switching operation.

<Canceling Power Save 1>

Power Save 1 is canceled either by resuming power generation by exposing the solar cell to light, or by operating the crown or buttons.

- When Power Save 1 is canceled, each hand rapidly returns to the current time and begins 1-second interval movement.

<Power Save 2>

The watch automatically switches to the Power Save 2 state to further reduce current consumption if the Power Save I1state continues for approximately 3 days.

- Each hand and the date continue in the Power Save 1 state.

Note: Regular automatic reception is not performed every day. In addition, free reception can also not be performed.

<Canceling Power Save 2>

Power Save 2 is canceled when power generation is resumed by exposing the solar cell to light.

- Recovery automatic reception is performed after the second hand and minute hand rapidly move to the current time. 1-second interval movement starts following completion of reception and the watch returns to normal operation.
- Power Save 2 cannot be canceled with the crown or buttons.

Notes:

- The watch also switches to the power save function from either 2-second interval movement (insufficient charge warming function) or irregular 2-second interval movement (time setting warning function).
- During the time the secondary battery is fully charged and the overcharging prevention function is activated, the power save function is not activated even if power is not generated as a result of the solar cell not being exposed to light. In addition, the power save function is similarly not activated when the secondary battery temporarily becomes fully charged as a result of the solar cell being exposed to intense light.
- Depending on the environment in which the watch is stored and so forth, reception may not be completed successfully even if recovery automatic reception is performed after cancellation of Power Save 2. It is therefore recommended to perform free reception before using the watch.

B. Insufficient Charge Warning Function

When the capacity of the secondary battery becomes low as a result of not exposing the solar cell to light, the second hand changes to 2-second interval movement (insufficient charge warming function) to indicate that the watch is insufficiently charged. Although the watch continues to run normally at this time, after about 11 days have passed since the start of 2-second interval movement. the watch ends up stopping as a result of being insufficiently charged. Sufficiently recharge the watch by exposing to light so that the second hand returns to its original 1-second interval movement.

Notes:

- The time and date cannot be corrected manually during 2-second interval movement.
- Regular automatic and free reception are also not available. Although the receiving station can be switched, the receiving station is not indicated.
- The all-reset procedure can be performed.

C. Time Setting Warning Function

Recovery automatic reception is performed when the watch is exposed to light and sufficiently recharged after having stopped as a result of being insufficiently charged.

- If reception has been successful, the time is corrected and the second hand begins 1-second interval movement.
- If reception has failed, the second hand moves by irregular 2-second interval movement (time setting warning function) indicating that the time is incorrect. Reset the time and date either by free reception or by manual setting.
- Irregular 2-second interval movement will continue unless the time is reset.

Note: In the case the watch has stopped as a result of being insufficiently charged, a minimum of about 30 minutes are required until recovery automatic reception is performed even if the watch is sufficiently exposed to light.

D. Overcharging Prevention Function

When the secondary battery becomes fully charged. the overcharging prevention function is activated to prevent the battery from being charged further.

§9. GENERAL REFERENCE FOR CHARGING TIMES OF SOLAR-POWERED WATCHES

The time required for recharging varies according to the model of the watch (color of the dial, etc.). The following times are shown below only to serve as a reference.

- Recharging time refers to the amount of time the watch is continuously exposed to light.

Illuminance (lx)	Environment	Charging time		
		Charging time for 1 day of operation	Charging time from the stopped state to recovery automatic reception	Charging time to fully charge
500	Interior lighting	2 hours 20 minutes	73 hours	—
1,000	60-70 cm (24-28 in) under a fluorescent lamp	65 minutes	34 hours	—
3,000	20 cm (8 in) under a fluorescent lamp (30 W)	22 minutes	11 hours	132 hours
10,000	Outdoors, cloudy	7 minutes	4 hours	38 hours 30 minuters
100,000	Outdoors, summer, under direct sunlight	6 minutes	3 hours 20 minutes	32 hours

Charging time to fully charge:

Time required for recharging the watch from the stopped state when insufficiently charged to full charged.

Charging time for 1 day of operation:

Time required for recharging the watch to run for 1 day.

Note: Once fully charged, this watch will continue to run without recharging for approximately 8.7 years (when in the Power Save 2 state). However, once it stops running due to being insufficiently charged, a considerable amount of time is required to recharge so that it starts running again as indicated in the table. Try to recharge the watch daily whenever possible.

§10. SOLAR-POWERED WATCH HANDLING PRECAUTIONS

<Try to Keep the Watch Charged at all Times>

- If you wear long sleeves, the fabric may cover the watch and prevent it from being exposed to light resulting in the watch becoming insufficiently charged.
- When the watch is removed, try to place it in as bright a location as possible. This will enable the watch to continue to run properly at all times.

CAUTION: Charging Precautions

- Avoid charging at high temperatures (over 60°C /140°F) since allowing the watch to reach a high temperature during charging can cause a malfunction.

  Examples: Charging by placing the watch too close to a light source that may become hot such as an incandescent lamp or halogen lamp, or charging by placing the watch on an automobile dashboard that can easily reach a high temperature.
- When charging the watch with an incandescent lamp, always make sure to place the watch at least 50 cm (20 in) away from the light source to prevent the watch from reaching a high temperature.

§11. REPLACING THE SECONDARY BATTERY

Unlike ordinary batteries, the secondary battery used in this watch does not have to be periodically replaced since it is able to be charged and discharged repeatedly.

§12. SETTING THE REFERENCE POSITION

In the case the reference position of the watch has changed due to being subjected to a strong shock or the effect of static electricity, check the reference position (0 position/12:00 position) that serves as the basis of operation.

If the second hand does not indicate the correct position, it is possible that the reference position may have shifted. Check the reference position of each hand using the procedure described below.

A. Checking the Reference Position

(1) Continuously depress button Ⓐ for at least 10 seconds.
- After the second hand has moved to the RX position (12:00 position), each hand rapidly moves to the reference position and stops.
- The date changes in coordination with the hour hand, and stops between 31 and 1.

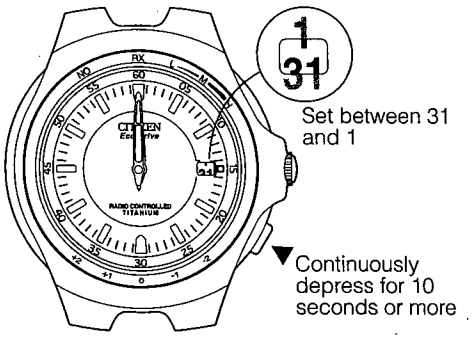
(2) When button Ⓐ is pressed for about 2 seconds, the hands rapidly return to the current time. Alternatively, the watch will automatically return to the current time if the buttons or crown are not operated for 2 minutes or more.

Note: Set the reference position if any of the hands or date do not indicate the reference position.

B. Setting the Reference Position

(1) Continuously depress button Ⓐ for 10 seconds or more.
- After the second hand has moved to the RX position (12:00 position), each hand rapidly moves to the reference position and stops.

(2) Pull the crown out to the first position, set the date between 31 and 1, and set the hour hand to 12:00.
- Set the date by continuously turning the crown to continuously move the hour hand.
- Turn the crown to set the hours.

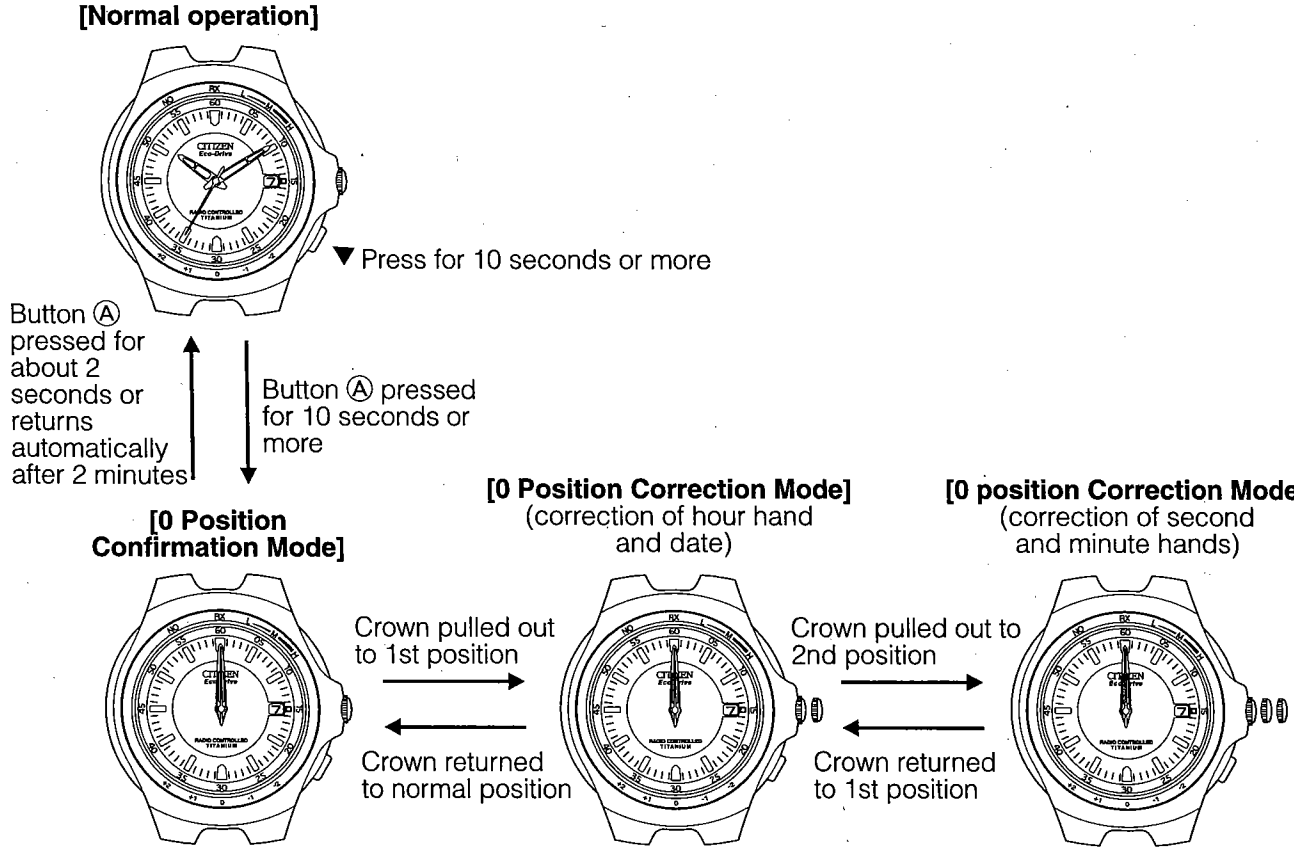


(3) Pull the crown out to the second position and set the second hand and minute hand to 12:00.
- Turn the crown to set the minutes.

(4) Return the crown to the normal position and press button Ⓐ for about 2 seconds.
- Each hand and the date rapidly return to the current time.

Note: After setting the reference position, always make sure to perform free reception or correct the time and date manually before using the watch.

<Changing the Mode when Setting the Reference Position>



§13. ALL-RESET

The watch display may become abnormal due to the effects of static electricity or a strong shock. If this happens, set the reference position.

(1) Pull the crown out to the second position.
- The second hand rapidly moves to the reference position stored in memory and stops.

(2) Press buttons Ⓐ and Ⓑ simultaneously.
- The second hand and hour hand perform a demonstration movement consisting of moving forward, backward and then forward again.

This completes the all-reset procedure. Always make sure to set the reference position after performing the all-reset procedure.

Cautions Following All-Reset:

- After performing the all-reset procedure, it takes about 1 second to store the reference position in memory when the reference position has been set. Do not pull out the crown immediately after setting the reference position.
- After performing the all-reset procedure, the second hand will remain stopped even if the crown is returned to the normal position unless the reference position is set with the crown at both the first and second positions.
- After performing the all-reset procedure, the time shown after setting the reference position is 12:00 AM. When setting the time manually, set both the time and date while paying attention to AM and PM so that the time is set correctly.

§14. TROUBLESHOOTING

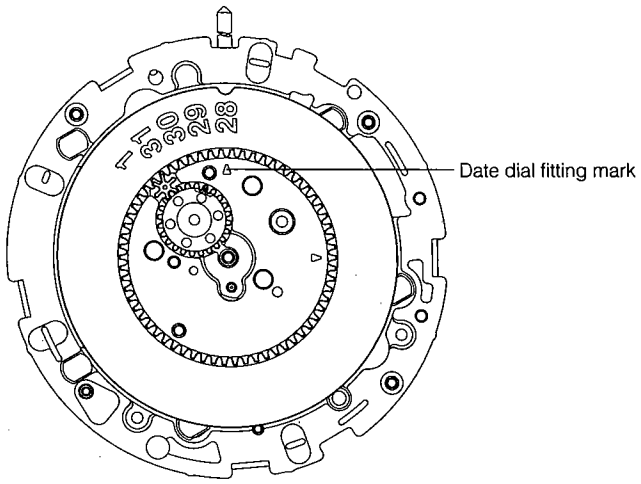
Problem	Check Items	Corrective Actions
Unable to receive radio waves (the watch cannot be switched to the receiving state)	Has button Ⓐ been pressed until the second hand points to RX (12:00 position)?	Press button Ⓐ for about 2 seconds, check that the second hand points to RX and then try receiving radio waves again.
Unable to receive radio waves (even within the receivable area)	Are there objects that block radio waves or generate noise nearby?	Refer to the sections entitled "For Good Reception" and "Locations where Reception may be Difficult" of this manual. Check if the reception environment has changed as a result of rearranging the room and so forth.
Current time incorrect even though radio waves ought to have been received	Has the reference position of any of the hands shifted?	Refer to section 10 of this manual entitled "Setting the Reference Position". If the reference position has shifted, properly reset the reference position.

§15. PRECAUTIONS FOR DISASSEMBLY AND ASSEMBLY

[Installation of calendar parts]

1. Installation of date dial

   Install the date dial, matching the tooth tip of date "28" to the "Date dial fitting mark" at the 3-o'clock position of the circuit unit supporter.



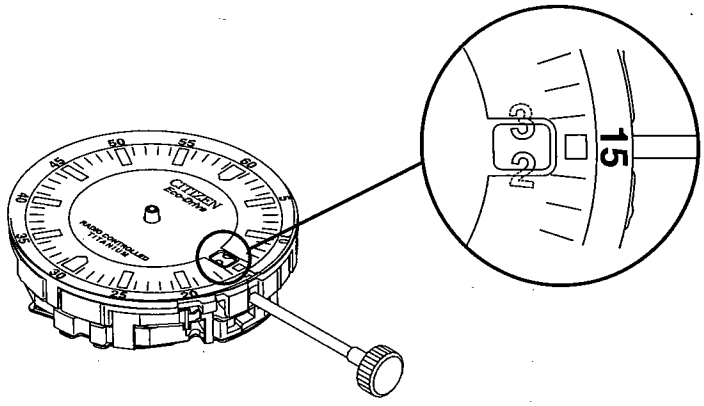
[Procedure for fitting hands]

1. Position the date dial.

(1) Pull the crown to the second click position and press the Ⓐ and Ⓑ buttons simultaneously to perform the all-reset operation.

(2) Set the crown to the first click position.

(3) Turn the crown to the right (forward) to set the data dial to the center between the date changing points.



- Be sure to turn the crown to the right to set the date dial to the correct position.
- If the hour hand is fitted temporarily and the crown is turned, a change of the date can be checked by the movement of the hand.

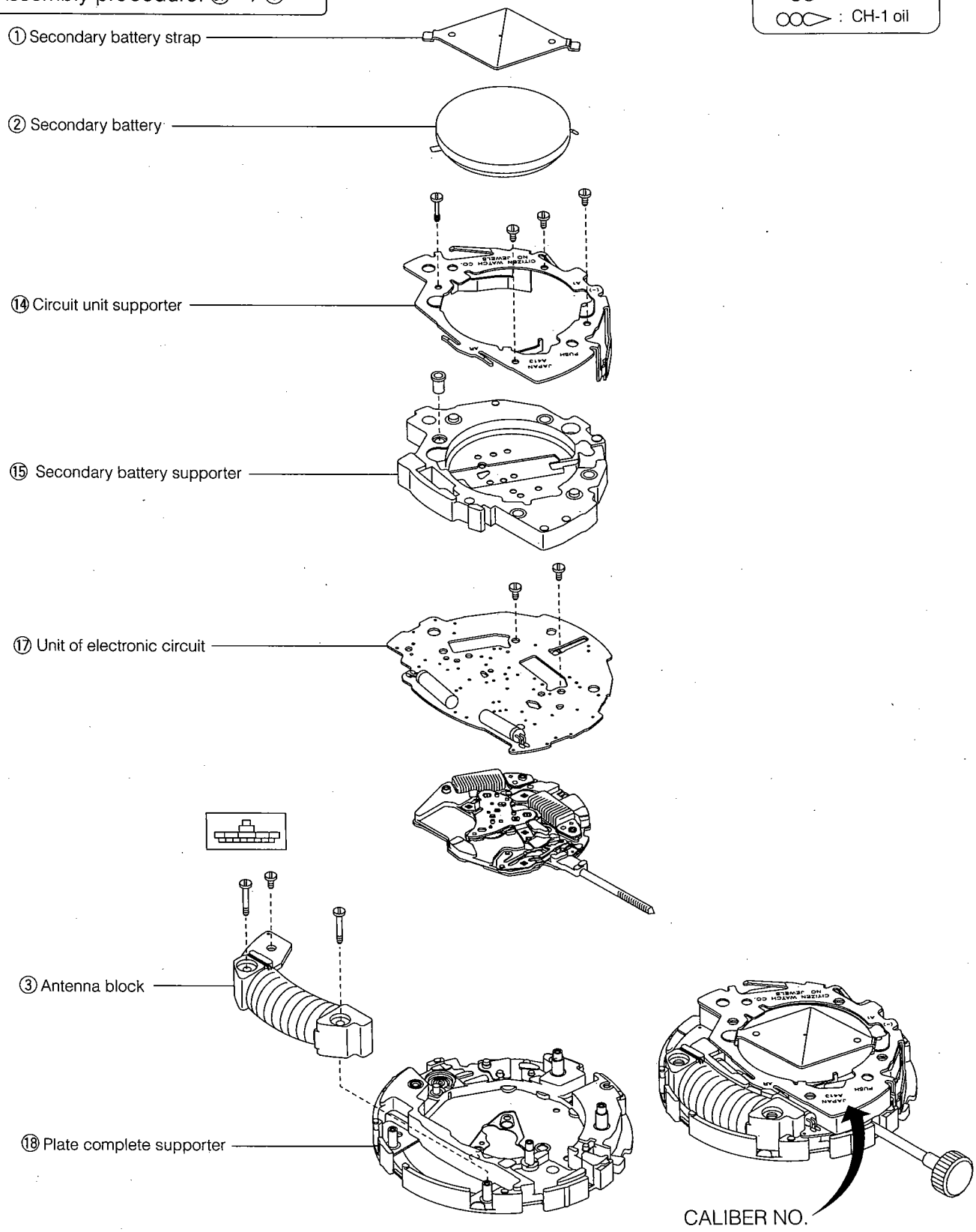
2. Fit the hour hand to the 12-o'clock position.
3. Pull the crown to the second click position.
4. Fit the minute hand near (before) the 12-o'clock position.
5. Turn the crown to the right (forward) to set the minute hand to the 12-o'clock position.
6. Fit the second hand to the 12-o'clock position.
7. Return the crown to the normal position, and the watch starts irregular 2-second interval movement.
8. Install the movement to the case and perform the all-reset operation again and set the standard position, and then set the watch to the correct time.

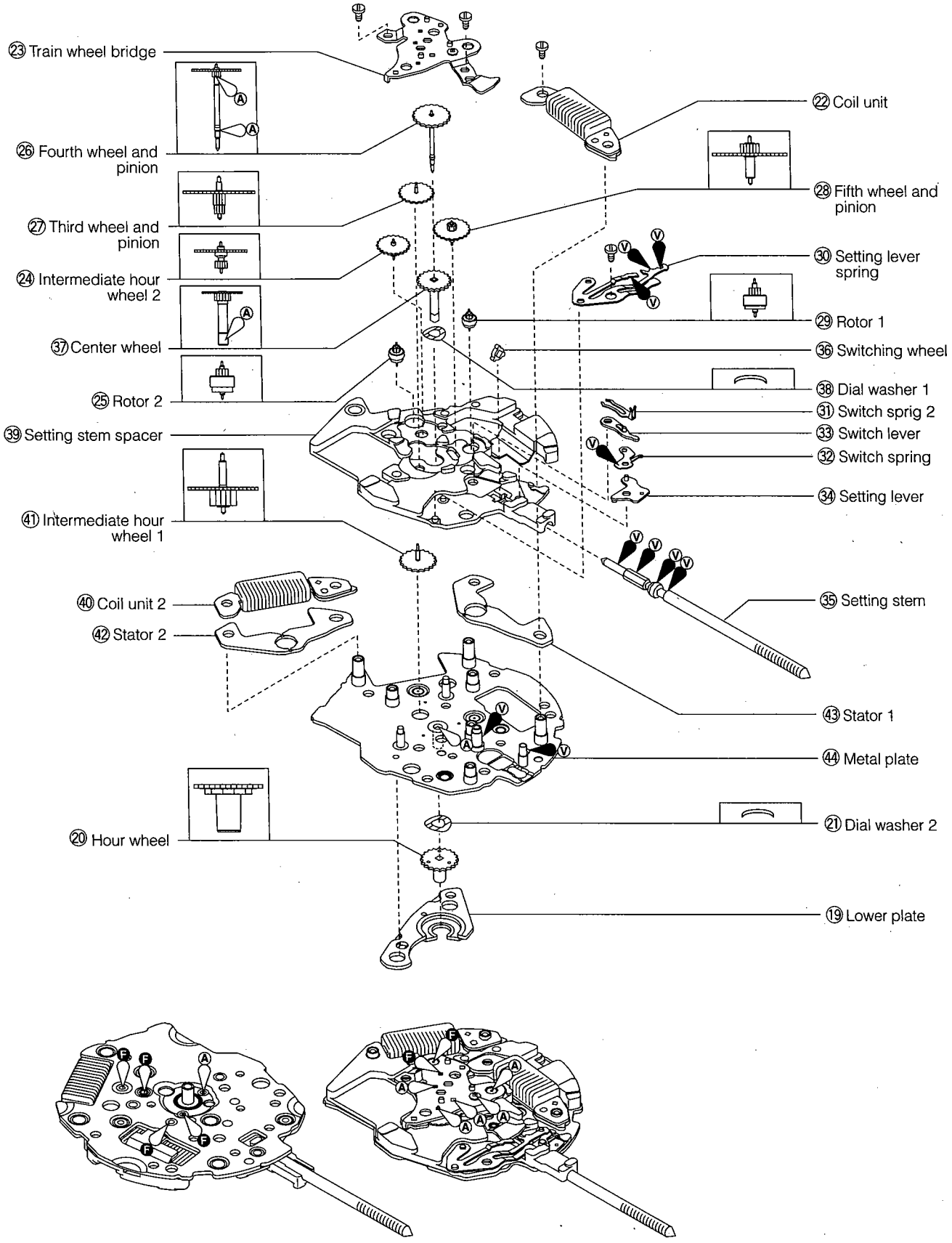
§16. DISASSEMBLY AND ASSEMBLY OF MOVEMENT

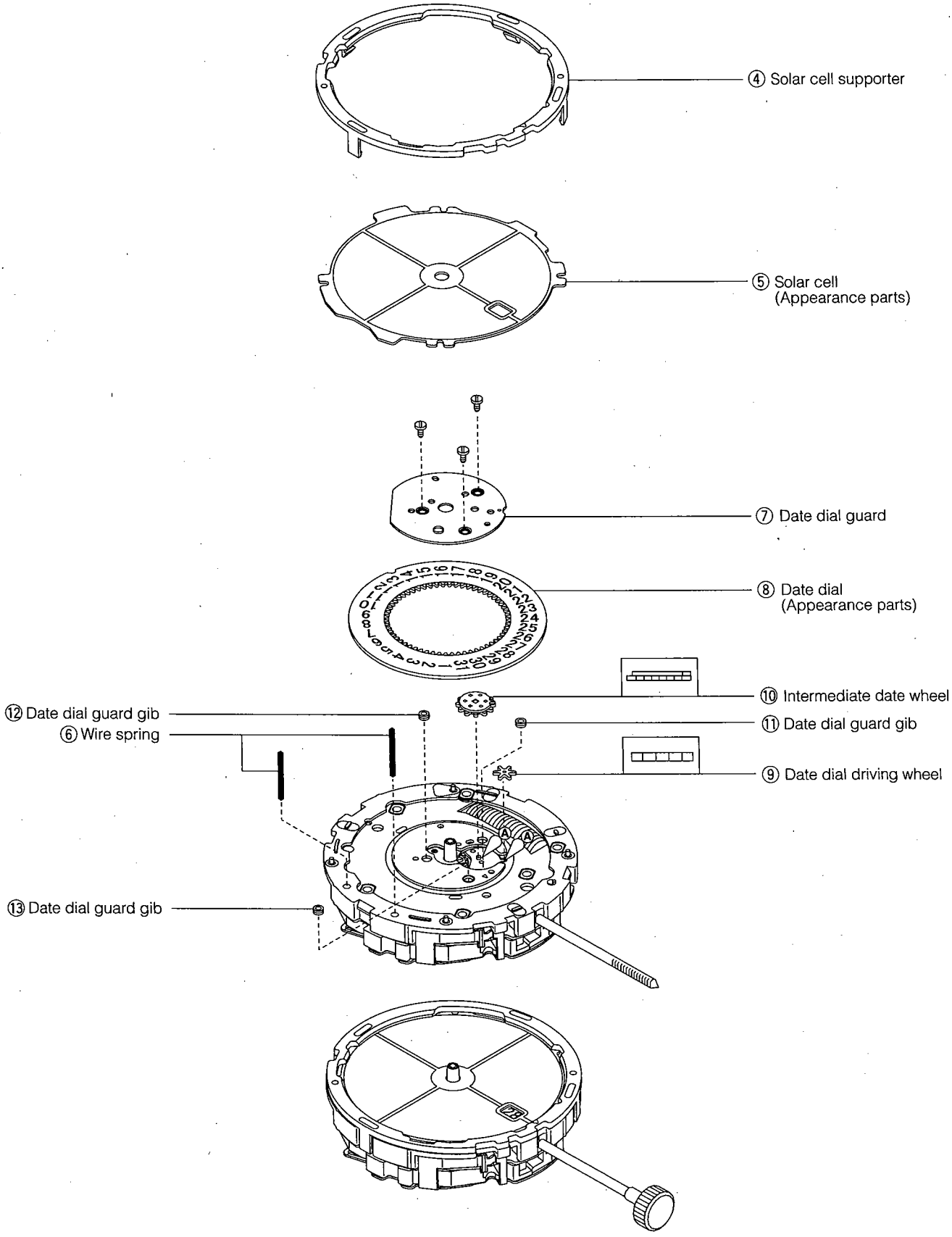
● Lubrication mark

Ⓐ : A-Lube oil
Ⓥ : V-Lube oil
Ⓕ : F-Lube oil
○○○ : CH-1 oil

Disassembly procedure: ① → ⑰
Assembly procedure: ⑰ → ①

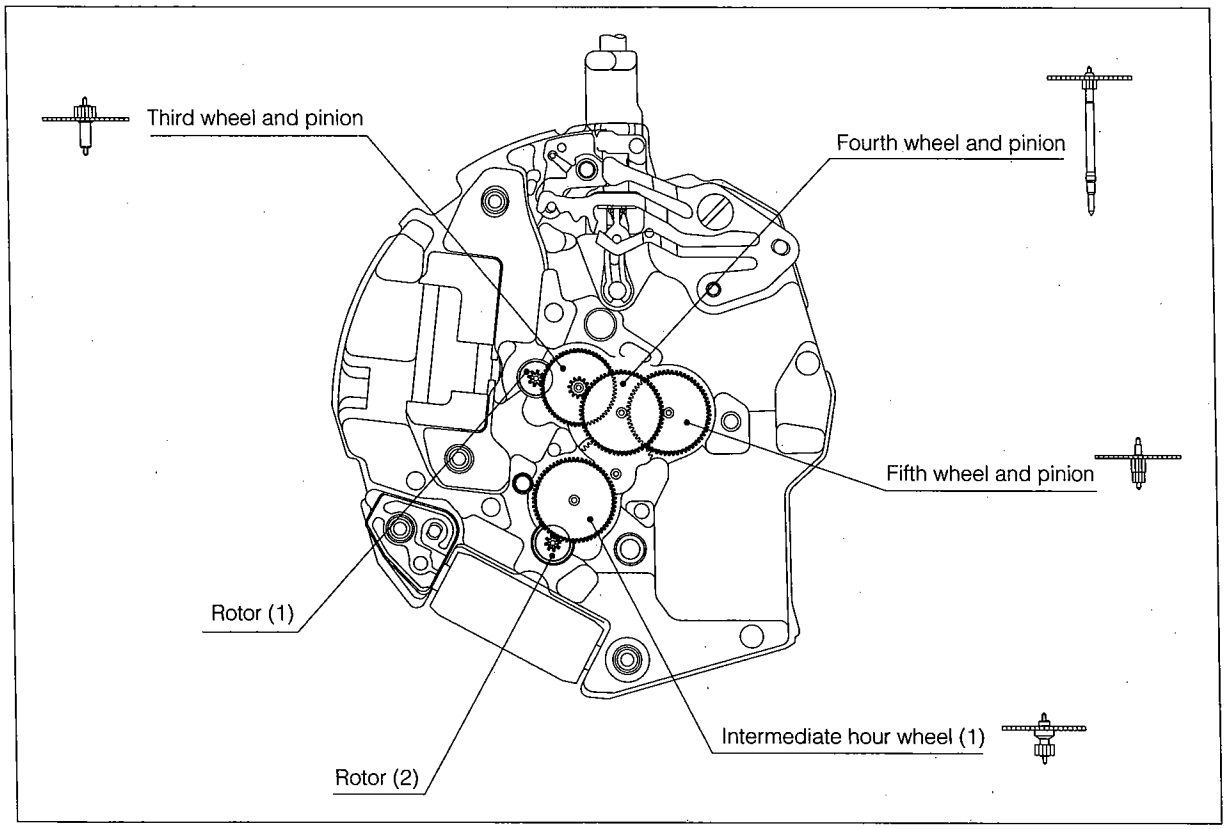



㉓ Train wheel bridge
㉖ Fourth wheel and pinion
㉗ Third wheel and pinion
㉔ Intermediate hour wheel 2
㊲ Center wheel
㉕ Rotor 2
㊴ Setting stem spacer
㊶ Intermediate hour wheel 1
㊵ Coil unit 2
㊷ Stator 2
⑳ Hour wheel
㉒ Coil unit
㉘ Fifth wheel and pinion
㉚ Setting lever spring
㉙ Rotor 1
㊱ Switching wheel
㊳ Dial washer 1
㉛ Switch sprig 2
㉝ Switch lever
㉜ Switch spring
㉞ Setting lever
㉟ Setting stem
㊸ Stator 1
㊹ Metal plate
㉑ Dial washer 2
⑲ Lower plate

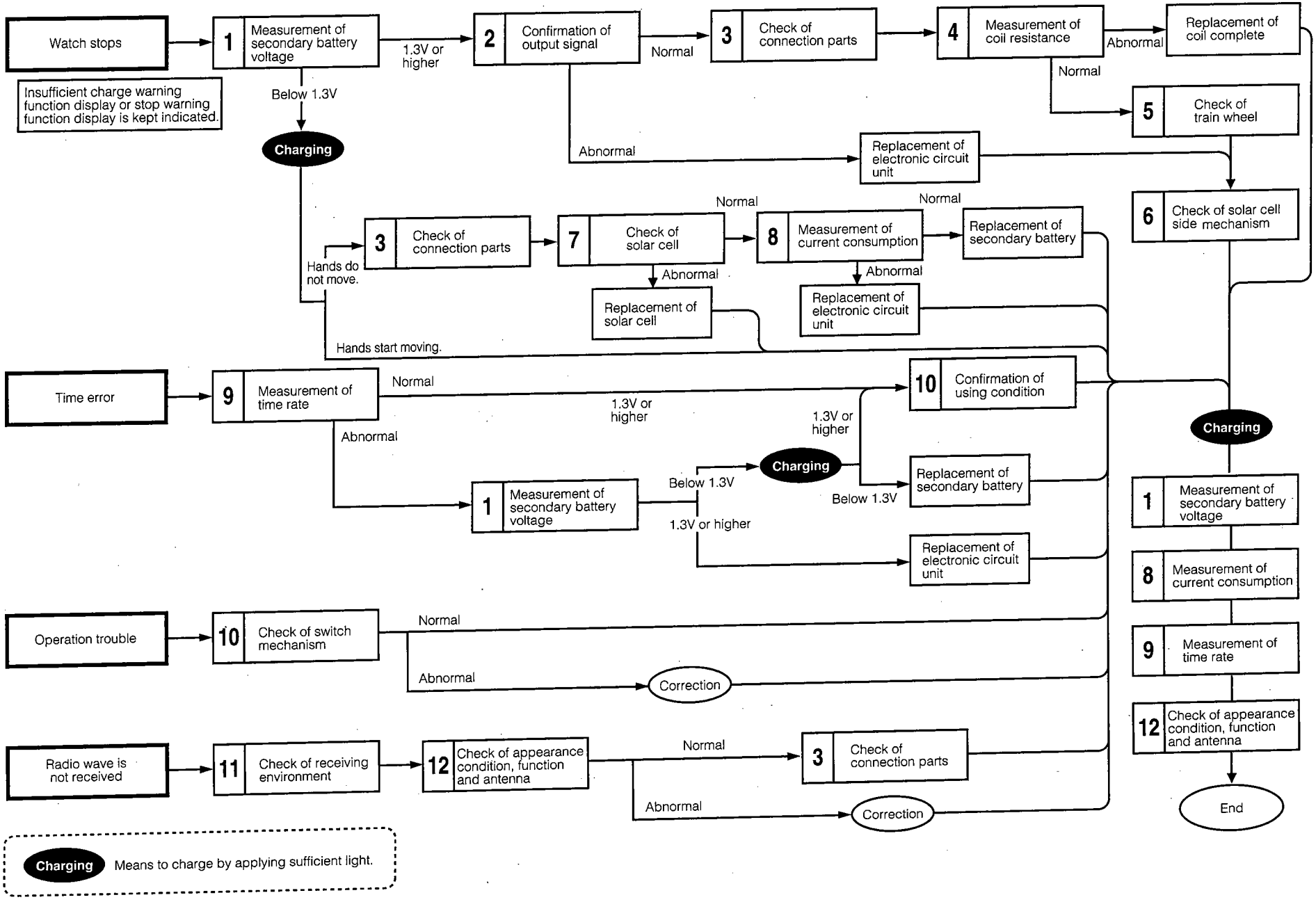

④ Solar cell supporter
⑤ Solar cell
(Appearance parts)
⑦ Date dial guard
⑧ Date dial
(Appearance parts)
⑩ Intermediate date wheel
⑫ Date dial guard gib
⑥ Wire spring
⑪ Date dial guard gib
⑨ Date dial driving wheel
⑬ Date dial guard gib

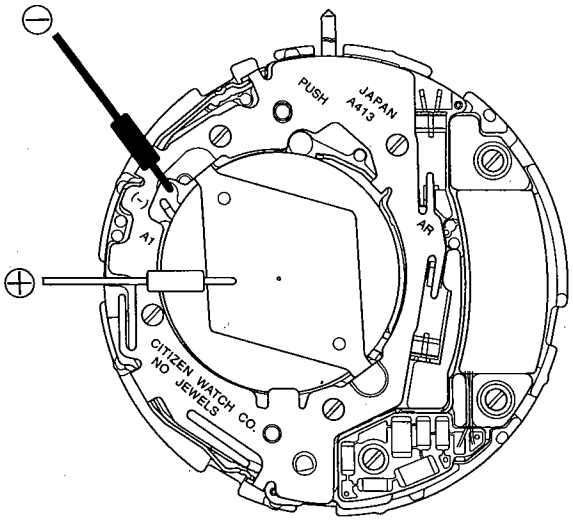
[Assembly drawing for train wheel]

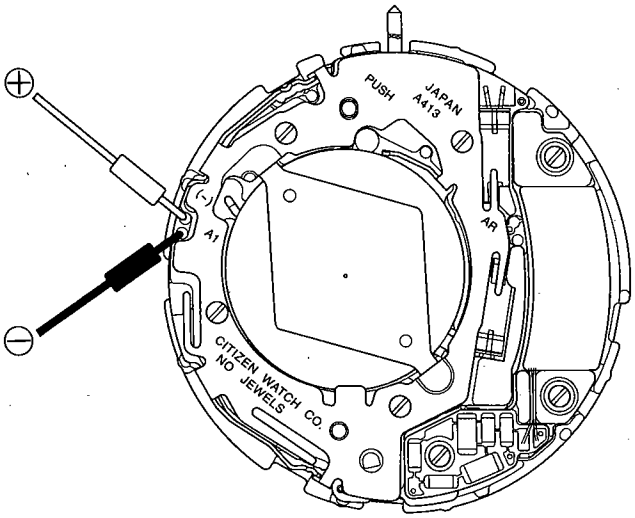
From rotor 1 to intermediate hour wheel 1

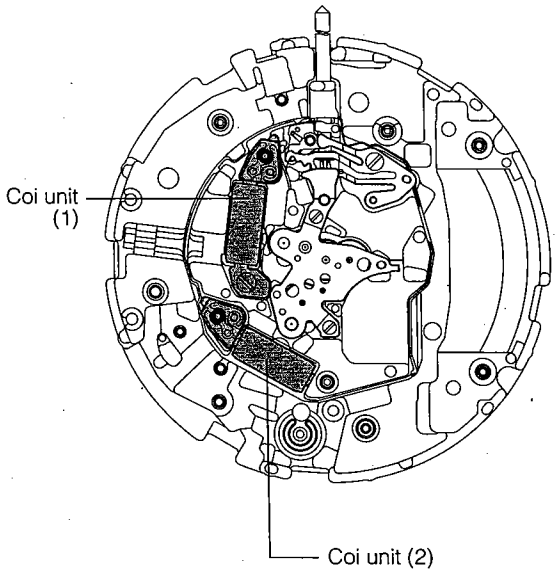


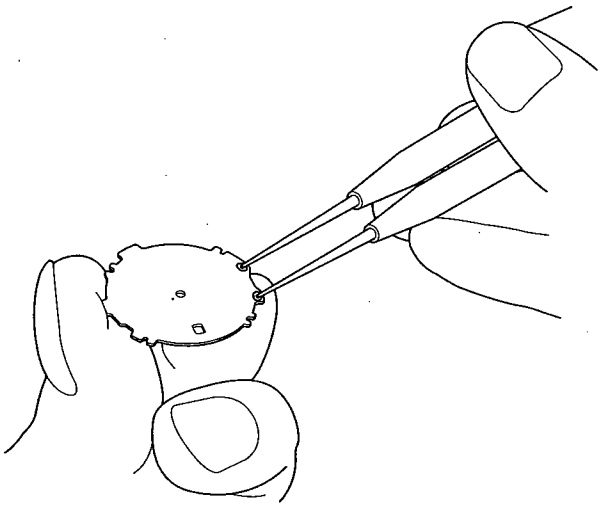
§17. TROUBLESHOOTING AND ADJUSTMENT METHOD

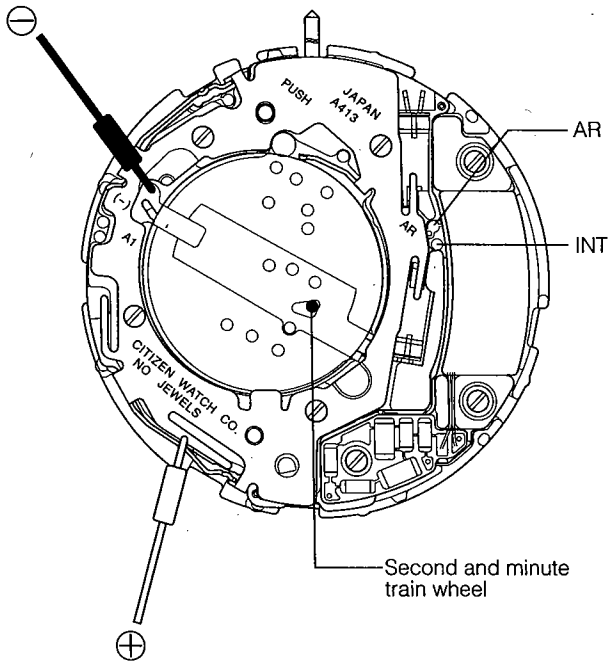


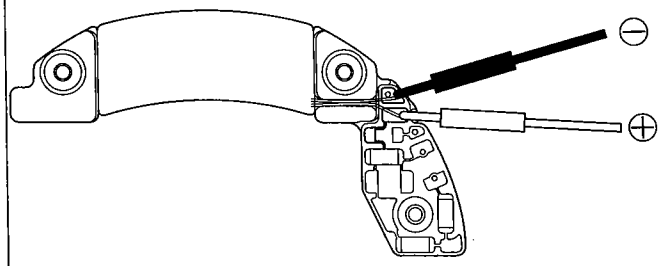
Check Items	How to Check	Result and Treatment
❶ Measurement of secondary battery voltage	<Tester range: DC. 3V>  Reference: • 1.1V~1.3V: 2-second interval movement 1.3V~2.1V: Normal 1-second interval movement • 2-second hitch movement is a function that signals that the watch has stopped and restarted. This mode will continue until the watch is set to the correct time, irrespective of the voltage. **Caution:** When measuring the voltage, be careful not to place the ⊖ tester pin on the supporter for electronic circuit (a short circuit will occur).	1.3V or higher → Good Below 1.3V → Charge. ⬇ Measure again after charging. 1.3V or higher → Check connecting parts. Below 1.3V → Check solar cell. ⬇ Good ⬇ Replace secondary battery.

Check Items	How to Check	Result and Treatment
❷ Confirmation of output signal	* Refer to Technical Manual, Basic Course: II-1-b. <Tester range: DCV. 0.3V>  • In the 1-second interval movement, the tester pointer should moves to the right left every 1 second. • In the 2-second interval movement or 2-second hitch movement, the test pointer moves in only one direction every 2 seconds.	Tester pointer move. → Normal Tester pointer does not move → Check connection parts. ⬇ Connection parts are normal → Replace of electronic circuit unit.
❸ Check of connection parts	* Refer to Technical Manual, Basic Course: II-2-a. • Check for looseness of screws, dust, stain, etc. • Check for stain and removal of the solar cell pattern (two places), deformation of connection spring, removal of welded lead plate of the secondary battery, stain of the circuit pattern, bad contact of each part.	Stain of solar cell pattern and circuit pattern → Remove stain. Removal of solar cell pattern, removal of circuit pattern, removal of welded lead plate of secondary battery → Replace parts.

Check Items	How to Check	Result and Treatment
❹ Measurement of coil resistance	* For the setting method of the tester, see Basic Course: II-1-c. • Remove the unit of electronic circuit and measure the coil resistance. <Tester range: R x 10Ω>  <The tester lead pins have no polarity>	Coil units (1) • 2.2 ~ 2.0kΩ → Good • Out of range of 2.2 ~ 2.0kΩ → Replace coil unit. Coil units (2) • 1.0 ~ 1.2kΩ → Good • Out of range of 1.0 ~ 1.2kΩ → Replace coil unit.
❺ Check of train wheel	* Refer to Basic Course: II-2-b. • Check that the all wheels are meshed smoothly. • Check the lubricating condition, etc. • Check that each train wheel works normally.	
❻ Check of solar cell side mechanism	* Check that the parts around the calendar are installed correctly. • Are the hour wheel, intermediate date wheel, and data dial installed to the correct positions? • Are the parts free from dirt and deformation? • Are the all parts lubricated normally?	

Check Items	How to Check	Result and Treatment
❼ Check of solar cell	• Check the solar cell for breakage and stain, and check its electrode for stain and flaking.  • Exposing the solar cell unit toolight, measure its voltage with a tester to see roughly if the soler cell works. (1) Keep the solar cell exposed to light and set the tester. (Tester range: D.C. 3V) (2) Check swinging of the tester pointer. **(Precaution)** When measuring the voltage of the solar cell, extremely take care not to damage its terminals.	• Breakage of solar cell → Replace solar cell. • Stain → Remove stain. • Flaking of electrode → Replace solar cell. • Tester pointer swings → Normal. • Tester pointer does not swings → Replace solar cell.

Check Items	How to Check	Result and Treatment
❽ Measurement of current consumption	* Refer to Basic Course: II-1-f. This watch uses a secondary battery instead of a battery. Accordingly, prepare a silver battery (1.50V or higher), then measure the current consumption according to the following procedure. (1) Set the crown to the normal position. (2) Remove the secondary battery. (3) Referring to Technical Manual, Basic Course, set the silver battery (1.55V) to the adapter of the tester correctly. (4) Set the tester. Replace the positive ⊕tester pin with a clip, then hitch it on the ground spring of the circuit unit supporter. Apply the negative ⊖tester pin to the negative ⊖ pattern of the unit of electronic circuit. (5) Apply one leg of tweezers to the "AR pattern" and apply the other one to the "INT pattern" and "circuit unit supporter" simultaneously to short them. (6) Separate the tweezers from the "AR pattern" and "INT pattern" in order. • Check that the "second and minute" train wheel is rotating. • If the "second and minute" train wheel is not rotating, repeat steps 5 and 6 again. (7) Measure the current consumption. **Note:** The tester indicates a high value at first. Wait until the tester pointer is stabilized, then measure the current consumption of the movement. **Note:** When measuring the current consumption, do not apply any light to the solar cell. If any light is applied, the voltage changes and correct current consumption cannot be measured. <Tester range: DC 10μA>  	Current consumption by module **Below 1.4μA** → Good **1.4μA or higher** → Measure unit of electronic circuit. Measurement of unit of electronic circuit. **Below 0.4μA** → Good **0.4μA or higher** → Replace unit of electronic circuit. Current consumption by module is high but that by electronic circuit unit is low → A part other than circuit seems to have a trouble. Check for stain, bad lubrication, deformation of parts, and remove causes of load.

Check Items	How to Check	Result and Treatment
❾ Measurement of time	* Refer to Basic Course: II-2-d. • Since DF measurement is applied, measure in the 10-second range. The time rate cannot be adjusted, however. The time rate may not be measured accurately in the 2-second interval movement or 2-second hitch movement. In this case, apply light to the watch until the second hand moves in the 1-second interval movement, the measure the time rate.	• Time rate is very different from specification → Replace unit of electronic circuit.
❿ Confirmation of using condition	* Refer to Basic Course: II-2-e. • Since this watch is energized by light, it should receive light as much as possible. If the watch is placed near a light source which generates heat (above 60°C) such as an incandescent lamp, a halogen lamp, etc., its functions and parts may be deteriorated or deformed by the heat. Accordingly, take care when applying light to it. Example: When the watch is hidden under a long sleeve or the customer works in a dark place, it needs to be exposed to light on purpose.	
⓫ Check of receiving environment	1. Check to see if the watch is used in a area where it can receive the radio wave. See "General Reference for Receiving Areas". 2. Check to see if there is anything which blocks the radio wave or generates noised. See "Location Where Radio Wave Reception may be Difficult". 3. Change the receiving place or the direction of the watch for receiving.	
⓬ Check of appearance condition, function and antenna	* Refer to Technical Manual, Basic Course: II-2-f. • Confirm that each correcting switch is normal. • Check the continuity of the antenna seat of the antenna unit removed from the watch. <Tester range: R x 10Ω>  	• Tester pointer swings. → Normal • Tester pointer does not swing. → Replace the antenna.

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Tokyo, Japan

PRINTED IN JAPAN
CTZ-2002.09
ITEM NO. T04E-24