

STYLE

Where value comes from

Employing intellectual curiosity to create
products that support intellectual creativity

The challenge of creating value that did not exist before

ORIGIN OF G-SHOCK

Creating value that changes the way people think... At a time when everyone was in pursuit of lighter, slimmer and more compact products, out came the shock-resistant watch, G-SHOCK, with its robust shape. Casio's approach to product development involves creating things the world has not yet seen.

> It all began with a discovery one day

If a watch drops, it breaks... In those days, this was no surprise, but it was the event that inspired Casio engineer Kikuo Ibe to develop the G-SHOCK.

"I had broken my precious watch, a gift from my father, simply by dropping it. However, rather than feeling regret, I remember feeling somewhat impressed by the sight of it cleanly breaking into many pieces. It was a first-hand lesson of the well-known fact that watches break easily because they are delicate, precision instruments."

This experience left a strong impression on Kikuo Ibe. In a new technology and product proposal that he submitted to the company, Ibe incorporated his impression of that episode. Then, without including any diagrams or detailed explanation, he simply wrote that he wanted to create a "tough watch that won't break, even when dropped."

"We got the green light at the meeting."

Ibe did not think the proposal would be approved. He had no idea why it was accepted. Reflecting on it now, he assumes that the intrinsic value expressed by that one phrase must have resonated with his boss. Soon, Ibe began experimenting with shock-resistance. His lab was in fact the office restroom. In an era when people were looking for slimmer and more compact watches, it was easy to imagine that the watch he was developing would be bigger. Without anyone taking much notice, Ibe continued to drop his prototypes from the restroom window to the ground below.

"A ground-floor window would have been sufficient for

drop-testing a regular watch. But I eventually decided to use the third-floor restroom window for my experiments. It was about 10 meters above the ground. As an engineer, I probably liked a nice round number like that."

Initially, Ibe thought that just adding a little cushioning material would be enough. However, he soon realized that the watch needed to be wrapped to the size of a softball in order to withstand the shock when dropped. He was flabbergasted.

"At that point, I couldn't even dream of coming up with a viable product. That experience made me realize how challenging this development really was."

> In the midst of struggle, a ray of light

After much trial and error, he created a five-stage structure that could absorb shock, and somehow managed to get it down to the size of a watch. That is when the struggle really began.

"There was always one component of the module within the watch that would break. If I protected the fragile LCD, the coil would break. If I protected the coil, the quartz crystal would break."

Ibe spent his days in a maze with no exit. Nothing he did seemed to work. The scheduled launch date for the watch was fast approaching. In desperation, he decided to set himself a deadline of one week and placed the prototype beside his bed as he slept, in hopes of finding a solution in his dreams. "I made up my mind to resign if I gave my best but still could not find the answer." But no solution came.

"On the final night, I was having strange thoughts such as, 'Maybe if I don't fall asleep, the morning won't come.' Of course, the deadline did arrive and I still had no solution."

Ibe was prepared to apologize to the company and resign on Monday. On the Sunday deadline, he went to the office to tidy up all his development materials in preparation for his departure. However, before he knew it, he found himself doing experiments. "Finally, I gave up and went out for lunch. After eating I didn't feel like going back to the office, so I went and sat in the park instead. I saw a little girl having fun bouncing a ball. At first I thought it must be nice to be a child with no worries. Then a light suddenly turned on in my mind. As I watched the ball bounce on the ground, I realized that if my watch module was suspended within the ball, it would withstand the shock. At that moment, I knew I could realize my product."

> From the seeds of invention, new value is created

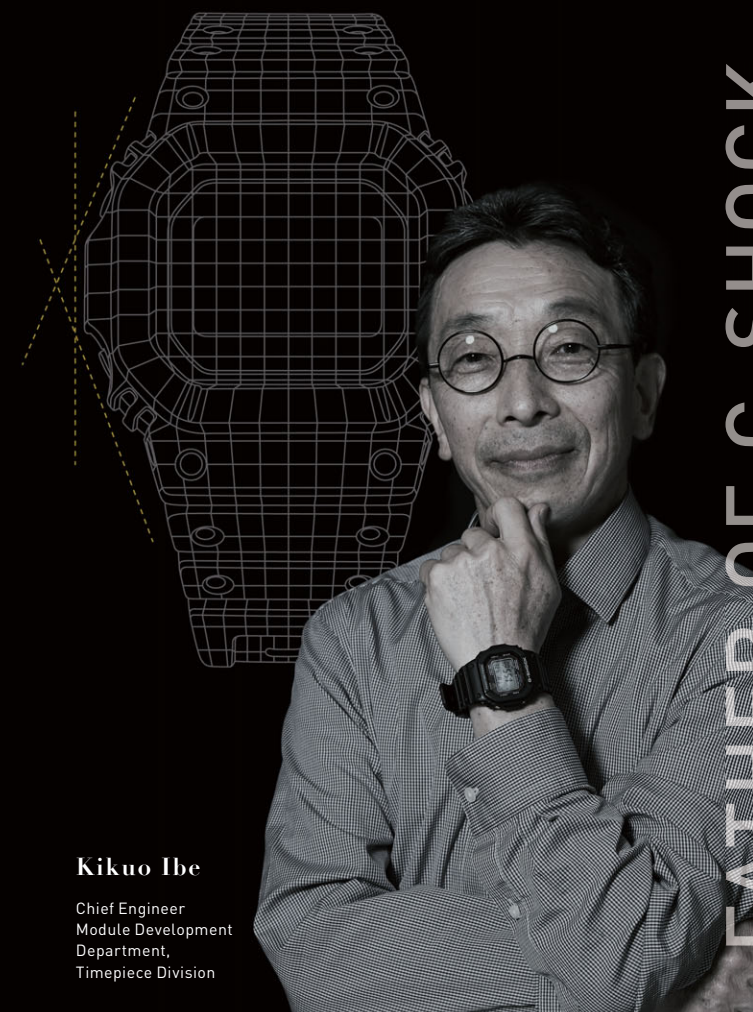
What Ibe had discovered, was the concept of a watch module that virtually floats. The module was supported by contact points with the case, the watch exterior. Together with the five-stage shock-absorbing structure, the new

prototype passed the drop test from the third floor window with flying colors. Ibe's strong determination and the serendipitous encounter in the park led to the successful development of the G-SHOCK watch. "To be honest, I was relieved when it was finally completed. The company allowed me to take on the product challenge based on just a single phrase, and provided an environment that enabled me to concentrate on its development. I also received cooperation from other members of my team who were supportive of the plan. That's why it was impossible for me to give up."

Now, over 30 years since it was first released, G-SHOCK has sold a total of about 80 million units. It is a watch loved by people around the world, including those working in harsh environments, athletes in impact sports, and young people seeking genuine products to express their individuality and fashion sense. This is because G-SHOCK is a one-of-a-kind product that has overturned conventional notions of the watch, a brand that has continued to evolve by pursuing the essential value of being unbreakable.

"Since then, numerous engineers have been involved in G-SHOCK product development, taking on the challenge of its evolution. Many people have also worked hard to grow the brand. I am much honored to have been part of this."

The seeds of invention planted by Kikuo Ibe have become a source of great value.



Kikuo Ibe

Chief Engineer
Module Development
Department,
Timepiece Division

Inheriting a spirit of challenge and creativity

GPS HYBRID WAVE CEPTOR G-SHOCK



Aiming to create a tough watch that does not break even when dropped... Over the years, Casio has maintained unshakable conviction about delivering intrinsic value while pursuing ideas unbound by conventional thinking.

Aiming for new toughness... The challenge of the evolving G-SHOCK brand never stops.

Always having the correct time, wherever you go in the world

Even in the jungles of South America, or in the middle of the Sahara—no matter where you are on the planet, you will always know precisely what time it is. The new G-SHOCK watch launched in 2014 was developed with the aim of providing the value of always having the exact local time in any part of the world.

Basically, even the slightest inaccuracies, after a while, cause watches to lose the correct time. This is true of mechanical watches as well as quartz models that move to the vibration of a crystal. However, by receiving time-calibration signals transmitted as radio waves, radio-controlled watches are able to correct timekeeping losses, and always show the correct time.

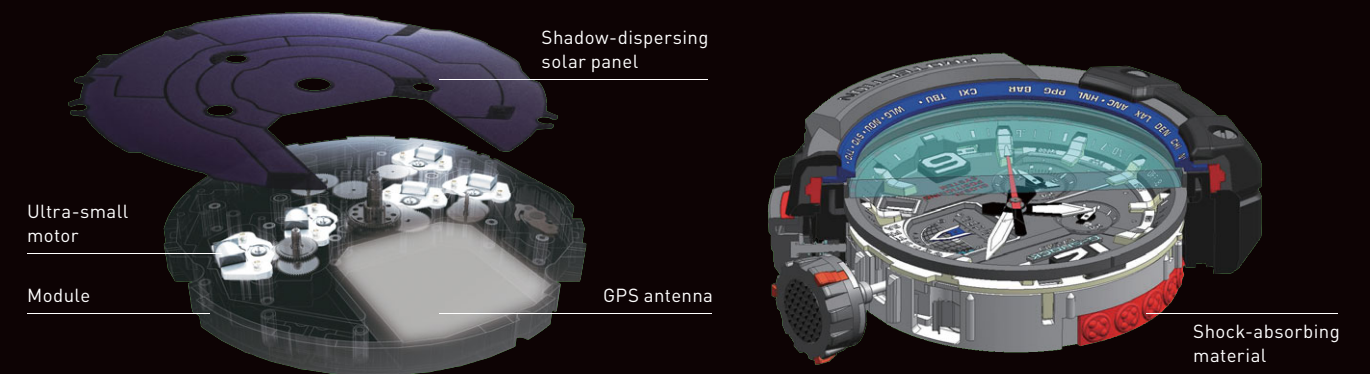
The new GPW-1000 stands out due to its hybrid system that can receive both GPS satellite signals and radio wave time-calibration signals. The terrestrial time-calibration signals offer the advantage of easy reception even indoors or between buildings, but are not available in all countries and regions. GPS signals, however, despite the drawback that they can be blocked by obstacles such as roofs, can be received anywhere on the planet. In other words, depending on the location, the hybrid system can select the appropriate signal type for receiving highly accurate time information.

Technology that creates new value

A high level of technology is required for a new idea to take shape as a useful product. In order to combine the two signal receiving systems, two different antennas needed to be incorporated into the module, the heart of the watch.

But this had to be done without the module getting any bigger, so that it could still fit into the watch case. So Casio created space for the two antennas by making the most of its component-level miniaturization and packaging technologies.

Innovative technologies included in the GPW-1000



Solar-powered GPS Hybrid Wave Ceptor

The GPW-1000 features a miniaturized watch motor. This provides the space needed for two antennas, one for receiving GPS signals and the other for picking up time-calibration signals. Moreover, to minimize the lost power generation efficiency caused by the shadows of the watch hands, shadow-dispersing solar panels have also been incorporated. They are arranged in six panels for optimal efficiency.

TRIPLE G RESIST

While inheriting the basic G-SHOCK structure for toughness, the GPW-1000 boasts construction that can withstand three types of gravitational acceleration: shock, centrifugal force and vibration. Outstanding shock-absorbing materials have been selected for the space between the module and case. The material is based on seismic isolation technology and processed into a cylindrical shape, offering high shock and vibration resistance.

This included developing the world's smallest watch motor,* which has dimensions about 25% smaller than a conventional motor.

* Among motors used in solar-powered radio-controlled watches, as of June 2014 (Casio research)

As part of the selection process for each of the components, Casio considered all kinds of situations in which the watch might be used. For example, a GPS antenna was chosen with wide directivity, meaning that it can receive signals from various directions. Since people wearing a G-SHOCK are not going to stand still in order to receive time signals, the watch needed an antenna that can receive signals from GPS satellites while the person is continually moving. This even includes situations such as bumping along over wide-open terrain in the back of a pickup truck.

Detailed map data was also included to further increase accuracy. The data is used to pinpoint the current position of the watch, in order to determine the exact time for that area. The internal Casio map data uses roughly 500-meter resolution grids. In places where you can travel a short distance and suddenly find yourself in a different time zone, such as when crossing an international border or entering a region with daylight savings time, the watch automatically adjusts to the correct local time.

Casio also made full use of its power-saving technology. The GPS antenna uses four times the power of the time-calibration signal antenna. Therefore, an IC chip for low power

consumption was customized to control reception. This was performed through measures such as developing special watch reception algorithms, to achieve further power savings.

The GPW-1000 even features a shadow-dispersing solar panel, a technology developed by Casio. Solar panels are made up of multiple cells that generate electricity, and the cells are all about the same size. The most efficient configuration is for each cell to generate the same amount of power. But with an analog watch, when the watch hand casts a shadow on one cell beneath it, the generating efficiency of all the cells in the panel is reduced. With the original shadow-dispersing solar panel from Casio, the hand shadow is scattered over multiple cells, minimizing the lost power by combining cells of different shapes. This not only ensures the power required, but also enables watch face design improvements, such as larger hands and numerals, to make G-SHOCK more readable even under extreme conditions.

Aiming for a watch with the ultimate toughness

G-SHOCK owners are active people. They include not only athletes engaged in impact sports, but also pilots subjected to the effects of severe gravity, and rescue personnel working in disaster zones. G-SHOCK provides support to these people with the strength to withstand use under all kinds of severe conditions.



Noritaka Ishida
President, BEST Co., Ltd.

Unique toughness that has earned the trust of customers worldwide

Among practical watches, Casio timepieces are the most reliable. They appeal to a wide range of customers from young people to business professionals who travel the world for work. Customers of all sorts of ages and nationalities come into our shop to buy Casio watches.

G-SHOCK is widely known by customers for its toughness, and it has a unique market presence that other brands cannot match. Although I myself own about 300 G-SHOCK watches, I especially like the solar powered radio-controlled models. They always keep the right time, and I really enjoy wearing them in all situations—from daily life to a resort vacation.

Casio is definitely a manufacturer that bolsters Japan's national image. I hope that the company continues to make advanced and practical watches.

Therefore, no matter how accurate the timekeeping is, a watch cannot be called a G-SHOCK unless it functions in all kinds of environments.

The GPW-1000 features TRIPLE G RESIST technology for solid structural strength. It enables the watch to withstand three types of gravitational acceleration: shock, centrifugal force and vibration.

Outstanding shock-absorbing material designed in a cylindrical shape is incorporated between the module and the casing. Based on seismic isolation technology used in

high-rise buildings, the cylindrical design disperses any impact force by moving horizontally, in addition to the shock-absorbing capability of the material itself.

Tough, fine resin is used for the frame of the watch case, and the resin band is reinforced with a sheet of carbon fiber, which has excellent tensile strength. These and other toughness features of the watch have been painstakingly designed. The GPW-1000 delivers high precision with its ability to receive time signals anywhere on earth, while also offering performance reliability under all kinds of conditions.

► Features of GPS and time-calibration signals

GPS satellite signals	Time-calibration signals	
All	Japan, North America, Europe, and China	Reception areas
○	○	Outdoor reception
×	△	Indoor reception

► Reception methods for GPS and time-calibration signals



Radio waves are received from GPS satellites, allowing the watch to ascertain accurate positioning and time information. The watch then adjusts the displayed time, by referencing its internal time zone and daylight savings time information. When it cannot receive time-calibration signals, it automatically receives GPS signals between 6 a.m. and 10 a.m.



The watch receives time-calibration radio waves transmitted from six stations worldwide (two in Japan and one each in the US, UK, Germany, and China) and automatically corrects the displayed time. Unless the watch is moving between different time zones, it automatically receives the signals daily between midnight and 5 a.m.

An essential part of my life that goes with every moment

I always wear my G-SHOCK when I am traveling around the world and when I am on the mountain snowboarding. What I love most about my G-SHOCK is the signature shock resistance. When I am snowboarding, I never have to worry about breaking it no matter how hard I crash or fall on it. Being on the mountain a lot, I also like the way it is backlit, so I can read it on the sunniest of days as well as in a whiteout.

Having many different types and various colors is another attractive point of the G-SHOCK. No matter what the occasion, there is always a watch you can wear that matches the activity or what you are wearing. G-SHOCK has continued to evolve with the insights into the various needs of users. I expect G-SHOCK to continue to be more innovative and to pursue the ultimate in toughness.



Louie Vito
Professional snowboarder

► If it's cautious, it's not a G-SHOCK

Since its initial launch, the approach to G-SHOCK development has been the total pursuit of toughness. While based on shock-resistance, G-SHOCK has evolved through the unshakable belief of Casio engineers in taking on challenges and incorporating innovative ideas. These include water resistance to 200 meters for diving, as well as resistance to dust, mud, rust, and centrifugal force.

It is the same with the new GPW-1000. Bold new thinking led to the creation of this solar-powered GPS Hybrid Wave Ceptor G-SHOCK.

This watch is the result of efforts to create a watch with the toughness to show the correct time no matter where it is in the world—which ought to be an essential feature in any watch.

"If it's cautious, it's not a G-SHOCK."

Casio engineers are in agreement about this point. There is no end to the challenge. The value of G-SHOCK lies in this spirit of challenge. The pursuit of toughness is always the goal.

