

***TECHNICAL  
INFORMATION***

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**CITIZEN QUARTZ  
Cal.No.914※※**

## 2. MAIN FEATURES

### 1) Full-dress calculator function

The calculator performs a number of applied calculations. Among them are the four rules of arithmetic (addition, subtraction, multiplication and division), extraction of the square root, automatic multiplication and division of constant, square, power, reciprocal, memory, function, commutation, factorial, statistics calculations and others.

### 2) Electronic (IC) switch for calculator ON/OFF

The calculator is turned ON with the first push of SW switch, and turned OFF with the second push of the switch. The calculator is turned OFF automatically in about 3 minutes and 30 seconds after completion of the button operation, which is especially effective in case the operator forgets to turn OFF the calculator after use.

### 3) Constant display of time

The watch displays "hour", "minute" and "second" constantly, and "month" and "date" are displayed instead of the time through a switch operation.

### 4) Automatic correction of calendar display

The "month" and "date" can be corrected and set automatically at the end of every month except for a leap year.

### 5) Built-in internal illumination lamp

An internal illumination lamp is built in the watch to facilitate an easy readout of the time even in a dark place.

### 6) Easy-to-disassemble/assemble movement

The number of the component parts is reduced extremely to facilitate an easy disassembly and assemble of the movement.

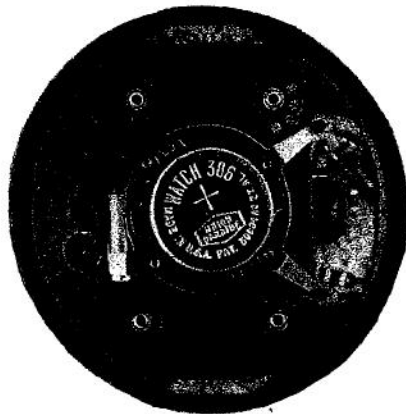
### 7) Continuous operation of about 3 years

Thanks to the newly developed matrix LC display system, the watch and calculator operates continuously for about 3 years on just a single unit of small-size silver oxide power cell.

## 1. OUTLINE



This is a highly accurate digital quartz crystal watch (liquid crystal display system) combined with a full-dress calculator. It is capable of various kinds of operations including even a functional equation, etc.



**Movement  
(Power cell side)**



**Movement  
(LC display panel side)**

## 4) How to use calculator

1. With push of switch button (SW),  $\square$  is displayed on the calculator display window.
2. The button must be pushed lightly. An excessive pushing force may cause a fault to the calculator.
3. The disappearance of the display in the course of calculation indicates that a calculation is being carried out inside the calculator. So the calculator must be operated while confirming the display existence.
4. Due to a floating display system, the digits after the 9th (including 9th digits) are not registered in case a figure register of 8 digits or more is carried out.

Ex.) Registering of 1 2 3 4 5 6 7 8 9:

1 2 3 4 5 6 7 8 9  $\longrightarrow$  1 2 3 4 5 6 7 8

5. The figure register is limited up to 2 digits at the exponent part, so last 2 digits are registered in case a figure register of 3 digits or more is carried out.

Ex.) Registering of  $123 \times 10^{456}$

1 2 3 (EXP) 4 5 6  $\longrightarrow$  1 2 3      5 6

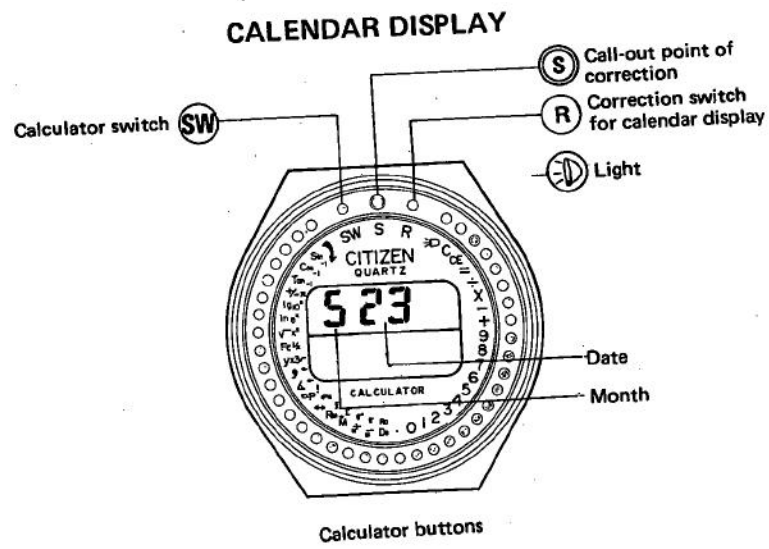
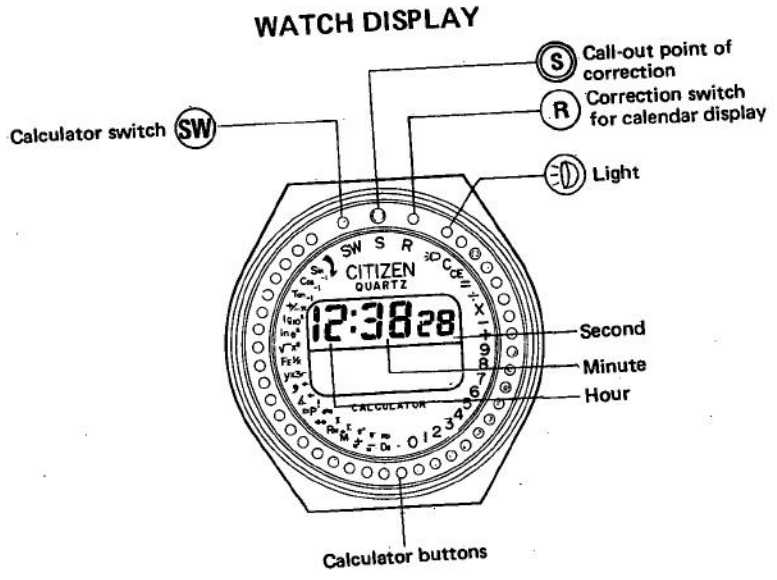
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Mantissa part
Exponent part

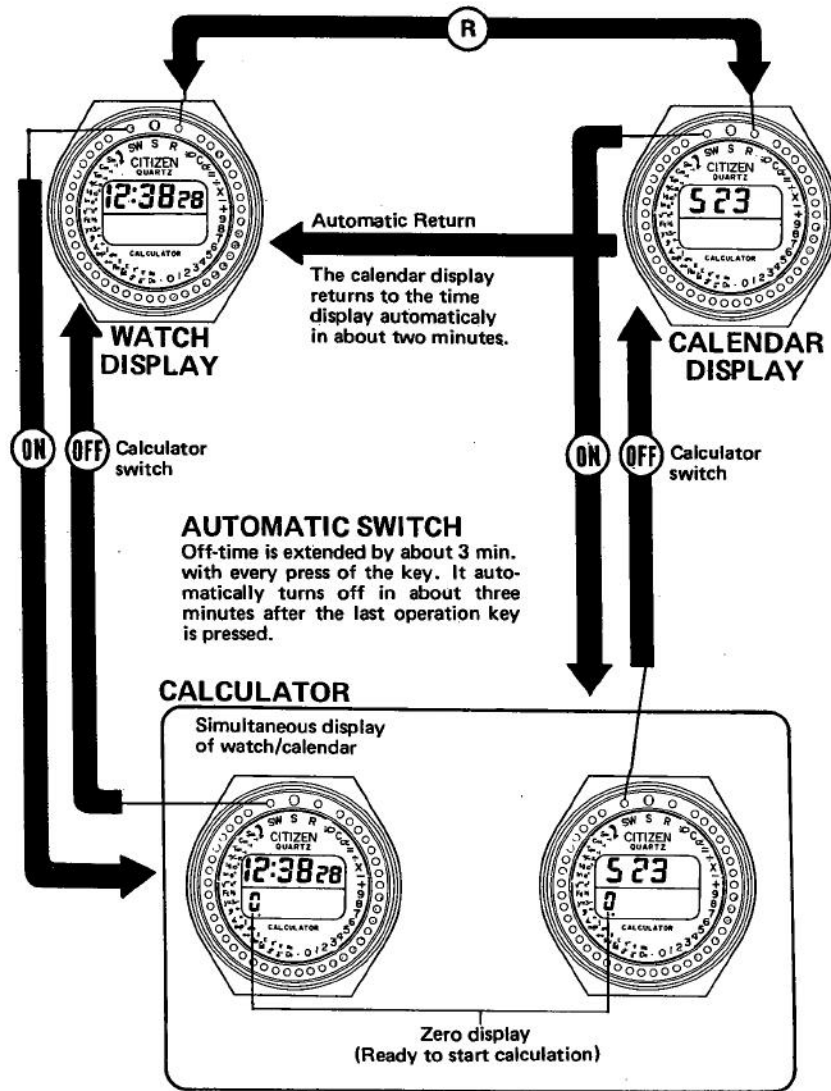
6. In case the calculations are carried out continuously, never fail to push the clear (C) button and confirm  $\square$  display prior to execution of the succeeding calculation.
7. In case the buttons for the four rules of arithmetic ( $+$ ,  $-$ ,  $\times$ ,  $\div$ ) are pushed mistakenly, push the correct button immediately. In this case, the buttons pushed later become valid.
8. When the calculation is finished, push the switch button (SW) to make the display disappear. The calculator is turned OFF automatically in 3 minutes and 30 seconds after completion of the calculation, which is especially effective in case you forget to push (SW) button after the use of the calculator.
9. The button operation is possible with your fingers. However, the buttons are operated more smoothly if the accessory pushing tool, a mechanical pencil (with the lead pushed in) or the like is used. Avoid using a tool with a sharp tip, because it may damage the button.

### 3. HANDLING INSTRUCTIONS

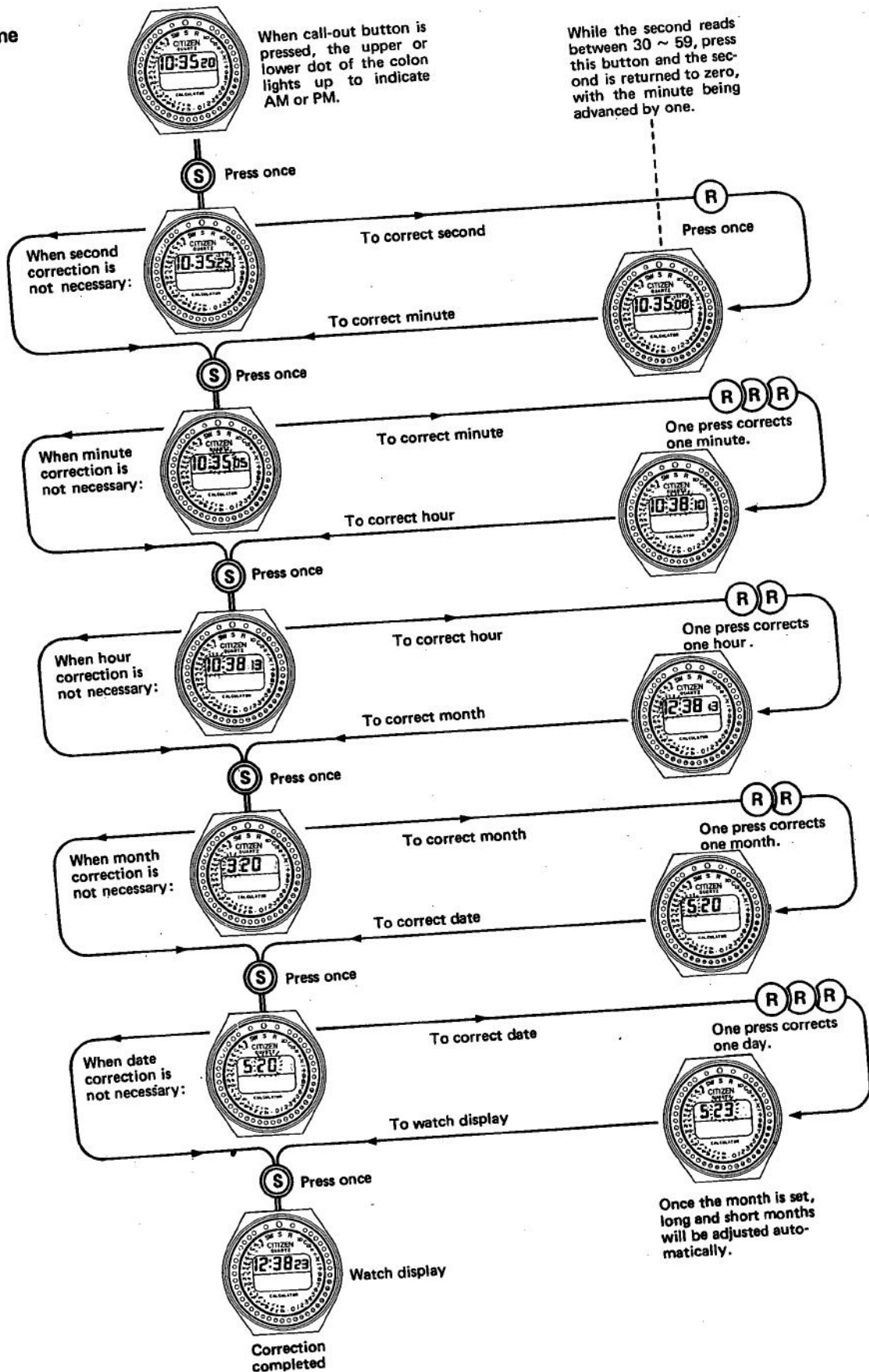
#### 1) How to read time and calendar



2) How to switch functions

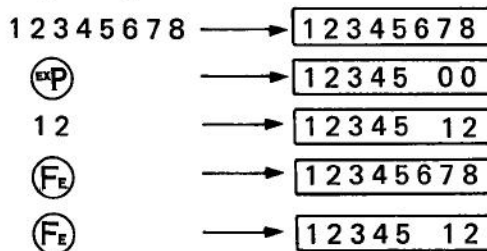


### 3) How to set time and calendar



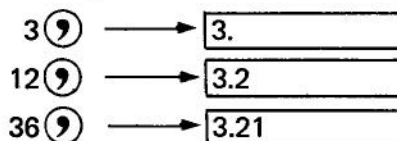
(Keys)	(Names)	(Function/Operation)
$\pm$	Sign change button	Pushed to invert the code of the displayed figure register. When pushed after $\text{EXP}$ button, the code at the exponent part is inverted.
$\pi$	Pi button	For registering pi ( $\pi$ ). The 8 digits of pi (3.1415926) are registered automatically.
$\lg$	Common logarithm button	For obtaining a logarithm with "10" as the base.
$10^x$	Common exponent button	For obtaining the power with "10" as the base.
$\ln$	Natural logarithm button	For obtaining a logarithm with e ( $\approx 2.7182818 \dots$ ) as the base.
$e^x$	Natural exponent button	For obtaining the power of e.
$\sqrt{\quad}$	Root button	For obtaining a square root.
$x^2$	Square button	For carrying out a square calculation.
$F_E$	Effective 3-digits call button	Pushed to call for effective 3 digits which are not displayed when an exponent is registered.

Ex.) Registering of  $12345678 \times 10^{12}$ :








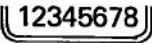



$1/x$	Reciprocal button	For obtaining a reciprocal of the displayed figure register.
$y^x$	Power button	For obtaining the power ( $x$ -power of $y$ ).
$\sqrt[3]{\quad}$	Cube root button	For obtaining the cube root.
$\text{DMS}$	Degree, minute & second conversion button	Pushed to convert the degree, minute and second (a 60-notation number is converted into a decimal number).

















Ex.) Conversion of  $3^\circ 12' 36''$  into a decimal:



## 4)-1. Descriptions for button symbols

(Key)	(Names)	(Function/Operation)
$\textcircled{\text{SW}}$	Switch button	Power ON/OFF switch of calculator.
$\textcircled{\text{C}}$	Clear button	Clears off all figure register and calculation orders except for the memory contents.
$\textcircled{\text{CE}}$	Clear entry button	Corrects the buttons pushed mistakenly. (For the four rules of arithmetic, the miss-push of the buttons can be corrected by pushing the correct buttons continuously. The buttons pushed later become valid.)
$\textcircled{=}$	Equal button	For obtaining answers of the four rules of arithmetic and other calculations.
$\textcircled{+} \textcircled{-} \textcircled{\times} \textcircled{\div}$	Buttons for four rules of arithmetic	For carrying out the four rules of arithmetic.
$\textcircled{0} \sim \textcircled{9}$	Figure register buttons	Pushed from the upper digits to register figures.
$\textcircled{\cdot}$	Decimal button	Pushed to register the decimal point.
$\textcircled{\curvearrowright}$	Right-row call button	Pushed to designate the second function (inside function) of the button featuring two functions, prior to operation of those buttons.
		Ex.) Calculation of $12x^2$ : $12 \textcircled{\curvearrowright} x^2 \longrightarrow 144$
		Calculation of $\text{Sin}^{-1} 0.5$ : $\textcircled{\cdot} 5 \textcircled{\curvearrowright} \textcircled{\text{Sin}^{-1}} \longrightarrow 30$
		* The designation of the function returns to the left row automatically when the second function button is once pushed.
		* In case no $\textcircled{\curvearrowright}$ button is pushed, the first function (outside function) is designated.
		* The $\textcircled{\curvearrowright}$ button is reversible. When the button is pushed mistakenly, push this button again to designate function.
		* "D <sub>G</sub> ↔ R <sub>D</sub> " switching is impossible with this button.
$\textcircled{\text{Sin}}$	Sine button	For obtaining a sine.
$\textcircled{-1}$	Arc-sine button	For obtaining an arc-sine.
$\textcircled{\text{Cos}}$	Cosine button	For obtaining a cosine.
$\textcircled{-1}$	Arc-cosine button	For obtaining an Arc-cosine
$\textcircled{\text{Tan}}$	Tangent button	For obtaining a tangent.
$\textcircled{-1}$	Arc-tangent button	For obtaining an arc-tangent.

(Keys)	(Names)	(Function/Operation)
	Population standard deviation button	For obtaining the population standard deviation for the data which is put in when a statistics calculation is carried out.
	Degree button	Pushed to express the scale of angles in degree, minute and second for the trigonometric function or the coordinates conversion.
	Radian button	<p>"Radian" is an angle which is expressed in relation with the arc and the center angle of a circle, which is called "circular measure". This button is pushed to express the register or the calculation result in the radian unit.</p> <ul style="list-style-type: none"> <li>* With operation of  button, the angular unit starts always at "D<sub>G</sub>" state.</li> <li>* The unit switch of "D<sub>G</sub> ↔ R<sub>D</sub>" is performed with every push of "D<sub>G</sub> ↔ R<sub>D</sub>" button, regardless of  button (call button for the right row). The switched state is kept until "D<sub>G</sub> ↔ R<sub>D</sub>" button is pushed next.</li> </ul>
	Display window	<p>Displays the register figures or the calculation result.</p> <ul style="list-style-type: none"> <li>* 8 digits are usually displayed. In case the absolute value of a calculation result is "0", "1 ~ 99999999" or less than "1" down to the 7th decimal plate, the register is displayed through a floating decimal point system. The registers other than the above are switched automatically to an exponent display.</li> </ul>
	Memory mark	Displayed at the upper right of the mantissa part when the figure register is memorized in the memory.
	Minus mark	Displayed at the right of the display part when the display register is negative at the mantissa part, and displayed at the left of the exponent part when the exponent part is negative respectively.
	Overflow error	An error mark is displayed at the right of the display part in case the calculation result exceeds the calculation range.

(Key)	(Names)	(Function/Operation)
	Degree conversion button	Pushed to convert the degree into degree, minute and second.
	Polar coordinates conversion button	Pushed to convert the vertical-cross coordinates into the polar coordinates.
	Vertical-cross coordinates conversion button	Pushed to convert the polar coordinates into the vertical-cross coordinates.
	Exponent register button	Pushed to have a figure register for the exponent part. Ex.) Registering of $1.2 \times 10^{23}$ : $1 \cdot 2 \text{ (EXP) } 23 \rightarrow \boxed{1.2 \quad 23}$ Registering of $2.3 \times 10^{-34}$ : $2 \cdot 3 \text{ (EXP) } 34 \text{ (1/2)} \rightarrow \boxed{2.3 \quad -34}$
	Factorial button	For obtaining a factorial.
	Register conversion button	Pushed to replace the display register (X register) with the register inside the calculator (Y register).
	Statics calculation call button	Pushed to carry out a statistics calculation. * The set mark (—) is displayed with push of  button, and the register inside the calculator including memory and the calculation orders are all cleared off.
	Recall memory button	Pushed to call for the register which is memorized in the memory.
	Average value button	For obtaining the average value for the data which is put in when a statistics calculation is carried out.
	Memory register button	Pushed to have a register into the memory. * When pushed after  button, the memory is cleared off.
	Sigma button	Pushed to obtain the sum total of the data which is put in when carrying out a statistics calculation.
	Memory addition button	Pushed to add the display register and the calculator result to the memory.
	Sample standard deviation button	Pushed to obtain the standard deviation for the data which is put in when carrying out a statistics calculation.
	Memory subtraction button	Pushed to subtract the display register or the calculation result from the memory.

## 5. SPECIFICATIONS

Caliber No.	9140A
Type	Digital-type quartz crystal watch with LC display
Movement	Size : 38.0 mm $\phi$ Thickness : 6.67 mm
Oscillation	32,768 Hz
Accuracy	$\pm 10$ sec./month in normal temperature
Display method	FE twist type nematic liquid crystal
information	<ul style="list-style-type: none"> <li>• Constant digital display of "hour", "minute" and "second"</li> <li>• "Month" and "date" displayed by switching operation</li> <li>• 8-digit display of calculator through matrix driving</li> </ul> <p>Calculations possible: Decimal point, four rules of arithmetic (addition, subtraction, multiplication &amp; division), extraction of the square, continuous operation, automatic constant multiplication &amp; division, square, power, reciprocal, memory, function, commutation, factorial, statistics, etc.</p>
Display correction	Independent correction for each digit by push-buttons
Effective temperature range	0°C ~ + 50°C (+32°F ~ + 122°F)
Integrated circuit	C/MOS-LSI, 3 units (1 for watch, 2 for calculator)
Additional mechanisms	<ul style="list-style-type: none"> <li>• Calculator (with electronic switch)</li> <li>• Automatic calendar correction at the end of each month</li> <li>• Built-in internal illumination lamp</li> </ul>
Power cell	<p>Small-size silver oxide power cell (280-21)</p> <p>Voltage : 1.5V</p> <p>Capacity : 120 mAH</p> <p>Size : 11.6 mm<math>\phi</math> x 4.2 mm</p> <p>Life : 3 years approx. (5 sec. lamp lighting &amp; 10 min. calculator operation per day)</p>