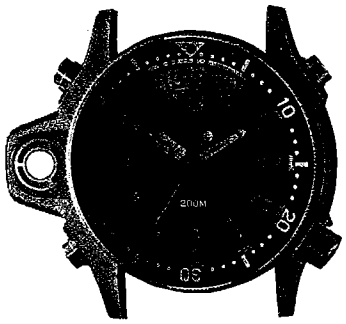
TECHNICAL INFORMATION

CITIZEN QUARTZ

Cal. No. C02※



Repair of this watch is restricted to the maker.

CITIZEN

- Magnetic resistance . . . . . More than 60 gauss (based upon ISO Standards)
- Water resistance . . . . . Resists water 200 m under the surface (based upon ISO Standards)

■3. HANDLING INSTRUCTIONS

Note on Use

- The water-depth meter was originally designed for use in sea water. Therefore, when it is used in a lake or in fresh water the displayed value is slightly different from that in sea water. (Specific gravity of sea water: 1.025)
- To ensure water-resistance at a depth of 200 m, be sure to replace the packing, including the push button packing, when replacing the power cells.
- This watch cannot be used as a substitute for an accompanying diver or as preventive measure against water hazards.
- Do not use the dive meter system in the following environments;

a. Where the altitude is more than 3,000 m. (10,000 ft.)
The system is not changed over to the dive meter system.

b. Where there is a substantial change in atmospheric pressure or temperature.
When there is a substantial change in atmospheric pressure or temperature after changing over to the dive meter system mode, depth display may show more than 1 m even while on the ground. In this case, the dive meter system mode will not change over to any other mode. To obtain proper operation of the watch, set the time display system and the dive meter system once again by pushing the Ⓡ , Ⓢ and Ⓜ buttons at the same time.

c. Where the temperature is beyond the +10°C (+50°F) to +40°C (+104°F) range.
When the watch is used in the above-mentioned environments, the depth meter mode may be over 1 m even while on the ground. In this case, bring the watch back into the effective temperature range.

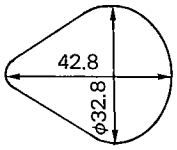
- If the depth meter mode returns to 0 m, display change is found in the maximum depth memory and the dive time memory.
Accordingly, if it is feared that the depth meter mode will return to 0 m, summon the maximum depth memory mode immediately before diving and then summon the depth meter mode.
- If the depth meter mode does not return to 0 m, a substantial temperature change is thought to have taken place. In this case, refer to the preceding item, b.

*These phenomena are not deemed as problems.
If the above handling instructions are observed, with user's environments in mind, correct measurement of depth is possible.

■1. OUTLINE

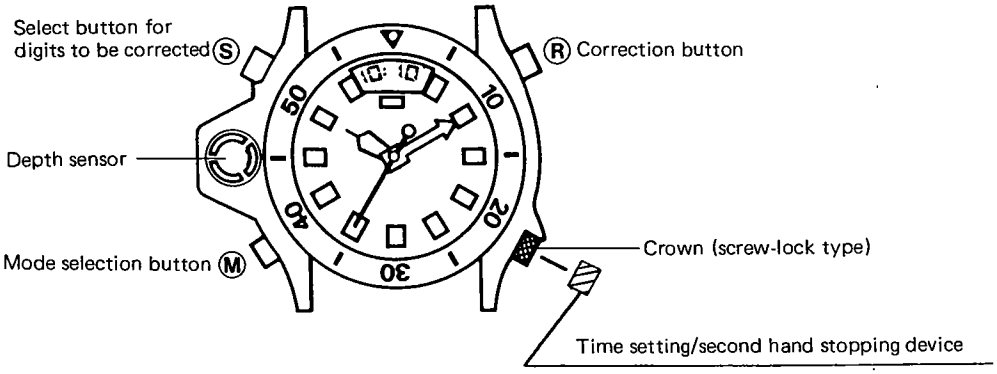
The Cal. C02* series is the world's first multifunctional diver's watch which has an electronic water-depth meter built into it. It can resist water at 20 atmospheric pressures.

■2. SPECIFICATIONS

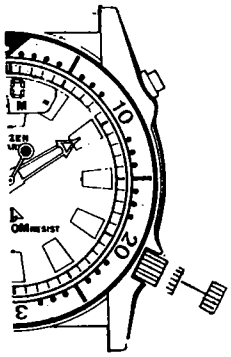
<table>
<tr><td colspan="4">Cal. No.</td><td>C020-01</td><td>C021-01</td><td>C026-01</td><td>C027-01</td></tr>
<tr><td colspan="4">Model</td><td colspan="4">Combination quartz watch</td></tr>
<tr><td colspan="4">Module size (mm)</td><td colspan="4"> 

Thickness: 5.2 (measured when the power cell section is included)</td></tr>
<tr><td colspan="4">Time accuracy</td><td colspan="4">±20 sec./month at normal temperature</td></tr>
<tr><td colspan="4">Water-depth display unit</td><td>meter</td><td>Ft.</td><td>meter</td><td>Ft.</td></tr>
<tr><td colspan="4">Depth meter accuracy (at a uniform temperature)</td><td>± (3% of displayed value +0.3 m)</td><td>± (3% of displayed value +1 ft.)</td><td>± (1.5% of displayed value +0.3 m)</td><td>± (1.5% of displayed value +1 ft.)</td></tr>
<tr><td colspan="4">Temperature range in which the water-depth meter is used</td><td colspan="4">+10°C (+50°F) ~ +40°C (+104°F)</td></tr>
<tr><td colspan="4">Display method</td><td colspan="4">Digital section . . . 3-split multiplex drive by FE nematic LC
Analog section . . . With a center second hand</td></tr>
<tr><td colspan="4">Integrated IC</td><td colspan="4">C/MOS-LSI (3 units)</td></tr>
<tr><td colspan="4">Effective temp. range</td><td colspan="4">±0°C ~ +55°C</td></tr>
<tr><td colspan="4">Adjustment of time rate</td><td colspan="4">By trimmer condenser</td></tr>
<tr><td colspan="4">Measurement of time rate</td><td colspan="4">2 seconds</td></tr>
<tr><td rowspan="10">Display functions</td><td colspan="3">Analog section</td><td colspan="4">Hour, minute, second</td></tr>
<tr><td rowspan="9">Digital section</td><td rowspan="4">Time display system</td><td>Normal time</td><td colspan="4">Hour, minute, second, P (displayed in the afternoon after the 12-hour display is used)/OFF</td></tr>
<tr><td>Calendar</td><td colspan="4">Month, date, day</td></tr>
<tr><td>Alarm</td><td colspan="4">Hour, minute, P (displayed in the afternoon when the 12-hour display is used)/OFF</td></tr>
<tr><td>Stopwatch</td><td colspan="4">Minute, second (displays up to 59 min. 59 sec.)</td></tr>
<tr><td rowspan="5">Dive display system</td><td>Maximum depth memory</td><td colspan="4">Displays from 0 m (0 ft.) up to 80 m (260 ft.). When depth is under 1 m (3 ft.), the displayed value is 0 m (0 ft.). Depth is displayed on a 0.1 m (1 ft.) basis.</td></tr>
<tr><td>Depth alarm</td><td colspan="4">Can be set at up to 80 m (258 ft.). Setting can be made on a 1 m (3 ft.) basis.</td></tr>
<tr><td>Dive time memory</td><td colspan="4">Minute, second (Displays up to 59 min. 59 sec.)</td></tr>
<tr><td>Dive time alarm</td><td colspan="4">Can be set at between 5 min. and 60 min. (Setting can be made at intervals of 5 min.)</td></tr>
<tr><td>Depth meter</td><td colspan="4">Display from 0 m (0 ft.) to 80 m (260 ft.). When depth is under 1 m (3 ft.), the displayed value is 0 m (0 ft.). Depth is displayed on a 1 m (3 ft.) basis.</td></tr>
<tr><td>Dive time reading</td><td colspan="4">Minute, second (displays up to 59 min. 59 sec.)</td></tr>
<tr><td colspan="4">Additional functions</td><td colspan="4">○ Hourly chime ○ Power cell life indicator ○ Alarm monitor
○ Fail safe operation system</td></tr>
<tr><td colspan="4" rowspan="2">Power cell</td><td colspan="2">No. of mounted power cells</td><td colspan="2">3 unites</td></tr>
<tr><td>Lifetime</td><td colspan="3">Approx. 2 years under the following conditions;
Alarm: 20 sec./day Hourly chime: 24 times/day
Depth alarm: 50 times/year (alarm sounds for 1 min., 10 sec. each time)
Dive time alarm: 50 times/year (alarm sounds for 40 sec. each time)
Either the depth meter or dive time reading:
50 times/year (on condition that each diving time is 1 hour and that the average diving depth is 15 m.)</td></tr>
</table>

1. Nomenclature and functions



2. Time setting of the analog section



The crown is fastened by the screw lock. To set the hands, unfasten the crown and turn it either clockwise or counterclockwise with it pulled out to the first clicking position.

Be sure to push the crown back straight.

Fully screw the crown clockwise until it does not turn any more.

Note on diving

Before dive

- Make sure that the colon(:) on the time display in the digital section does not flicker on and off.

  *Before diving, be sure to check when to replace the power cells.

- Make sure that the crown has been firmly screwed in place.
- Make sure that cuts, cracks or scratches are not found on the glass, and also make sure that the wrist band has been firmly mounted.
- To get more accuracy in depth measurement, check the cell on the dive meter system after dipping the watch in water for 2 minutes. If there is a big temperature difference between wearing on the ground and in the water. Be sure to change over to the dive meter system on the water surface. (If doing the changover in the water, accuracy may be affected.)
- When the depth meter mode is shown, make sure that the display is correct.

During dive

- Do not operate the crown in the water.
- Be careful not to bump the watch against rock.
- When the time display system is operating, the alarm for the dive meter system does not sound. Conversely, when the dive meter system is operating, the alarm for the time display system does not sound. This is designed to prevent misunderstandings.
- In the water, a clear alarm sound may not be heard due to the conditions and environments in which the watch is used. When using the alarm, pay attention to, for example, the hood, wet suit and the arm's position.

After dive

- Rinse the sea water off and then wash off mud and sand in fresh water.
- Thoroughly wipe the watch after washing.
- Do not touch the watch with a needle or the like even if foreign matter enters the sensor section. The foreign matter should also be washed off in fresh water.
  Pay special attention that the pressure sensor section is kept away from alcohol, gasoline, thinner and other chamicals.

Notes on safety

- When this watch's additional safety function (fail safe operation system) begins working, immediately stop using the watch and have it checked at your nearest Citizen Service Center.

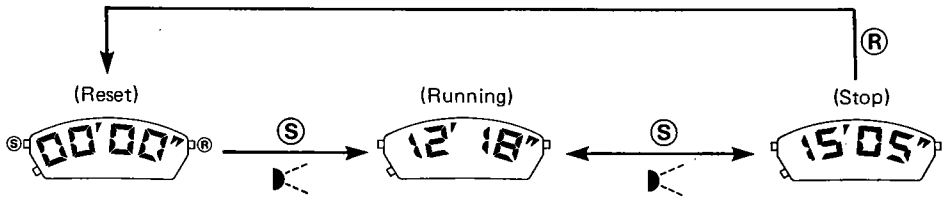
  When the dive meter system functions do not operate properly, or when the colon (:) in the digital section flickers on and off (when the power cell life indicator is in operation), the change-over from the time display system to the dive meter system cannot be made. This is because the watch's function to fail safe operation is at work.

  *If you find anything abnormal with the watch operation, other than the above-described, immediately stop using the watch and have it checked.

- If the watch is to be used during a dive, get safety training beforehand.The watch cannot be used as a substitute for an accompanying diver or as a preventive measure against water hazards.
- The watch displays the water depth up to 80 m (260 ft.)
  When the depth is beyond 80 m (260 ft.), it does not display any value.
- For safety reasons, we recommend diving sports at the depth of 30 m (100 ft.) to 40 m (133 ft.).

- The 12/24 hour switching function is interlocked with the time display system.
- If the Ⓡ button is pushed while the <Alarm set> is on display, the alarm will turn OFF, thus <Alarm OFF> and <Alarm set> will be displayed.
- "P" mark appears only for PM in the 12-hour display.
  No mark has been provided to indicate AM (forenoon).
- When the dive meter system is in use, the buzzer does not sound even though the current time reaches the alarm set time.

3) Stopwatch use method

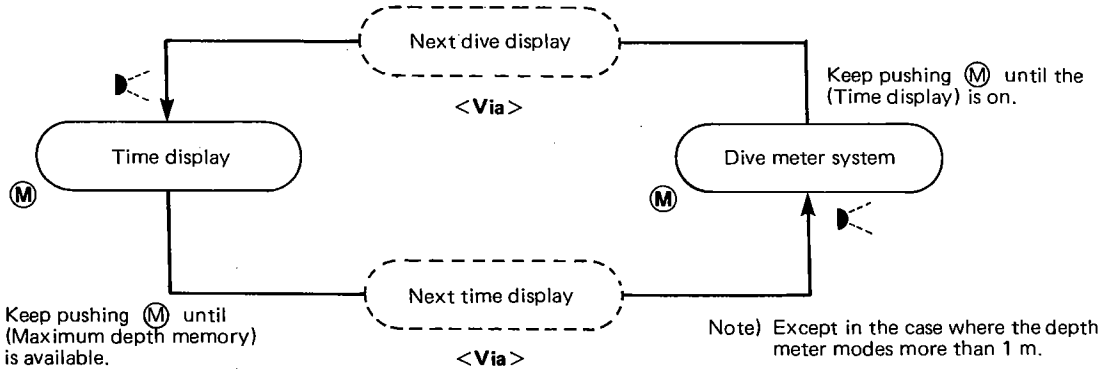


*The Stopwatch mode goes up to 59 min. 59 sec. at intervals of 1 sec. and then returns to 00 min. 00 sec. and repeats the time counting.

*If the Ⓢ button is repeatedly pushed during time counting, the stopwatch works as an integrating meter, going back and forth between "Running" and "Stop" over and over again.

*A confirmation sound is heard if the Ⓢ button is pushed when the stopwatch starts or stops running.

4) Changeover between the time display system and the dive meter system



- When changing over between the time display system and the dive meter system, keep pushing the Ⓜ button until a confirmation sound is heard in any mode (except the correction mode).
  (Example)
  Time display system — Dive meter system
  <Time display> → <Calendar display> → <Maximum depth memory>
  Dive meter system — Time display system
  <Maximum depth memory> → <Depth alarm> → <Time display>
- If the dive meter system does not operate properly, the time display will not be replaced by the dive meter system. (Fail safe operation system)

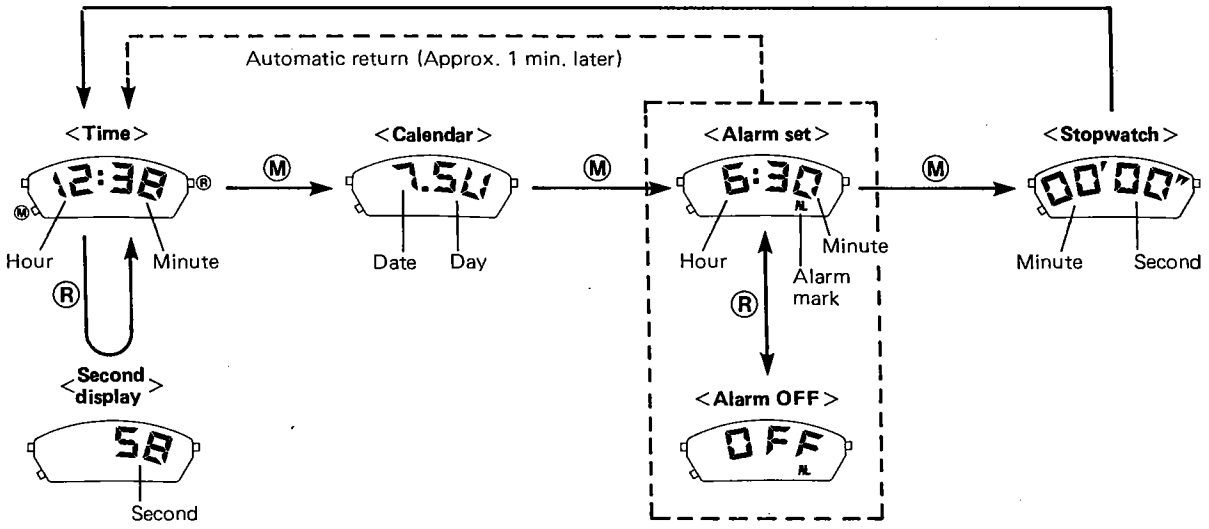
  At this time, the DM mark on the display flickers on and off.
  In this case, have it checked or adjusted at your nearest Citizen Service Center.
- When the power cell life indicator is in operation, the dive meter system cannot be summonded. (Fail safe operation system)

3. Handling of the digital section

- The circled portions flash.
- A confirmation sound is heard when operating the button marked with ⋉
- *The digital section contains the time display system and the dive meter system.

•Time display system

1) Changing over to the time display system



(How to read seconds)

Seconds are displayed only while the Ⓡ button is pressed in the time display mode.

Whether the alarm is ON or OFF, if the alarm display is left as it is for about 1 minute, the time display will automatically return and replace the alarm display. (Automatic return)

2) Time, calendar and alarm setting methods

(How to set seconds)

To summon the seconds correction display, push the Ⓢ button until the second display flickers on and off while the time display is on.

If the Ⓡ button is pushed simultaneously with the hourly chime, the second display will show 00 sec.

If the Ⓡ button is pushed when the second display is between 30 and 59, the minute display will increase by 1 min.

(How to set time, calendar and alarm)

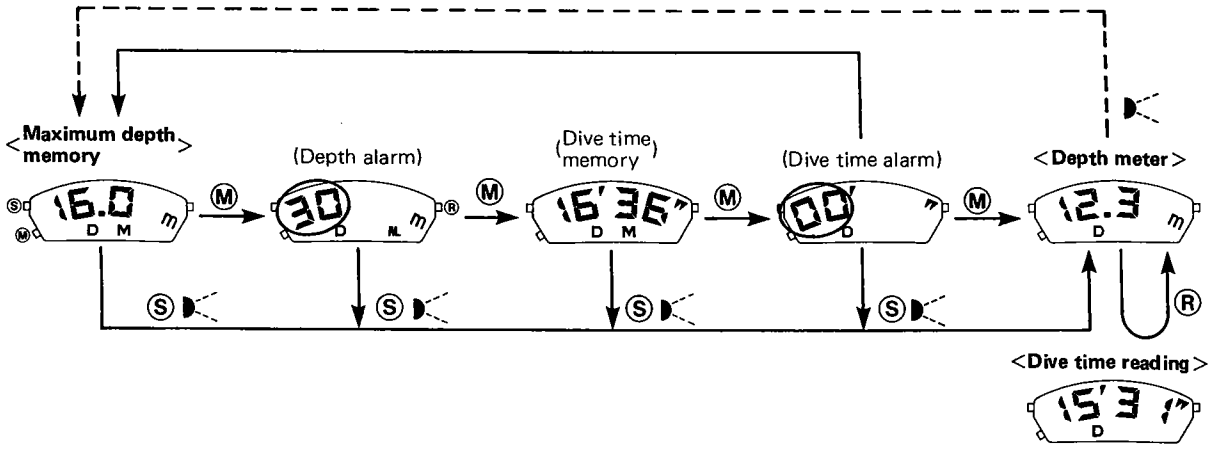
1 To set the time, calendar and alarm, push the Ⓢ button in each respective display mode until the correction mode is obtained.

2 Any mode can be independently corrected. Select the mode which you want to correct by pushing the Ⓢ button. The mode under correction will flicker on and off.
Then set the mode with the Ⓡ button.

Each push of the Ⓡ button advances the figures one by one, a continuous push of the Ⓡ button makes rapid advancement.

3 After the setting is finished the mode returns to the previous state in which it had been set by bushing the Ⓜ button. (Instant manual return)
Any mode left as it is for 4 to 5 minutes will automatically return to the previous state in which it had been set. (Automatic return).

5) Changing over to the dive meter system



- The depth meter is diaplayed by pushing the Ⓢ button in any mode of the four numbered 1 to 4.
- To change the mode from the depth meter to the maximum depth memory, push the Ⓢ button when the display depth value is 0 m (0 ft.)
- If the depth value of 0 m (0 ft.) remains displayed for 30 to 40 minutes, the Maximum depth memory will automatically return to the mode. (Automatic return)
- The depth meter mode is replaced by the dive time mode when the Ⓡ button is pushed.

① Maximum depth memory

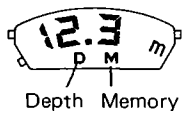
(What is maximum depth memory?)

- It is the maximum dive depth which is automatically memorized.
- The maximum dive depth is shown by changing over to the maximum depth memory mode after finishing the dive.
- The maximum depth memory mode is replaced by the depth meter mode.
  When more than 1 m (3 ft.) of depth is measured, the maximum depth memory mode is reset and thus the new value of the maximum depth is memorized.
  *When the depth value is under 1 m (3 ft.), the previous maximum depth memory is not reset.
- When more than 5 m (17 ft.) of depth value is measured in a second, the value is deemed as abnormal and is not memorized.

(How to read the display)

- The maximum displayed value of the maximum depth memory is 80 m (260 ft.)
- The maximum depth memory is displayed as follows;

<Display in meters>



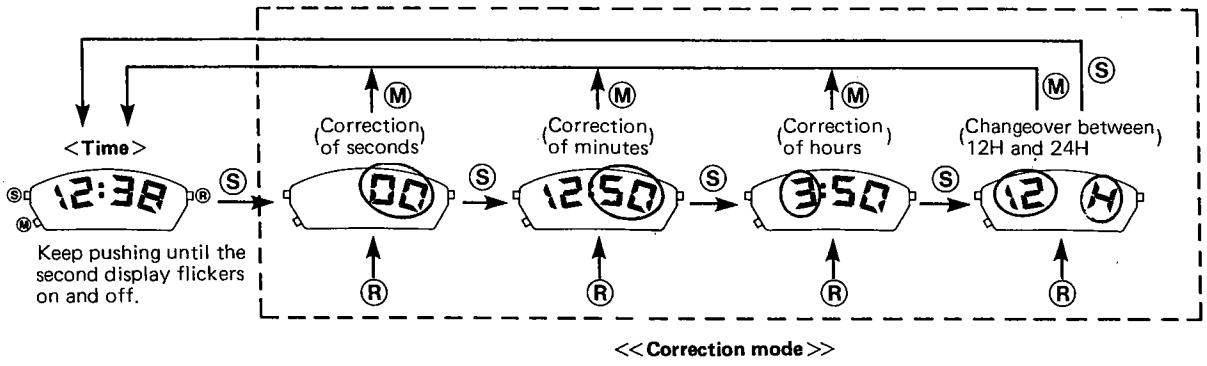
- Display 0, 1.0, 1.1, 1.2, ... 80.0, —, –,
- DM mark → Depth Memory

<Display in feet>

Display 0, 3, 4, 5, ... 260, ———,

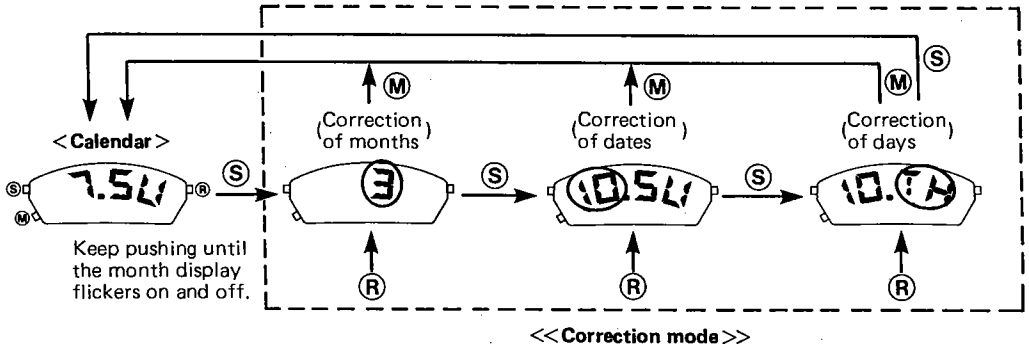
*When the depth value is under 1.0 m (3 ft.), the displayed figure is 0. The depth value is shown on a 0.1 m (1 ft.) basis when it is over 1.0 m (3 ft.).
When the depth value is over 80 m (260 ft.) it is displayed as —, – (———)

(How to set the time)



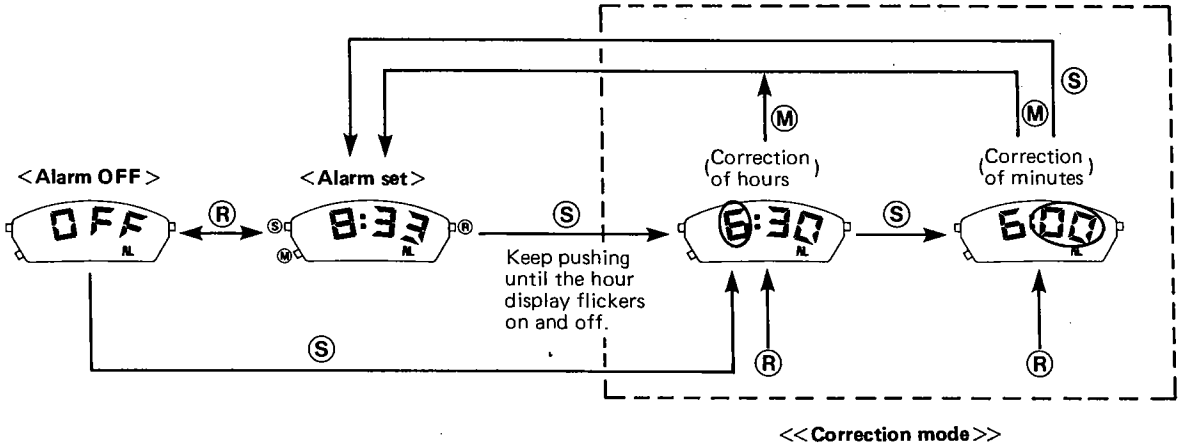
- In the AM/PM 12-hour display, when setting hours, confirm that the letter P is showing afternoon only when the current time is in the afternoon.
  No mark has been provided to indicate the AM.

(How to set the calendar)



- If a non-existing date (for instance, February the 30th) has been set, it will automatically change to the first day of the following month after changing over to the calendar mode. – (for instance, March the 1st)
- The calendar is automatically corrected (however, February ends on the 28th).
  To display February the 29th, set the calendar by operating the button.

(How to set the alarm)

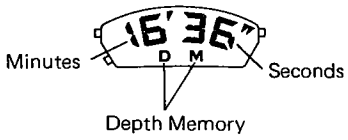


③ Dive time memory

(What is the dive time memory?)

- It is time needed for diving at a depth of more than 1 m (3 ft.), which is automatically memorized. As long as the depth meter mode is not canceled, the dive time is automatically added and memorized.
- The dive time is displayed by changing over to the dive time memory mode after finishing the dive.
- The dive time memory mode is replaced by the depth meter mode.
  When more than 1 m (3 ft.) in depth is measured, the dive time memory mode is reset, and the new value of the diving time is memorized.
  However, when the measured depth is under 1 m (3 ft.), it is not reset.

(How to read the display)



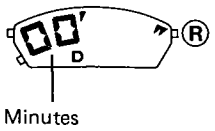
Dive time up to 59 min. 59 sec. is memorized at intervals of 1 second. After memorizing 59 min. 59 sec. the display begins again with 00 min. 00 sec.

④ Dive time alarm

(What is the dive time alarm?)

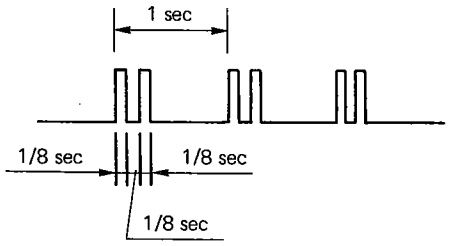
If a certain period of time was previously set for diving, a buzzer sounds for 30 to 40 seconds when the diver stays in the water beyond that period of time.
To stop the buzzer, push either the Ⓢ , Ⓡ or Ⓜ buttons.
However, diving time at a depth of 1 m (3 ft.) or less cannot be measured.

(Setting the dive time alarm)



- With each push of the Ⓡ button the time advances 5 minutes. Quick forwarding is obtained with a continuous push of the Ⓡ button.
- The dive time alarm can be set at to 60 min. at intervals of 5 min.

(Alarm sound)



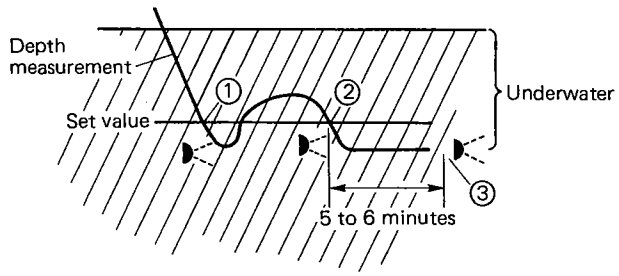
Every second on the second, the alarm sounds for 1/8 sec. Moreover, it repeatedly sounds for 1/8 sec. at intervals of 1/8 sec.

Thus systems runs for 30 to 40 seconds.

② Depth alarm

(What is depth alarm?)

(Example)



When the diving depth exceeds the previously set value, a buzzer sounds from 1 min. to 1 min. 10 sec. The buzzer stops sounding when the diver goes up toward the water surface beyond the set value.

When the diver goes deeper the set value, the buzzer starts sounding again. (2)

In addition, if the diver stays at a depth below the set value for 5 to 6 minutes, the buzzer starts sounding. (3)

(How to set)

- Set the alarm when <Depth alarm> is displayed. Each push of the Ⓡ button increases the figure by one. Quick forwarding of the figure is possible by continuously pushing the same button.
- Alarm depth can be set at intervals of 1 m (3 ft.). If the alarm depth is set at 80 m (258 ft.), the depth alarm mode will return to — (———).
- When the depth alarm mode is — (———), the buzzer does not sound.
- To stop the buzzer, push either the Ⓢ, Ⓡ or Ⓜ buttons.
- Display method

<Display in meter>

Display

— — → 1 → 2 → 3 → ---------- → 79 → 80

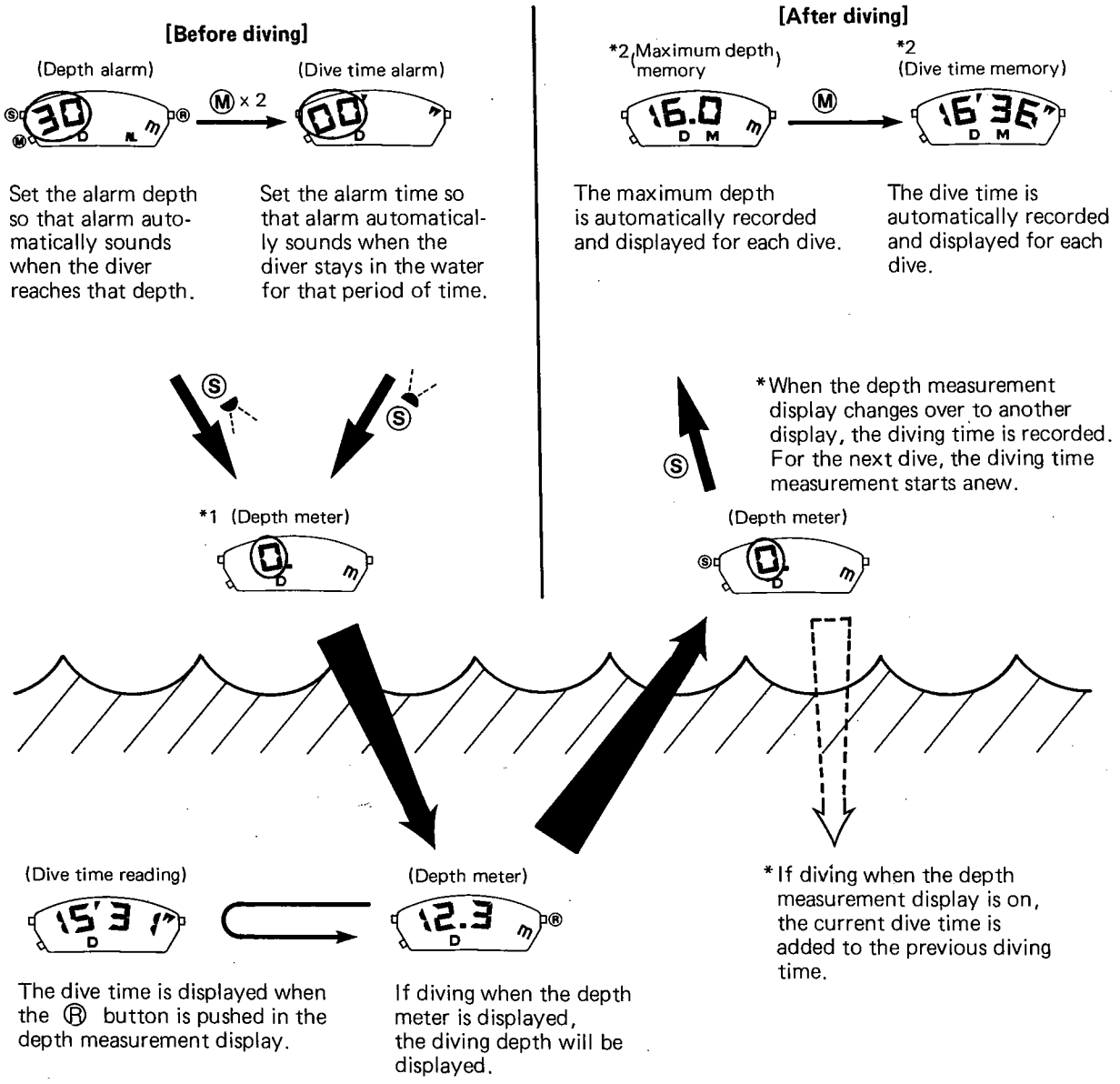
<Display in feet>

Display

— — — → 3 → 6 → 9 → ---------- → 255 → 258

■4. EXPLANATION OF THE DIVE METER SYSTEM

Concerning the dive meter system



*1. The dive meter system automatically begins measurement when the diver reaches a depth of 1 m with the depth meter continously displayed, and it automatically stops measurement when the diver goes up beyond the 1 m depth.

*2. When the diver reaches a depth of 1 m, the previous records of the maximum depth and the dive time are reset and the new measurement begins.

⑤ Depth meter

(What is the depth meter?)

- It is a function of measuring the diving depth.
- When measuring a depth of more than 1 m (3 ft.), the depth meter mode is not replaced by any other mode even when the Ⓢ button is pushed. (Fail safe operation system)

(How to read the display)

<Display in meters>

<Display in feet>

- The maximum display value of the depth meter is 80 m (260 ft.)
- Depth is displayed as follows;

<Display in meters> 0 → 1.0 → 1.1 → 1.2 . . → 80.0 → ––, –

<Display in feet> 0 → 3 → 4 → 5 . . → 260 → –––

When the depth is 1.0 m (3 ft.) or less, the displayed figure is 0.
The depth is displayed at intervals of 0.1 m (1 ft.) when it exceeds 1.0 m (3 ft.).
When the depth exceeds 80 m (260 ft.), it is shown as ––, – (–––).

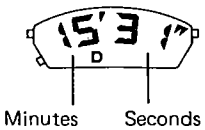
- When the figure (0) is displayed, it flashes.
- If the figure (0) remains displayed for 30 to 40 minutes, the display will automatically return to the maximum depth memory mode. (Automatic return)

⑥ Dive time reading

(What is dive time reading?)

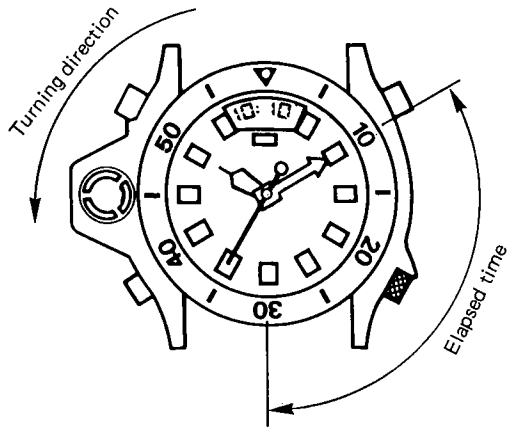
- It is a function of measuring the dive time at a depth of more than 1 m (3 ft.).
- This measurement automatically starts at a depth of more than 1 m and automatically stops at a depth of less than 1 m.

(How to read the display)



- When the depth meter mode is 0 m (0 ft.), the dive time reading is not carried out.
- Up to 59 min. 59 sec. of dive times is measured at intervals of 1 second.
  After measuring 59 min. 59 sec., the measurement starts again from 00 min. 00 sec.

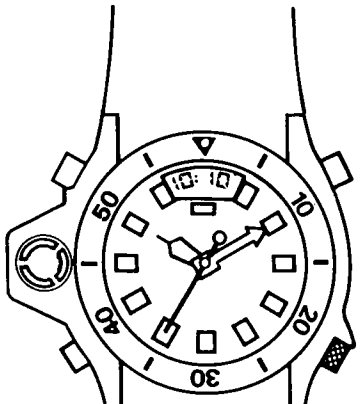
■7. USE OF THE REGISTER RING



The register ring can be turned only in the counterclockwise direction. An anti-reverse mechanism with a click sound is provided in order to protect the above mechanism, do not use excessive force in turning in the clockwise direction. Set the triangle mark (▲) to the position of the Minute Hand at the dive start time to read the elapsed time. The ring can be turned in units of every 0.5 minute.

12 Section
12
Graphic #1

■8. HOW TO READ THE NON DECOMPRESSION LIMIT VALUES



N.D.LIMITS — NO. DECOMPRESSION LIMITS (No decompression limits)

DEPTH m	N.D. TIME		
12	200	30	25
15	100	33	20
18	60	36	15
21	50	39	10
24	40	42	10
27	30	45	5

DEPTH m.N.D. TIME (Depth meter) (No decompression time)

Dependin[illegible] ıe diver may surfa[illegible]
On tl[illegible] ıe limit for dives ı[illegible]

13 Section
13, Graphic 1

(Examp[illegible] ..ɔ as follows;
21 m 50 ..ive time does not exceed 50 minutes at a depth of 21 m, the diver can surface without decompressing.

12 m – 200 min.	30 m – 25 min.
15 m – 100 min.	33 m – 20 min.
18 m – 60 min.	36 m – 15 min.
21 m – 50 min.	39 m – 10 min.
24 m – 40 min.	42 m – 10 min.
27 m – 30 min.	45 m – 5 min.

(Based on U.S. Navy Standards)

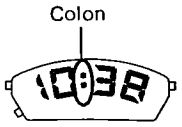
■5. HOURLY CHIME/ALARM MONITOR

To turn the hourly chime ON or OFF, push the Ⓢ and Ⓡ buttons at the same time in the time mode.
When the hourly chime is turned ON, the buzzer continues to sound while the two buttons are pushed.
When the hourly chime is turned OFF, the buzzer sounds for the fixed previous time.

– Alarm monitor

■6. POWER CELL LIFE INDICATOR

The colon in the digital section flickers on and off when the power cell life nears an end.
Depending on use, the analog section may stop operation before the power cell life indicator starts operation.



(2) IC (II)

IC (II) consists of an amplifier circuit and an AD converter.

a. Amplifier circuit

Output voltage of the pressure sensor is as low as a few mV. Therefore, the amplifier circuit is used to amplify the voltage by about 50-fold.

b. AD converter (which converts amplified output voltage, namely analog value, into digital value)

As soon as measurement is started, the AD converter compares the amplified output voltage with the integrating circuit in which output voltage increases linearly with the time.

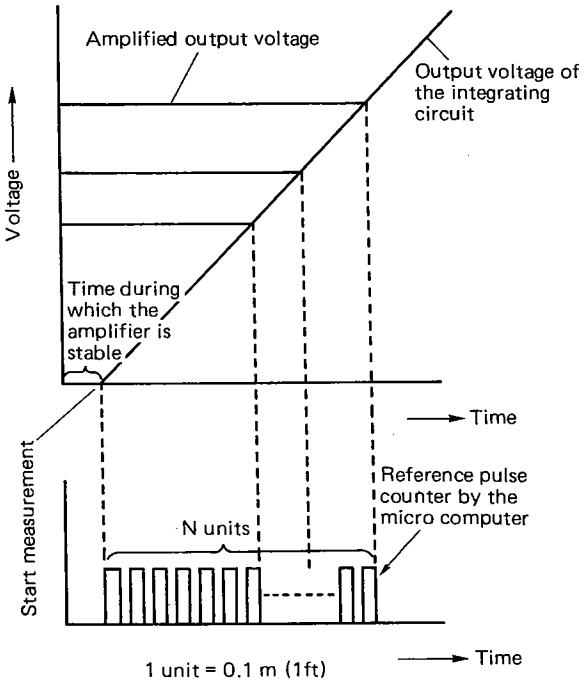
When the output voltage of the integrating circuit exceeds the amplified voltage, the AD converter outputs a signal to finish the measurement.

(3) Depth display through the use of a micro computer (IC (I))

As was previously mentioned, the output voltage of the integrating circuit increases linearly simultaneously with the start of the measurement. In addition, when measurement is started, the micro computer counts reference pulses on the counter of the AD converter. The number of reference pulses counted on the counter indicates the point at which the output voltage of the integrating circuits and the amplified output voltage intersect.

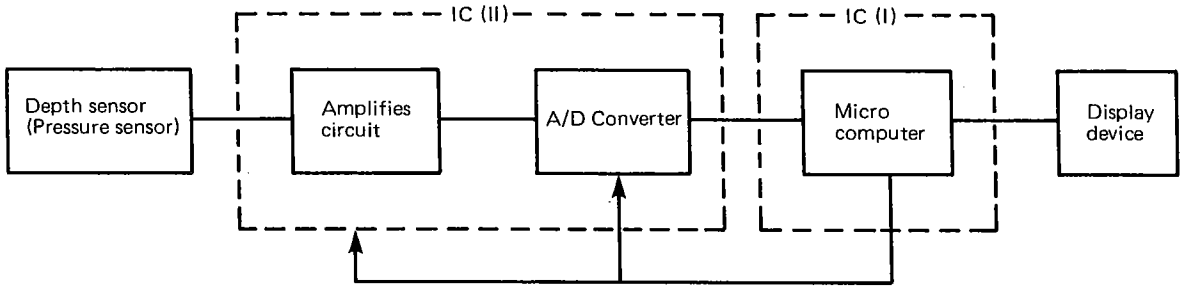
It is understood that the amplified output voltage is proportional to the number on the counter if the output voltage of the integrating circuit increases at a uniform rate.

In other words, output voltage, namely analog, value, is converted into the number on the counter, namely digital value, which is then operated by the micro computer (IC (I)) and displayed on the LC display panel as water-depth.



■9. CONCERNING THE DEPTH METER'S WORKING

1. Circuit configuration

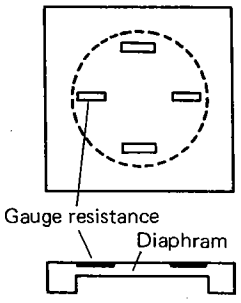


2. Configuration and working of each block

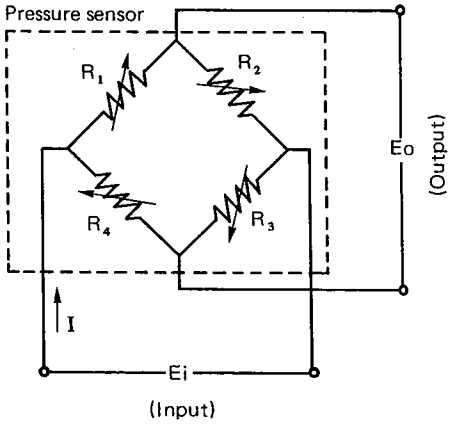
(1) Pressure sensor

The semiconductor pressure sensor, which is used as the depth sensor for the depth gauge, utilizes a piezo-electric effect that electric resistance is changed by the stress of external force pressing the semiconductor.

1. If pressure is applied to the diaphram, stress is created on it.
2. The value of the gauge resistance is changed by the stress on the diaphram.
3. If constant voltage or constant current is applied to the input side of the bridge circuit, the resistance value will lose its balance, and output change will be found in voltage or current at the output side of the bridge circuit.
   The workings of the pressure sensor are concretely explain below.



When pressure is applied to the bridge circuit, which consists of R_1, R_2, R_3 and R_4 as shown in the diagram to the right, gauge resistance, R_1, R_2, R_3 and R_4 change their values by ΔR_1, ΔR_2, ΔR_3 and ΔR_4 respectively in proportion to the pressure.
Output voltage (Eo) is illustrated in the following equation;



$$Eo = \frac{R_1, R_3 - R_2, R_4}{R_1 + R_2 + R_3 + R_4} I$$

$$Eo = \Delta R. I$$

As a result, the following can be stated;

*Output voltage Eo is proportional to the pressure because resistance changes its value by ΔR proportionately with the pressure.

Q: What functions does this watch have to ensure safety for divers?

A: We have provided the following functions in the watch.

- When the dive meter system does not operate properly, or when the power cell life indicator is in operation, the dive meter system cannot be summoned .
  (Fail safe operation system.)
- When measureing a depth of more than 1 m (3 ft.), other displays cannot be summoned.
  (Fail safe operation system.)
- In addition to these, the watch is provided with a mechanism to prevent the reverse turn of the register ring.

Q: When sand or dust enters the sensor, is the depth meter affected by it?

A: No, it isn't.
All you have to do is wash off the sand or dust in clean water after diving.

Q: How is sand or dust removed from the sensor?

A: Wash it off in clean water.
Do not use chemicals and do not touch the watch with a pointed instrument.
If sand or dust remain even after washing, ask your nearest Citizen Service Center to remove it.

Q: Does the depth meter need periodic inspections?

A: It does not necessarily need it. But, to maintain the water-resistance of this watch, it is advisable for you to replace the packings when the power cells are replaced. It is especially necessary to replace the packing of the push button.

Q: Does the accuracy of the depth meter drop as time goes by?

A: The accuracy does not drop so much as to cause you anxiety.

Q: When comparing the accuracy of this depth meter with that of general ones, is there any difference between the two?

A: The measurement system of this depth meter is different from that of general ones. Therefore, we cannot simply compare the two.
In a general depth meter, accuracy is not usually guaranteed. But, we guarantee the accuracy of our depth meter. Accordingly, it might be safe to say that the accuracy of our depth meter is much higher than that of general ones.

Q: Do the power cells run down when the depth meter is in operation?

A: In a general depth meter, accuracy is not usually guaranteed. But, we guarantee the accuracy of our depth meter. Accordingly, it might be safe to say that the accuracy of our depth meter is much higher than that of general ones.

Q: Is the depth meter influenced by temperature change?

A: It is influenced by an extremely large temperature change (more than 20°C). If there is such a large change between wearing it on the ground and in the water, dip the watch in the water for about 2 minutes before using the depth meter.

Q: Is the depth display influenced by diving or swimming?

A: It is hardly influenced by either.

■10. QUESTIONS & ANSWERS ABOUT CAL. C02*

Q: Has a watch with a built-in depth meter ever been marketed before?

A: So far, the world's market has not seen an electronic wristwatch with a depth meter. Therefore, Cal. C02* is the world's first of this type to go on the market.

Q: Did Citizen develop the depth sensor by themselves or was it developed in cooperation with another firm?

A: In hopes of mounting a depth sensor on a wrist watch, we, at Citizen, devoted our technology to the development of a compact depth sensor with low current just consumption. As a result, we have succeeded in realizing just such a depth sensor.

Q: To what extent is this watch water resistant?

A: It's intended for divers and therefore is resistant 200 m under the waters surface. It has undergone a water-resistance test under 25 atmospheric pressures.
200 m (equipment to 20 atmospheric pressures) x 1.25 = 25 atmospheric pressures.
So, we believe that you will be satisfied with the water-resistance of this watch.

Q: Can the diver hear the alarm in the water?

A: Yes, he can hear it in the water just as on the ground. There are times, however, when it is difficult to hear it due to the hood/wet suit he wears, bubble noise from exhaust air, and the position of his arm.

Q: Can the diver see the digital display in the water?

A: If he uses a water glass, the display is 1.3 times larger than on the ground and therefore easy to see.

Q: Can this watch be used for mountain-climbing?

A: No, it can't. The mountain-climbing watch incorporates different devices from those built in this watch. They are, for example, an air gauge and altimeter.

- Depth gauge, Pressure display . . . Relative pressure.
- Air gauge, altimeter, Decompression display . . . Absolute pressure.

Q: Is the depth display in seawater different from that in fresh water (lake, etc.)?

A: Yes, Seawater has a special gravity of 1.025 against fresh water. The depth meter for this watch is designed to measure depth in seawater.

Therefore, when using it in fresh water, the actual depth can be obtained from the following formula;

Depth display x 1.025

Q: When is the depth measured and displayed?

A: The depth meter measures and displays every second.

Q: This depth meter is quite small compared with general ones. What made it possible to produce such a small device?

A: Through our latest electronics technology and our experience in developing the depth sensor, we, at Citizen, were the first in the world able to amount a depth meter on a wrist watch.

Q: What is the black spraying method used to treat the case surface?

A: Various materials can be used for black spraying. For this watch case, composite materials of alumina (Al 203) and titanium oxide (Ti02) are employed.
Heat the composite materials using mixed gases of acetylene and oxygen, and they will half melt. Then, collide them against the case. Thus, the black spraying is carried out.
Black spraying has the following merits;

- Excellent hardness (HV 800 — 1000) and wear-resistance.
- Difficult to crack and scratch or cut.
- Coatings provided over the case by the black spraying area 30 — 50μ in thickness.
  Black spraying is widely used. Its applications include the NASA Space Shuttle, jet engines and nuclear reactors.

Q: Do you provide after-sale service for this watch?

A: Yes, of course. Like any other watch, the user of this watch can receive after-sale service.
For repairs of the depth meter, ask a Citizen service base/Authorized agency.
----- Refer to "For Repairing this Watch"

Q: What are the terms of the guarantee?

A: This watch is guaranteed for one year.

Q: A convex is found at the 9-hour mark. Doesn't this cause problems?

A: No, it doesn't.

For Repairing This Watch

The repair of this watch shall be performed by the maker.
This is because special techniques and equipment are necessary for final adjustment and confirmation after the repair work is completed.
Therefore, if the power cells have to be replaced or if any malfunction should occur which requires repairs and adjustments of the watch, inquire at a Citizen service center.
*When replacing the power cells, all the three power cells must be replaced simultaneously.

Q: Is the watch shock resistant?

A: The watch passed the strict shock-resistance test (1 m) prescribed in the ISO Standards. Therefore, it may be safe to say that this watch is superior to other watches for general use in shock-resistance.

Q: Won't the diver mishear the alarm for the time display system for the depth alarm when depth is being measured?

A: When the dive meter system is shown, the time display alarm system does not sound even if the watch tells the alarm set time.

Q: Three power cells are mounted in this watch. What are they used for?

A: For the digital display and the depth meter, two power cells are used.

(2 x 1.5V = 3V)

To generate the analog section and the alram, a single power cell is used.

(1 x 1.5V = 1.5V)

Replace these three power cells all same time.

Q: Can the diver push the buttons in the water?

A: Yes, he can. But, manual handling of the buttons in the water is only necessary when the diving time is measured.
In other cases, the buttons are automatically operated. Therefore, the diver does not have to handle the buttons in the water.

Q: How accurate is the depth meter?

A: In Cal. C020 (C021), accuracy is within ±(3% of the displayed value +0.3 m (1 ft.)) at a uniform temperature.
In Cal. C026 (C027), accuracy is within ±(1.5% of the displayed value +0.3 m (1 ft.)) at a uniform temperature.
Accuracy is influenced by large temperature changes.
In Cal. C020 (C021), accuracy is within ±1 m (4 ft.) at a temperature gap of 30°C.
In Cal. C026 (C027), accuracy is within ±0.5 m (2 ft.) at a temperature gap of 30°C.

Q: Please explain the constitution of the depth sensor. What is it made of?

A: The depth sensor is manufactured as follows. First, we coat the upper surface of the depth sensor chip (silicon chip) with resin, and then wrap it with ceramic. Constant voltage (or constant current) is applied to the depth sensor. If pressure is applied to the depth sensor, the resistance value of the depth sensor chip will change, and thus output change in voltage (or in current) is observed at the output side of the depth sensor.
The above-mentioned output change is shown as water depth through the use of two ICs.

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