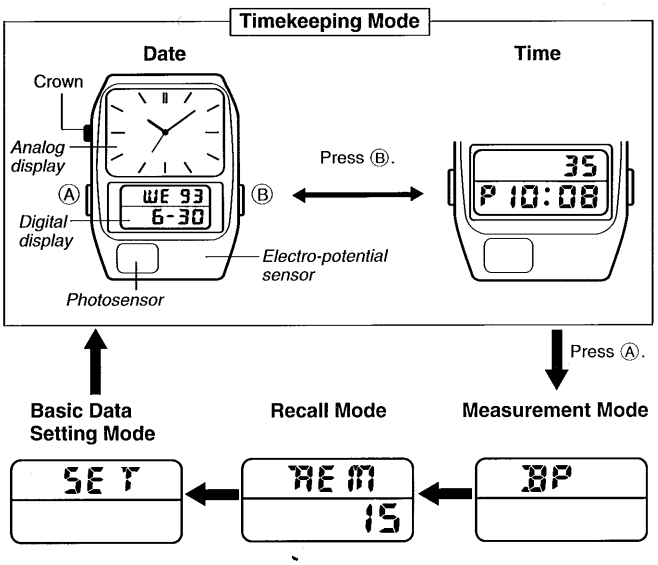
OPERATION CHART: MODULE QW-770
GENERAL GUIDE

- Press Ⓐ to change from mode to mode. Each mode is explained in detail on the following pages.



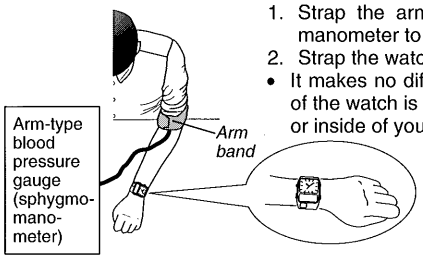
BASIC DATA

The watch cannot calculate a blood pressure value until the person using it first inputs some basic data. There are two types of basic data: *at-rest* and *post-exercise* basic data. Your at-rest and post-exercise basic data should be obtained using a standard arm-type blood pressure gauge (sphygmomanometer). If you do not have one of your own, consult with your physician about taking a blood pressure reading, or use blood pressure readings obtained during a recent visit to your doctor.
The following describes how to input your basic data.

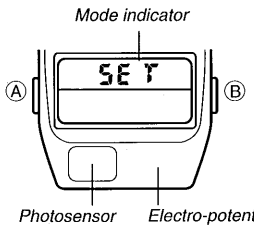
Inputting At-Rest Basic Data

Note

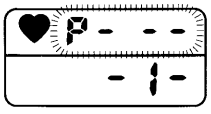
- The following procedure describes how to input at-rest basic data as you measure it with an arm-type blood pressure gauge. If you are using values that were measured previously, skip the steps that deal with operation of the sphygmomanometer.



1. Strap the arm band of the sphygmomanometer to your left arm.
2. Strap the watch onto your left wrist.
- It makes no difference whether the back of the watch is in contact with the outside or inside of your wrist.



3. Use Ⓐ to enter the Basic Data Setting Mode.
- If you do not press any button for about 15 minutes in the Basic Data Setting Mode, the display automatically returns to the Timekeeping Mode.



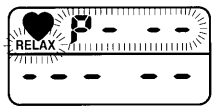
4. Now press Ⓑ to start the actual basic data input procedure. The message "– 1 –" appears in the lower display, which indicates input of at-rest basic data.
- At this time the pulse rate setting should also be flashing on the display.



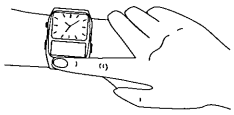
5. To make sure that any previously stored data is cleared, hold down Ⓑ until the message "CLEAr" appears in the lower display.

6. Press Ⓐ to return to the pulse rate setting display (step 4).
- At this time previously stored data is deleted.

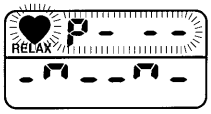
7. Measure your blood pressure with the arm-type blood pressure gauge.
- If you are taking your own blood pressure measurements, refer to the manual that comes with your blood pressure gauge for details on correct operation.



8. Press Ⓐ to start measurement of your pulse rate.
- At this time the message "RELAX" flashes on the upper display.

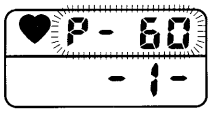


9. As shown in the illustration, lightly place a finger of your right hand onto the photosensor and the electro-potential sensor. Note that the pad of your finger covers the photosensor glass.

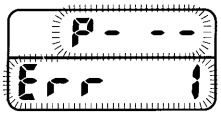


- After about 20 to 30 seconds, the display should change to show a "♥" symbol flashing and a cardiogram line scrolling across in the display. This indicates that your pulse is being measured.
Important!
Try not to move your right hand finger during this measurement.

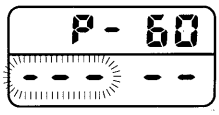
- Actually, your pulse wave transit time is also measured by the watch, but the value does not appear on the display. The value measured by the watch is used for internal calculations only.



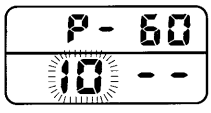
10. When the measurement is complete, your pulse rate appears on the display.



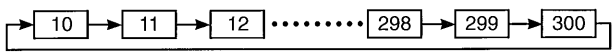
- If the message "Err" appears followed by a number from 1 to 4, consult with the error message meanings of this manual. Next, press Ⓐ and try again from step 9, above.

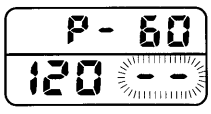


11. After you successfully input your pulse rate, press Ⓑ and the systolic blood pressure part of the display starts to flash because it is selected.

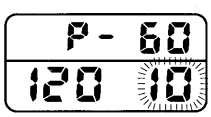


12. Input the value that you (or your physician) measured with the arm-type blood pressure gauge. Press Ⓐ to increase the value (mmHg) within the range shown below. Holding down Ⓐ changes the value at high speed.

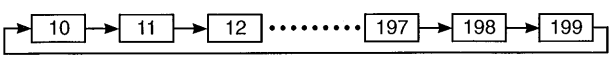


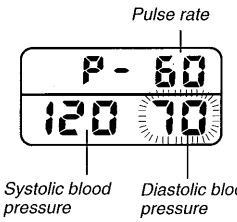


13. After you input your systolic blood pressure, press Ⓑ to select the diastolic blood pressure part of the display.



14. Input your diastolic blood pressure value from the arm-type blood pressure gauge. Press Ⓐ to increase the value (mmHg) within the range shown below. Holding down Ⓐ changes the value at high speed.





15. Check once more to make sure that your pulse, systolic blood pressure, and diastolic blood pressure values are all in the correct positions on the display.



16. Press Ⓑ to return to the Basic Data Setting Mode and store your basic data into memory.



- If the message "Err" appears followed by a number from 5 to 10, consult the error message table of this manual.

17. To return to the Timekeeping Mode, press Ⓐ.
- If you do not operate any button for about 15 minutes, the watch automatically exits the flashing input display.

About Post-Exercise Basic Data

If the blood pressure values produced by the watch differ greatly from those produced by an arm-type blood pressure gauge, you should also input post-exercise basic data.

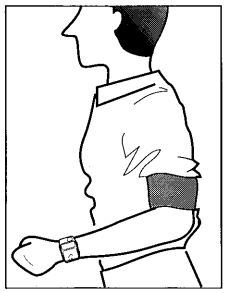
Important
- If the post-exercise basic data is almost the same as the at-rest basic data, you should set at-rest basic data only.
- To measure your post-exercise basic data, you need an arm-type blood pressure gauge (sphygmomanometer) and some steps.

Though you can input post-exercise basic data after virtually any type of strenuous exercise, the following routine ensures that the required load is placed on your circulatory system.

CAUTION
- Be sure to consult with a physician before attempting this or any other strenuous exercise. Take care not to over do it.
- Should you feel overly fatigued while doing the exercise, stop immediately, and consider using at-rest data only.
- When performing the following exercise, be sure to take all possible precautions to ensure that you do not fall or slip off of the steps you are using.
- Should you feel that the pace for your age group is too strenuous, stop exercising immediately. After a rest, try again, using the next slower rank. Keep trying until you find a pace that is comfortable for you.

You can use post-exercise data obtained after virtually any strenuous activity. You can use the following procedure to measure your post-exercise data.

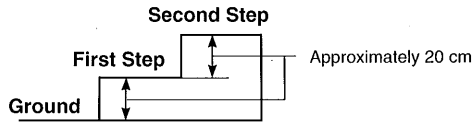
1. Strap the watch onto your left wrist.
2. Strap the arm band of a sphygmomanometer to your left arm, and disconnect the rubber hose that connects the arm band to the measuring unit.
3. Perform the exercise described below.
4. Immediately after you finish the exercise, use the rubber hose to connect the arm band to the measuring unit.



5. Simultaneously measure your diastolic and systolic blood pressure (on the sphygmomanometer), along with your pulse (on the watch).

Exercise
Repeat the following for three minutes, using the pace noted below for your age group.

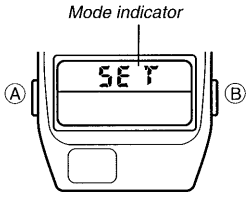
Age	Pace
60–69	11/minute (33 total)
50–59	14/minute (42 total)
40–49	17/minute (51 total)
30–39	20/minute (60 total)
20–29	23/minute (69 total)
10–19	25/minute (75 total)



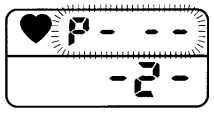
1. Stand facing the steps.
2. Step up onto the first step with your right foot.
3. Step up onto the second step with your left foot.
4. Step up onto the second step with your right foot.
5. Without turning around, step back onto the first step with your left foot.
6. Step back onto the ground with your right foot.
7. Bring your left foot back to ground.

Inputting Post-Exercise Basic Data

1. Perform the exercise described in the previous section to put the required load on your cardiovascular system.



2. Use Ⓐ to enter the Basic Data Setting Mode.
- If you do not press any button for about 15 minutes in the Basic Data Setting Mode, the display automatically returns to the Timekeeping Mode.



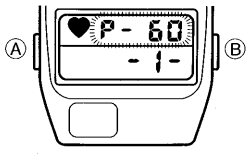
3. Hold down Ⓑ until the message "– 2 –" appears in the lower display, which indicates input of post-exercise basic data.
- At this time the pulse rate setting should also be flashing on the display.

4. To make sure that any previously stored data is cleared, hold down Ⓑ until the message "CLEAr" appears in the lower display.
5. Press Ⓐ to return to the pulse rate setting display (step 3 above).
- At this time previously stored data is cleared.
6. Use the same procedures as described in steps 7 through 15 under "Inputting At-Rest Basic Data."
7. Press Ⓑ to store your post-exercise basic data into memory.
- If the message "Err" appears followed by a number from 5 to 10, consult the error message table of this manual.
8. To return to the Timekeeping Mode, press the Ⓐ button.
- If you do not operate any button for about 15 minutes, the watch automatically exits the flashing input display.

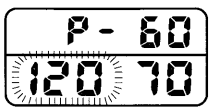
Looking Up and Clearing Basic Data

Use the following procedures whenever you want to check your basic data values or clear them.

To look up your at-rest basic data



1. Use Ⓐ to enter the Basic Data Setting Mode.
2. Press Ⓑ. The message "–1–" appears in the lower display, which indicates input of at-rest basic data.

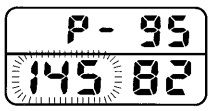


3. Press Ⓑ to display the at-rest basic data.
4. To return to the Basic Data Setting Mode, press Ⓑ twice.
5. To return to the Timekeeping Mode, press Ⓐ.

To look up your post-exercise basic data



1. Use Ⓐ to enter the Basic Data Setting Mode.
2. Hold down Ⓑ until the message "–2–" appears in the lower display, which indicates input of post-exercise basic data.

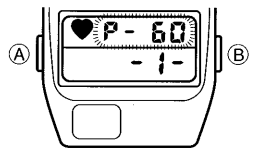


3. Press Ⓑ to display the post-exercise basic data.
   - If you have not input any post-exercise data, the values on the display will be replaced by "– –".
4. To return to the Basic Data Setting Mode, press Ⓑ twice.
5. To return to the Timekeeping Mode, press Ⓐ.

Precautions about clearing basic data

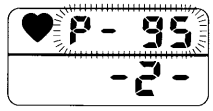
- Perform the following procedure only if the basic data setting are no longer needed.
- After you perform the following operation, you will have to input new basic data before you can use the watch for blood pressure measurements.

To clear your at-rest basic data



1. Use Ⓐ to enter the Basic Data Setting Mode.
2. Press Ⓑ. The message "–1–" appears in the lower display, which indicates input of at-rest basic data.
3. To make sure that any previously stored data is cleared, hold down Ⓑ until the message "CLEAr" appears in the lower display.
4. Press Ⓐ to return to the pulse rate setting display (step 2 above).
   - At this time previously stored data is cleared.
5. To return to the Basic Data Setting Mode, press Ⓑ three times.
6. To return to the Timekeeping Mode, press Ⓐ.

To clear your post-exercise basic data



1. Use Ⓐ to enter the Basic Data Setting Mode.
2. Hold down Ⓑ until the message "–2–" appears in the lower display, which indicates input of post-exercise basic data.
3. To make sure that any previously stored data is cleared, hold down Ⓑ until the message "CLEAr" appears in the lower display.
4. Press Ⓐ to return to the pulse rate setting display (step 2 above).
   - At this time previously stored data is cleared.
5. To return to the Basic Data Setting Mode, press Ⓑ three times.
6. To return to the Timekeeping Mode, press Ⓐ.

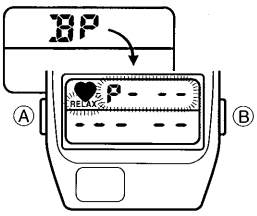
BLOOD PRESSURE MEASUREMENTS

In order to get a reasonably accurate idea of changes in your blood pressure from day to day, we recommend that you take measurements under the same conditions (same time, same environment, etc.) each day.

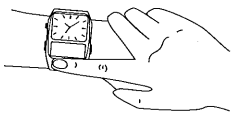
Important !

- Remember that you have to input basic data before you can use the watch for blood pressure measurements. Once you set your basic data, you can take blood pressure measurements using the procedures described below.
- You should use the same finger for blood pressure and pulse measurements that you used when setting your basic data. Otherwise, measured data may be wrong.
- If you attempt to take blood pressure measurements without setting basic data, the message "DEMO" appears for about two seconds following the "BP" indicator (step 2 below). This message indicates a simulated measurement intended to demonstrate how the watch measures blood pressure. Blood pressure values produced on the display during the simulated measurement *are not* true blood pressure values.
- This watch automatically stores measured values, along with the current time and date in memory. Be sure to set the time and date before taking measurements.

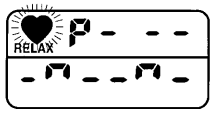
Measuring Blood Pressure and Pulse



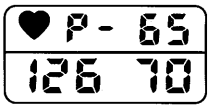
1. Strap the watch onto your left wrist.
2. Use Ⓐ to enter the Measurement Mode.
   - The mode indicator "BP" appears in the upper display. It is soon replaced by "P – – –".



3. As shown in the illustration, lightly place a finger of your right hand onto the photosensor and the electro-potential sensor. Note that the pad of your finger covers the photosensor glass.

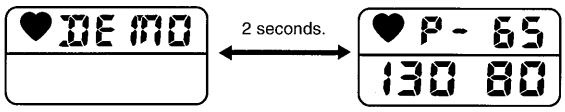


- After about 20 to 30 seconds, the display should change to show a "♥" symbol flashing and a cardiogram line scrolling across in the display. This indicates that your pulse and blood pressure are being measured.
  Important!
  Try not to move your right hand finger during this measurement.



4. When the measurement is complete, the watch shows your pulse, systolic blood pressure, and diastolic blood pressure on the display.
   - If you want to take another measurement, press Ⓑ and continue from step 3, above.

- If the message "Err" appears followed by a number from 1 to 10, consult with the error message meanings of this manual and then repeat the procedure (from step 1).
- If you have not yet set basic data, the display alternates between measurement data and the message "DEMO". This message indicates a simulated measurement intended to demonstrate how the watch measures blood pressure. Blood pressure values produced on the display during the simulated measurement are *not true* blood pressure values.



5. After you successfully take a measurement, press Ⓐ three times to return to the Timekeeping Mode and store the measurement data in memory.
   - For details on memory, "Using the Measurement Data Memory".
   - If you do not press any button for one or two minutes in the Measurement Mode, the display automatically returns to the Timekeeping Mode.

Note
Blood pressure measurements are based on the basic data that you preset. If a comparison of an arm-type blood pressure gauge (Sphygmomanometer) and current readings of the watch indicates a variance of 20 mmHg or more, the basic data should be updated. In any event, be sure to update this data at least monthly.

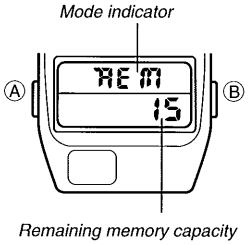
CASIO ASSUMES NO LIABILITY OR RESPONSIBILITY WHATSOEVER FOR ANY DAMAGES, INCLUDING BUT WITHOUT LIMITATION TO DAMAGES OR INJURIES RESULTING FROM MATHEMATICAL OR BLOOD PRESSURE MEASUREMENT INACCURACY OF THE WATCH OR THE LOSS OF STORED DATA.

Using the Measurement Data Memory

You can store up to 30 sets of measurement data in memory. Each set of data includes the pulse rate, systolic blood pressure and diastolic blood pressure, and the month, date, and the time that the measurement was taken. If memory is already full when you perform the measurement procedure, the oldest set of measurement data is deleted to make room for the new data. You can also recall and manually delete data (either an individual set of data or all data in memory) using the procedures described below.

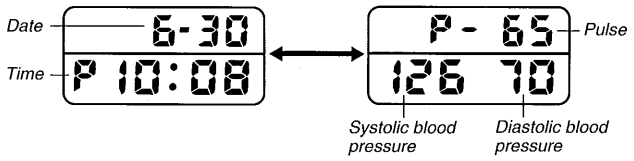
You can use copies of the Blood Pressure Record at the end of this manual to keep track of changes in your blood pressure and pulse measurements.

To recall data from memory



1. Use Ⓐ to enter the Recall Mode.
- At this time, the display shows the remaining memory capacity.
- If you do not press any button for one or two minutes in the Recall Mode, the display automatically returns to the Timekeeping Mode.

2. Press Ⓑ to display the newest data in memory.
- Note that not all of the measurement data can fit on a single display. Because of this, the display switches automatically every few seconds between time/date and pulse/blood pressure value, as shown in the illustration.



3. Use Ⓑ to scroll backward through the sets of data.
4. To return to the Timekeeping Mode, press Ⓐ twice.

To delete an individual set of measurement data from memory

1. Use Ⓐ to enter the Recall Mode. At this time, the display shows the remaining memory capacity.



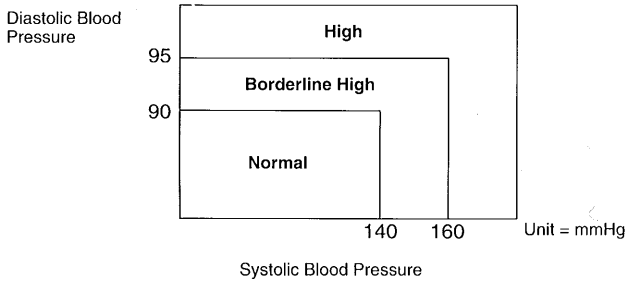
2. Use Ⓑ to display the set of measurement data you want to delete.
3. Hold down Ⓑ until the message "CLEAr" appears in the lower display.
4. Press Ⓐ to return to the Recall Mode. At this time, the data is cleared.
5. To return to the Timekeeping Mode, press Ⓐ twice.

To delete all measurement data from memory

1. Use Ⓐ to enter the Recall Mode. At this time, the display shows the remaining memory capacity.
2. Hold down Ⓑ until the message "CLEAr" appears in the lower display.
3. Press Ⓐ to return to the Recall Mode. At this time, the data is cleared.
4. To return to the Timekeeping Mode, press Ⓐ twice.

Things to know about blood pressure

- The term "blood pressure" means the pressure exerted by blood against the inner walls of the blood vessels with each contraction of the heart. Blood pressure is constantly changing, with relatively wide differences possible in morning, afternoon, and evening levels.
- Such factors as exercise, coffee, tea, smoking, and even the need to urinate can cause the blood pressure to rise.
- Blood pressure levels are also affected by stress caused by physical condition, mood, or anxiety.
- Generally, a blood pressure reading taken while sitting is lower than a reading taken while standing.
- Blood pressure levels are affected by temperature and humidity. Generally, a reading taken during the winter tends to be higher than a reading taken in the summer.
- Blood pressure levels may differ depending on where you are. When you visit the doctor, for example, you might feel a little nervous, so your blood pressure may read about 10 to 30 mmHg higher than when you are at home.
- Rises and falls in blood pressure are not indicated by difference between any two particular readings. It is best to take daily readings and keep track of long term trends.
- Generally, systolic blood pressure should be equal to one's age plus 90, but there are a lot of exceptions to this general rule. The following shows some guidelines about evaluating blood pressure measurements.

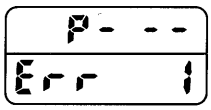


Source: World Health Organization Standards

DISPLAY MESSAGES

This part of the manual tells you the meanings of the display messages and what you should do when they appear.

Err Message

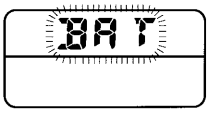


The "Err" message appears whenever there is a problem with your basic data. It is always followed by a number that indicates the error type. The following table shows the meaning of each of the "Err" messages.

No.	Cause	Action
1	No pulse wave detected.	Apply less pressure on the finger placed on the photosensor or warm up the finger before taking a measurement.
2	No electrical potential detected.	Place your finger on the electro-potential sensor correctly, and check to make sure the sensor is not dirty. If it is, clean it off. If your hands are wet, either wipe them dry or take care not to let your two hands come into contact with each other.
3	PWTT and pulse continuously outside allowable limits. Pulse wave height too high.	Do not move your finger on the sensors. Do not change the pressure of your finger on the photosensor.
4	Calculated blood pressure result outside of measurement range.	Check basic data. Correct it if necessary.
5	At-rest basic data for systolic pressure, diastolic pressure or pulse is missing.	Input data for all three basic data items.
6	At-rest systolic pressure basic data setting is less than the diastolic pressure basic data setting.	Re-input the systolic blood pressure basic data setting making sure it is greater than the diastolic blood pressure basic data setting.
7	Post-exercise basic data for systolic pressure, diastolic pressure or pulse is missing.	Input data for all three basic data items. If you do not want to input any post-exercise data, clear the existing post-exercise data so that the display shows "– –" for all data.
8	Post-exercise systolic pressure basic data setting is less than the diastolic pressure basic data setting.	Re-input the systolic blood pressure basic data setting making sure it is greater than the diastolic blood pressure basic data setting.
9	At-rest systolic pressure basic data setting is greater than the post-exercise systolic pressure basic data setting.	Re-input the basic data making sure that the post-exercise data is greater than the at-rest data.
10	At-rest PWTT basic data is less than post-exercise PWTT basic data.	PWTT basic data is set automatically by the watch when you input your other basic data items. If this error appears, re-input your basic data, making sure that you measure your at-rest pulse while you are fully relaxed, and that you measure your post-exercise pulse immediately after exercise.

- For more details on possible causes and required actions, see the section of this manual titled "Tips on Taking Measurements".

BAT Message

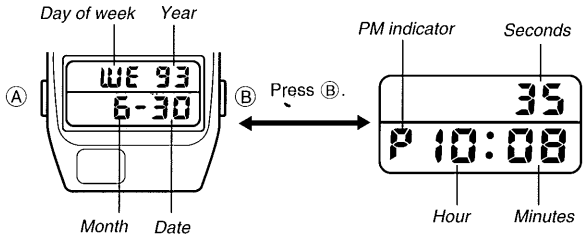


The "BAT" message appears whenever the battery becomes weak. Have the battery replaced as soon as possible after this message appears, and re-input your basic data. While the "BAT" message is shown on the display, you will not be able to take blood pressure measurements.

SETTING THE TIME AND DATE

This part of the manual tells you how to set the digital time/date and analog time. You can set the time and date in the Timekeeping Mode, which you can enter using Ⓐ.

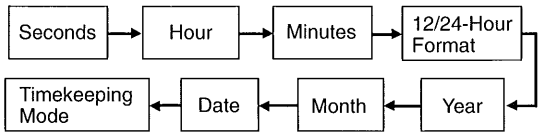
- While in the Timekeeping Mode, press Ⓑ to switch between Time and Date displays.



To set the digital time and date



1. Hold down Ⓑ while in the Timekeeping Mode until the seconds digits start to flash on the display. The seconds flash because they are *selected*.
2. Press Ⓑ to change the selection in the following sequence.

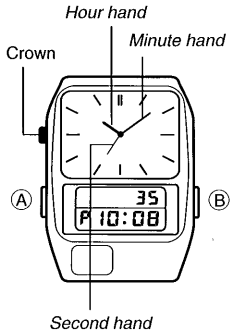


- Once you reach the Timekeeping Mode, you have to hold down Ⓑ again to display the flashing seconds.

3. While the seconds digits are selected (flashing), press Ⓐ to reset the seconds to "00". If you press Ⓐ while the seconds count is in the range of 30 to 59, the seconds are reset to "00" and 1 is added to the minutes. If the seconds count is in the range of 00 to 29, the minutes count is unchanged.
4. While any other digits (besides seconds) are selected (flashing), press Ⓐ to increase the number. Holding down Ⓐ changes the current selection at high speed.
   While the 12/24-hour setting is selected, press Ⓐ to switch between the two formats.
5. After you make your settings, press Ⓑ to select the Timekeeping Mode.

- The day of the week is automatically set in accordance with the date.
- The date can be set within the range of January 1, 1990 to December 31, 2029.
- If you do not operate any button for a few minutes while a selection is flashing, the flashing stops and the watch goes back to the Timekeeping Mode automatically.

To set the analog time



1. Pull the crown out to stop the second hand. If you plan to restart analog timekeeping on some time signal (from the radio or television), pull the crown out when the second hand is at the 12 o'clock position.
2. Set the hands by turning the crown.
3. Push the crown back in to restart timekeeping.

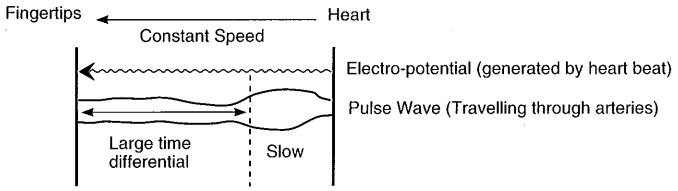
- Analog time is kept by a mechanical timepiece. Because of this, the second hand may be not start exactly when you push the crown back in.

HOW THE WATCH MEASURES BLOOD PRESSURE

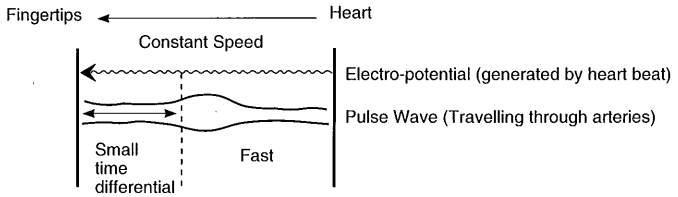
This part of the manual describes the internal workings of the watch in detail. It also contains information you might find helpful in taking measurements correctly.

Basic Operation

The watch calculates blood pressure based on medical research on the relationship between the propagation speed of pulse waves and blood pressure.
Each beat of your heart produces a change in the electro-potential of your body, which sends an electrical signal through your body. This electrical signal travels at a constant speed. The speed of the pulse waves produced by the beating of your heart is affected by a variety of factors, such as your physical condition.
The watch calculates the propagation speed of pulse waves based on the pulse wave transit time, or PWTT. The PWTT is the amount of time it takes for a pulse wave to reach a certain point of your body (such as your fingertips) following the heartbeat that produces that wave.

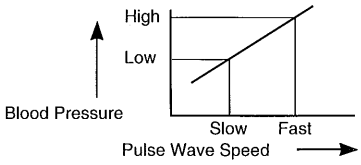


A high PWTT, as illustrated above, results from a slow pulse wave, which equates to low blood pressure.



A low PWTT, as illustrated above, results from a fast pulse wave, which equates to high blood pressure.

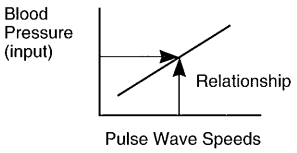
This graph illustrates the relationship between pulse wave speeds and blood pressure.



Basic Data

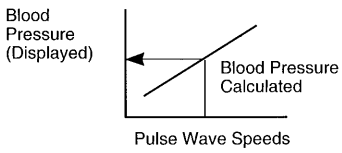
Though the graph at the end of the previous section illustrates a general relationship, the fact is that the actual relationship between pulse wave speeds and blood pressure differs from person-to-person. Because of this, you must input basic data so that the watch can adjust for individual differences in this relationship. This data tells the watch what your current physical condition is, what your current blood pressure is, and what kind of PWTT your body produces for a specified blood pressure reading.
The watch is able to determine your physical condition by itself, but it requires that you also input your current blood pressure as measured using an arm-type blood pressure gauge (sphygmomanometer).

Basic Data Setting



- Blood pressure is measured using an arm-type blood pressure gauge, and the PWTT is measured by the watch. The watch then uses these values to determine the interrelationship shown in the above graph.

Normal Measurements



- Once you set basic data, the watch calculates blood pressure values in accordance with the measured pulse wave speed (determined using the PWTT).

It is important to remember that correct blood pressure measurements are impossible unless you correctly set your basic data.

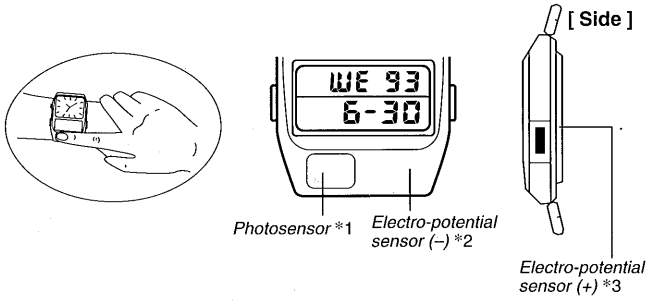
Tips on Inputting Basic Data

You should input your at-rest basic data while you are relaxed. It is not essential to have an arm-type blood pressure gauge on hand when you set the data. Simply use recent data that you have had measured using a blood pressure gauge. A good time to set your at-rest basic data is in the morning after you get up, before you eat breakfast.
Generally, blood pressure measurements are possible using at-rest basic data only. Some people, however, may naturally have physical make ups that fall outside the normal PWTT-blood pressure relationship. Such individuals will have better results by setting post-exercise basic data together with at-rest basic data.

About the Sensors

The watch is equipped with two types of sensors that provide the data required to calculate blood pressure as described below.

1. The electro-potential sensors detect the electro-potential differential (voltage) of the left and right hands, which is generated when the heart beats.
2. Detection of an electro-potential differential indicates occurrence of a heartbeat.
3. The photosensor detects when the pulse wave produced by the heartbeat reaches the tip of the finger of the right hand.
4. The lag between the heart beat and the arrival of the pulse wave is the pulse wave transit time.
5. The watch calculates the current blood pressure based on the calculated PWTT and the relationship defined by the basic data.



*1 This sensor detects when a pulse wave reaches your fingertip. This is used for measuring your pulse rate.
*2 This sensor is the negative (–) electrode used for detecting differences in the body's electro-potential.
*3 The entire back of the watch acts as a positive (+) electrode, which is used for detecting differences in the body's electro-potential.

Tips on Taking Measurements

Use the following techniques to ensure correct blood pressure measurements every time.

- When you are out of breath, your finger may move and cause problems with taking measurements. Wait for about five minutes before taking measurements.
- Once you start the measurement procedure, place your finger on the sensors as soon as possible.
- During measurements, keep still and do not talk.
- You should not be wearing a ring or any other object that restricts normal blood flow on the finger you place on the sensor.
- Avoid bright light when taking measurements.
- Do not take measurements near a TV or motor.

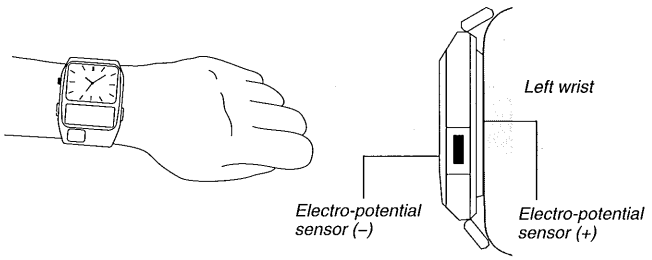
Important!
The following factors may make it difficult or even impossible to achieve good blood pressure readings with the watch.

- Severe arrhythmia
  Pulse waves are unstable, so they cannot be detected properly by the photosensor.
- Arteriosclerosis or other circulatory problems
  Circulation at the fingertips is bad, so the photosensor cannot detect pulse waves.
- Thick fingertip skin
  Thick skin impedes the passage of light through the fingertip. This makes it hard for the photosensor to take readings.
- Hairy arms
  Electrical potential cannot be accurately measured unless the back cover's electro-potential sensor (+) is in close contact with the skin. Try taking the measurement in a place where close skin contact can be maintained.

Tips on Placing Your Finger on the Sensors

The watch uses the data detected through its sensors to calculate blood pressure. If it cannot pick up data through the sensors, an "Err" message appears on the display. Note the following points if you experience problems with measurements.

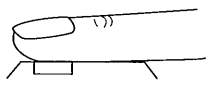
- Be sure to wear the watch on your left wrist.
  The back of the watch is designed to act as a sensor, and it must be in close contact with your left wrist.



- Finger Placement
  You can place any finger of your right hand on the sensors.
  ① Place your fingertip lightly onto the photosensor glass.
  ② Next, press down lightly to completely cover the electro-potential sensor (–).

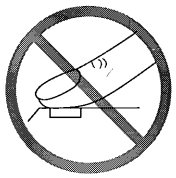


Correct

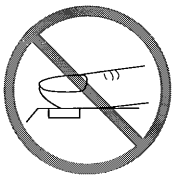


Place your finger on the sensors so that the pad of the finger (not the fingertip) is covering the photosensor. If your fingernail turns white, it means you are pressing too hard.

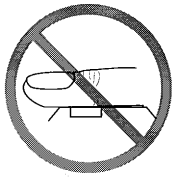
Incorrect



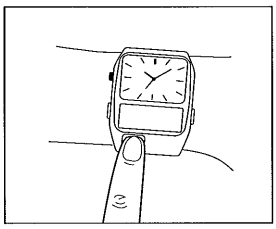
Finger too upright.



Finger not covering both sensors completely.



Finger too far forward on the sensors.



You can also place your finger on the photosensor as shown in the illustration. No matter how you place your finger on the sensor, you should use the same finger for blood pressure and pulse measurements that you used when setting your basic data. Otherwise, measured data may be wrong.