

**Technical Description: Casio G-Shock DW-5000C**

Abigail L. Ureña

Department of English, The City College of New York

ENGL 21007: Writing for Engineering

The City College of New York

Ms. Crystal Rodwell

March 30, 2020

## Table of Contents

	<b>Page</b>
1. ABSTRACT.....	2
2. HISTORY & DEVELOPMENT.....	2-3
3. DESCRIPTION OF INNOVATION.....	3-4
3. A. SPECIFICATIONS.....	4-5
4. MECHANICAL DESCRIPTION.....	6-12
4. A. MAIN COMPONENTS .....	6-10
4. B. BATTERY.....	10
4. C STRAP.....	11-12
5. COMPETITORS .....	12
6. CONCLUSION.....	13
7. REFERENCES.....	14-15

## **Technical Description: Casio G-Shock DW-5000C**

### **ABSTRACT**

This essay will describe in detail the specifications and inner workings of a Casio G-Shock watch. G-Shock is a brand of watches created by the Japanese electronics company Casio in 1983. The name G-Shock is an abbreviation Gravitational Shock. All G-Shocks are digital or a combination of analog and digital and have a stopwatch feature, countdown timer, electroluminescent backlight and are water resistant for at least 100 meters.

The watches in the G-Shock range are designed primarily for sports, military and outdoor-oriented activities; these watches withstand the daily wear and tear that would be prevalent in other watch models. Since G-Shocks were created they have become a staple in many essential industries of the world. These industries include military organizations, emergency and aid institutions, athletics, and medical professions. These watches have met the demands of these industries and have remained invincible to any potential competitors. The incomparable price and durable materials from which this watch is made from, and a multitude of other unique features allow this watch to be unparalleled with competing watches. The G-Shock was developed at a time when watches were generally considered highly fragile instruments. When the G-Shock was introduced to the market, it became the toughest, most durable watch in the world.

### **HISTORY & DEVELOPMENT**

In 1981 Kikuo Ibe, a young engineer at Casio was inspired to create a durable watch after he dropped an expensive wristwatch he received as a gift, and it shattered. As head of watch design at the time, Ibe formed a team of three members called "Team Tough". Project team

“Tough” developed more than 200 prototypes of the most durable watch they could create in search of a shock-resistant structure. The G-Shock was conceived as a watch which would have triple 10 resistance, meaning it would have a battery life of 10 years, have a 10-bar water resistance, and could survive a fall of 10 meters. Their target turned out to be extremely difficult, after months of hard work, their tireless efforts to create a durable watch reached a dead end. Ibe was re-inspired when he visited a playground, and observed how children played with a rubber ball. He noticed that the center of the rubber ball did not suffer any of the effects of the shock of the bounce on a hard surface. Ibe and his team decided to implement this structure into their watch. Two years after the start of development, in April 1983 the first G-shock, the DW-5000C was launched.

#### DESCRIPTION OF INNOVATION

The G-Shock DW-5000C is the first model in this range of watches. The DW-5000C, contains 10 main elements that are responsible for the Shock-Resistant structure of the watch. The shock resistant design has 10 layers protecting the quartz timekeeping module. These components include the hollow structure, which creates a situation as if the module were floating inside the watch case, a shock-resistant case, shock-resistant bezel form, cushioning that protects key parts, an all-directional guard structure, and the shock-resistant band shape. The hollow structure is an integral part of the watch; this part permits the watch to be shock-resistant, and 10-bar water resistant (10-bar is the pressure felt underwater at 100m depth). A hollow structure protects the module, cushioning material safeguards key parts, and an all directional guard structure shields the buttons and watch glass, reducing the impact of dropping shocks. Other components include a urethane rubber bumper, the stainless steel case, a hardened mineral glass

watch crystal, the stainless steel screwdown caseback, and the hollow structure, also referred to as “floating module” where the quartz mechanism floats free in a urethane rubber cradle, with the outer buttons and LCD module attached with flexible cables.

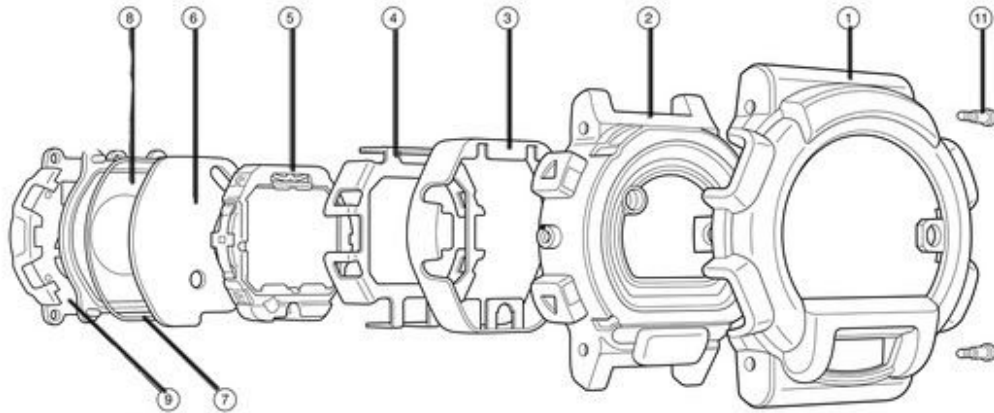


Figure 1. Represents the 10 main elements of the watch.

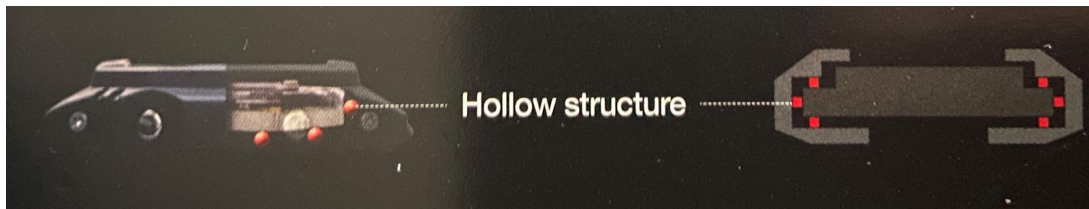


Figure 2. Depicts the hollow structure (floating module) of the watch face.

### A.SPECIFICATIONS

The table below includes the specifications of the G-Shock DW-5000C. This table includes elements published by Casio, the watches manufacturer, and other resellers. A table similar to the one below is often published by manufacturers. This table with specifications provides the consumers with the specific materials and special features included in this watch.

<b>Brand</b>	Casio
<b>Model Number</b>	DW-5000C

<b>Display Type</b>	Digital
<b>Case Material</b>	Stainless Steel/Resin
<b>Case Diameter</b>	43.00 millimeters
<b>Case Thickness</b>	1.35 millimeters
<b>Band Length</b>	177.8- 228.6 millimeters
<b>Band Width</b>	22 millimeters
<b>Bezel Material</b>	Resin
<b>Battery</b>	BR2020
<b>Battery Life</b>	10 years
<b>Battery Material</b>	Carbon-monofluoride lithium non-rechargeable battery
<b>Current Consumption</b>	2.25 V
<b>Alarm System</b>	Piezo plate on Back cover
<b>Accuracy</b>	±15 sec./month
<b>Accuracy Setting System</b>	Trimmer capacitor
<b>Functions</b>	<ul style="list-style-type: none"> <li>• Shock resistant (G-SHOCK)</li> <li>• Electro-luminescent backlight</li> <li>Auto light switch, afterglow</li> <li>• World time</li> <li>Current time in 27 cities (29 time zones), city code display, daylight saving on/off</li> <li>• 1/100-second stopwatch</li> <li>Measuring capacity: 99:59'59"</li> <li>Measuring modes: Elapsed time, lap/split time</li> <li>Memory capacity: 500 lap/split time records with lap/split number</li> <li>• Daily alarm</li> <li>• Hourly time signal</li> <li>• Auto-calendar (to year 2039)</li> <li>• 12/24-hour formats</li> <li>• Regular timekeeping: Hour, min, sec, pm, month, date, day</li> </ul>

## MECHANICAL DESCRIPTION

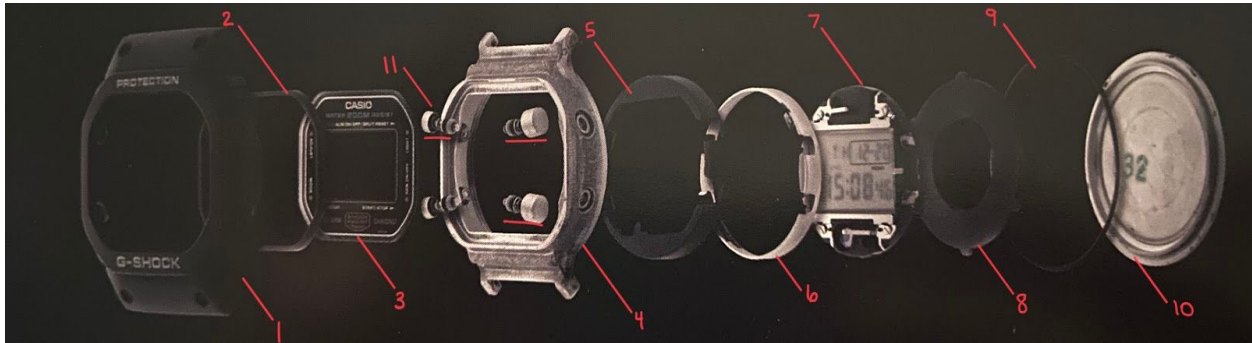


Figure 3. Exploded image of the components of the watch.

The third figure includes images of the components of the G-Shock DW-5000C. The first three items labeled in the image above, are a recreation of the outer shell. The outer shell is one of the components that makes the hollow structure/floating module. This outer shell is a synthetic resin case that makes up the watches outermost layer. Synthetic resins are produced by curing rigid polymers to have protective benefits in response to injury, similar to natural plant secreted resins. The resin allows for the watch design to be sleek and smooth, while providing an extra layer of protection for the floating module. The second component listed, also a component of the hollow structure, is a cushioning safeguard used to allow the third component to float in the module. The cushioning safeguard is made of rubber, which allows the watch glass to lay in the module without touching any of the sides. The third component is a watch glass made of hardened mineral glass. Hardened mineral glass is a type of glass used for watches, this glass is combined with minerals such as sapphire or diamond, to make it resistant to scratches, and less brittle than ordinary glass. The watch glass is a frame in which the computer board will lay. The computer board is also referred to as a logic board or a circuit board. The computer board powers

the digital display of the clock. The next component, the fourth labeled in the figure is an all directional guard structure. The all directional guard structure is a stainless steel case that protects the floating module from impact on hard surfaces. The stainless steel used in the case is made up of at least 11% chromium; this composition prevents the steel from rusting if it ever comes in contact with water, and it also provides the steel with a resistivity to heat and pressure. The all directional guard structure is the last component of the floating module, which is perhaps the most significant element present in the hollow structure, as it is made of an exceptionally rigid material which accounts for the watch's durability and toughness.

The fifth component labeled in the exploded image above is a urethane rubber bumper which serves a similar purpose to the second component labeled. This allows the inner workings of the watch to be shock resistant, and vibration resistant. Polyurethane rubber or urethane rubber is a dense synthetic rubber used to protect the watch from collision. Urethane rubber has a unique composition that allows it to have good wear resistance, heat resistance, and abrasion resistance. These qualities and its low cost, work as a seal to keep the computer board from coming in contact with water, which makes it an important material that is used throughout the watch. The sixth component shares a similar duty to the fifth component mentioned. The sixth component is a stainless steel band that fits into the rubber bumper creating a case for allowing the computer board to be securely placed inside of the floating module.

The seventh component is the computer board which holds the nodes that power the watches timekeeping, and other special functions. The computer board also holds transistors, coils, oscillators, resistors and chips that allow the data to be displayed on the Liquid-Crystal Display (LCD). The LCD is the screen of the clock inside of the watch; this LCD displays the



time and other timekeeping functions unique to the G-Shock watch range. The Liquid-Crystal Display is a flat-panel display that uses the light-modulating properties of liquid crystals (and quartz in this watch) combined with polarizers to produce images in monochrome. The LCD uses a backlight that is found on the computer board to produce the images. Basic coding phrases are found in the chip that is stored in the computer board, these codes create a matrix of small pixels that compose an image. The images produced are the digits that make the digital clock function. The oscillators, transistors, inverter and coils convert the power from the battery to power the clock. The chip holds the data that allows the watch to have different functions and features. All of these components are made of copper and steel. Copper is used for its malleable

and conductive properties that allows it to be molded into coils and transistors. The rest of the board is made of stainless steel because of its sturdy character that allows it to be used in many instances throughout the watch.

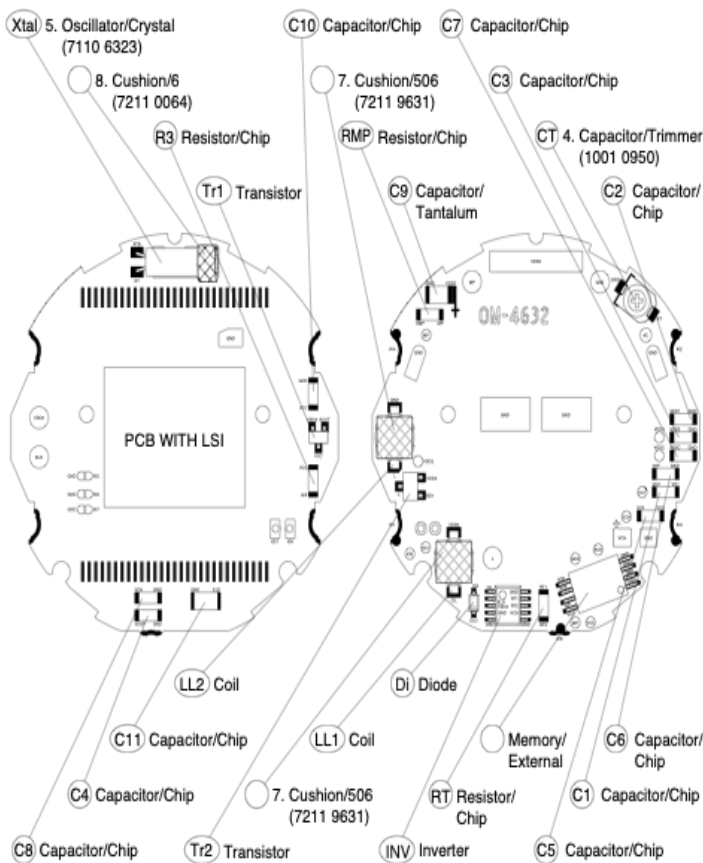
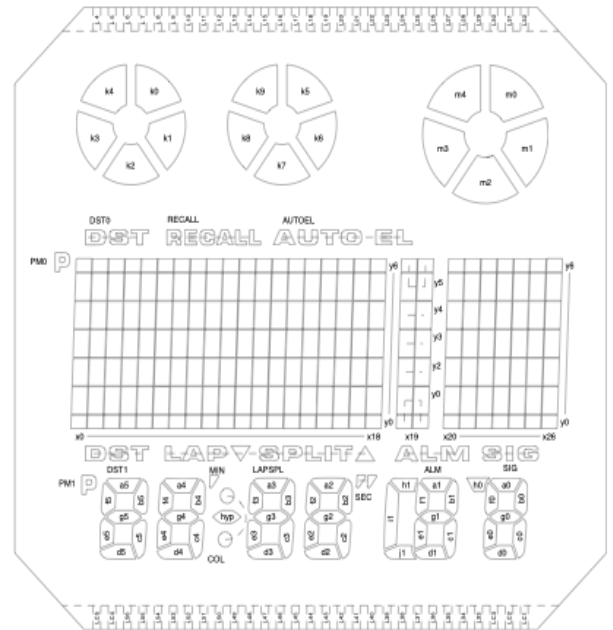


Figure 3.1. Depicts an image of the computer board and its multiple components that power the watch.

Figure 3.2. An image of the LCD screen of the watch. This image also shows the matrix of pixels that creates the digits of the numbers on the watch.



The eighth component of the watch labeled in Figure 3 is a flat rubber seal. This seal is made from urethane rubber, much like the other rubber components of the watch. This seal provides a bed for the battery to lay secure on. The battery is the following element that will be placed before the ninth component is placed. The next component is the ninth; this is a back rubber seal. The back rubber seal is made from urethane rubber. This seal keeps the battery in place, and it corresponds to the lip that the back cover has. The last main component is the stainless steel screwdown caseback. The caseback has a small lip in which the back rubber seal is placed into, which provides a grip for the caseback to be tightened and secured. The stainless steel caseback encloses all of the components together; the case back is made of durable stainless steel that allows all of the components to stay and place, it also allows for the caseback to be secured tightly.

An eleventh component mentioned in Figure 3 is screws. The entire watch uses the same type of stainless steel screw. Four screws are placed in the all directional stainless steel guard.

The screws secure the floating module in place. The screws used are a short screw, with multiple tiny helical ridges unique to Casio G-Shock models of the 1980's and 90's. These screws are made specifically for G-Shocks, and the one used in the DW-5000C model is a Casio 91041930615 screw.

## B. BATTERY



Figure 4. An image of a BR2020 battery used in DW-5000C G-Shock.

The battery of this watch is a significant element. The battery of this watch contains a coin-cell battery that can be found in many other electronic products. Casio uses their own non-rechargeable batteries for this watch, such as the one in Figure 4 above. The DW-5000C contains a BR2020 battery, that has a ten year battery life. The BR2020 is a carbon-monofluoride lithium non-rechargeable battery; 20 millimeters in diameter and 2.0 millimeters in height. This battery has a voltage of 3V, which makes it a wonderful option for this watch, as its output voltage over time is more stable than the output voltage of other batteries commonly used in watches.

## C. STRAP



Figure 5. Image of a resin watch strap, and a stainless steel fastener used for a DW-5000C.

The strap of a watch allows the wearer to fasten the watch to their wrist. The strap is attached to the face of the watch, which makes the watch wearable and functional for everyday use. The strap of the G-Shock DW-5000C, is made of resin, and attached to the face of the watch with small spring rods. The strap also features a stainless steel fastener, that resists scratches and allows the band to be adjusted depending on the wearer's wrist size. The strap in the figure above is an image of the strap used for most early models of the G-Shock range.

Resin is a durable material that allows the strap to be comfortable for the wearer. Most G-Shocks can be worn for interminable periods of time without causing harm to the wearer. The flexible resin allows the strap to lay smoothly, and wrap around the wrist. This waterproof

material allows the skin to breathe, even after long periods of wear. The strap also helps the watch sustain itself from impact.

The spring rods used to attach the strap to the face are unique to Casio, similar to the battery and screws. These springs are a Casio 91041943222 and a Casio 91049780794. The two springs are indiscernible, both of them are 20mm by 14 ½ mm. The reasoning behind the two distinct names is caused by the fact that both springs have been used to assemble the watch depending on the location of the manufacturer. The manufacturers in Europe and the United States use a Casio 91041943222, and the Japanese manufacturers use a Casio 91049780794.



Figure 5.1 An image of the Casio 91041943222 and 91049780794 spring rods used to attach the face to the straps.

## COMPETITORS

A competitor to the G-Shock watch line, is the Rolex Oyster watch range. The Rolex Oyster was launched in 1926, which was the first waterproof wristwatch in the world. At the time this watch launched, wristwatches weren't popular. Pocket watches were too fragile and delicate for use in the battlefield. However, this novel watch that was waterproof, seemed like a great alternative for soldiers in the war front. Soon this watch was used by athletes and medical professionals of the time. The high price tag, brittle glass, and daintiness of this watch made it unsustainable for practical use. The G-Shock however, is a very durable and tough watch that can be used for long periods of time without breaking, is a much better alternative than any other watch on the market. The economical price of the G-Shock range makes it accessible to many, establishing the watch's illustriousness among many of the world's industries.

## CONCLUSION

The G-Shock DW-5000C, is a tremendous technological innovation. This watch is a very durable and dependable product. The watch is made from lasting materials that are economical and reliable. The shock-resistant structure, resilient materials, and functional designs of the G-Shock watches are the result of an abundance of research and attention to detail. The creation of this watch was an engineering feat that has been able to prevail in practically every environment and circumstance in the world. The first watch was released in 1983, but this unique watch has remained invincible to every watch on the market. The G-Shock watch range, is a legendary brand of watches

## References

(n.d.). Retrieved from

[https://www.pacparts.com/model.cfm?mfg=Casio&model\\_id=DW5000-1A&row\\_start=1  
&src\\_model\\_id=dw-5000&action=list\\_part](https://www.pacparts.com/model.cfm?mfg=Casio&model_id=DW5000-1A&row_start=1&src_model_id=dw-5000&action=list_part)

BR2020. (n.d.). Retrieved from

<https://www.digikey.com/product-detail/en/panasonic-bsg/BR2020/P185-ND/31921>

Casio DW-5000C-1A. (2018, March 20). Retrieved from

<http://www.liquidcrystal.co.nz/watches/casio-dw-5000c/>

Casio. (n.d) (2012). *G-Shock 30th Anniversary Book*.

Estlow, E. (2016, March 18). The History of the Casio G-Shock • Gear Patrol. Retrieved from

<https://gearpatrol.com/2013/10/15/icon-casio-g-shock/>

G-Shock Watch Manuals in PDF for all Models. (2017, August 31). Retrieved from

<https://casiowatchparts.com/replacement/manuals/g-shock-manuals/>

History of The Oyster Perpetual -. (n.d.). Retrieved from

<https://beckertime.com/history-of-rolex-oyster-perpetual/>

KINKODO: Band (belt) for Casio [CASIO] G-SHOCK [new article] [pure article]

DW-5000C, DW-5200C. (n.d.). Retrieved from

<https://global.rakuten.com/en/store/kinkodo/item/70360128/>

Manuals. (n.d.). Retrieved from

<https://www.manualslib.com/manual/1291178/Casio-Dw-6100cf.html?page=6#manual>

Manuals. (n.d.). Retrieved from

<https://www.manualslib.com/manual/1270395/Casio-G-2400.html?page=8#manual>

Printed Circuit Board. (n.d.). Retrieved from

<http://www.madehow.com/Volume-2/Printed-Circuit-Board.html>

Rouse, M. (2019, September 13). What is LCD (Liquid Crystal Display)? Retrieved from

<https://whatis.techtarget.com/definition/LCD-liquid-crystal-display>

The Casio G-Shock GW-5000 an offspring from the first G-Shock in 1983. (2019, February 5). Retrieved from

<https://www.fratellowatches.com/casio-g-shock-gw-5000-52mondayz-week-34/>

Watchonista. (2019, April 25). A look back at the history of the Casio G-Shock. Retrieved from <https://www.watchonista.com/articles/history/look-back-history-casio-g-shock>

XS Power D3400 XS Series 12V 3,300 Amp AGM High Output Battery. (n.d.). Retrieved from

<https://www.batteryequivalents.com/cr2020-br2020-vl2020-battery-replacements-and-equivalents.html>