

CASIO

BY MARK BERNARDO

CONFIDENTIAL

*Behind the scenes at
the Japanese
electronics giant's
timepiece division*



Outside, workers are tending to the cherry trees in the hot, humid air. Inside, in cool, temperature-regulated comfort, I'm suiting up for a moonwalk.

At least it feels that way, here inside the high-tech manufacturing facility of Casio Computer Ltd. in Japan. My small tour group, which is here to witness the company's watch production, is suited up head to toe in blue astronaut suits, with slip-on booties covering our shoes and surgical masks over our faces. On the way into the room where the most delicate work is being done, we each step into a "Star Trek"-like chamber that renders us dust-free. Even for someone who has walked through his share of watch factories, and been duly impressed with

their meticulousness, this one takes sterility to a new level.

The facility, Yamagata Casio, is in the city of Higashine, an industrial hub nestled within the prefecture of Yamagata, a beautiful agricultural area known for its flavorful cherries and pears, on the Japanese mainland. Established in 1979 as a subsidiary of Tokyo-based Casio, it is the company's mother factory, making mobile phones, calculators, and — as I am about to see firsthand — timepieces. (It also does contract work for other clients such as Motorola and Pioneer.) The Yamagata production tour is the final leg of a multi-part presentation that began more than 200 miles away back in Tokyo, in which one of the world's best-known electronics companies offers a rare glimpse of its world-class watch production prowess.



G-Shock watches on display at Casio's in-house museum

Casio's premium-priced watches — those priced at \$300 and up, including the Oceanus and the new Pathfinder models — are either partially or totally manufactured at Yamagata Casio. (Low- and mid-price watches are made at two other Casio factories in China and another in Thailand.) As my guides and I pad through the workshops in our protective garments, I witness the entire picture coming together. First, it's the movements, which look like no other quartz movements I've ever seen, with tiny antennas and five minuscule motors for all the analog functions of complicated models (simple three-hand analog models use only one motor). It is, as you'd expect, a highly mechanized process, with assembly-line robots attaching tiny screws, rotors, and electronic coils, and punching tiny pinholes in the gears. Why the pinholes? After they are punched, a machine emits a red light beam that checks the exact position of the holes in relation to that of the hands to ensure that they line up exactly. If the red light shines through all layers, the movement has passed Casio's "Tough Movement" test — more on which later — and a digital "OK" appears on the monitor. Technicians apply by hand the pieces that are still too tiny for the robots to work with, like the tiny washers be-

tween the gears, and tighten all the screws as a final step. The assembly line pumps out an astounding one complete movement every 16 seconds, or more than 1,500 per shift.

Plastic cases are also made here — from the metal dies to make the molds, to the molds themselves, to the finished cases. (Most steel cases, like those used for the Oceanus, are purchased from outside suppliers.) The factory even makes the molds from which the movement base plates are made. Digital concept drawings for the molds, cases and plates come in from the R&D department in Hamura, an industrial area outside Tokyo where other large technology companies, including Toshiba, also have facilities. Technicians at Yamagata then initiate the mechanized process that make them into 3D reality, beginning with the massive banks of machines that cut the molds with computerized precision and concluding with the "baking" of the finished cases for one hour to remove any excess moisture from the molding process. By the time I remove my dust-resistant suit, I've witnessed a rarity in the watch world: a process where both the case and movement of a watch are constructed A-to-Z under the same roof.

WHEN MOST WATCH aficionados think of Casio, they usually think of it as the third of the Big Three Japanese watch giants, after Seiko and Citizen, and it is a colossus: Casio Computer has net sales of 427 billion yen (\$4.98 billion) and employs over 12,000 people worldwide. Watches represent 18.2 percent of its global sales, about 30 million units. Casio is, however, unique among the Big Three in a couple of significant ways. One is that, unlike the other two, Casio did not start out as a watch company; it did not, in fact, enter the timepiece business until 1974, a far cry from Seiko (which produced its first pocketwatch in 1895 and its first wristwatch in 1913) and Citizen (which began making pocketwatches in 1924 and wristwatches in 1931). The other difference is that unlike its competitors,

Casio at a Glance

Founded: June 1, 1957

Headquarters: 1-6-2, Honmachi
Shibuya-ku, Tokyo 151-8543, Japan

CEO: Kazuo Kashio

Net sales: ¥427 billion/\$4.98 billion
(fiscal 2010)

Number of employees: 12,247
(March 2010)

Top products: Digital cameras,
electronic dictionaries, calculators,
cellular phones, timepieces

Annual watch production: 30 million
units

Watch collections: G-Shock,
Baby-G, G-Shock Mini, Edifice,
Pathfinder, Oceanus, WaveCeptor,
Databank, Classic, Sport, Dress



Photo: Michael Comdon

*Yamagata Casio is Casio
Computer's mother factory.*

Casio has never made and has no plans to make a traditional, mechanical watch. The company takes as much pride in its electronics expertise, and its innovations to quartz timekeeping technology, as any Swiss purveyor of *haute horlogerie* takes in its tourbillons and minute repeaters. Even as a Japanese producer of quartz watches, Casio stands somewhat apart, as it is the only one of the trio to have both rechargeable solar batteries and radio-controlled atomic timekeeping as standard features in all its premium models.

The first day of the tour, at Casio's sleek skyscraper headquarters in the bustling Shibuya district of downtown Tokyo, I browse through the company's history at an on-site museum devoted to telling the Casio story, with numerous historic and modern Casio products — including a full complement of significant watches — presented in glass cases.

That story begins with Tadao Kashio and his three younger brothers, Toshio, Kazuo, and Yukio. In 1946, amid the devastation of World War II, Tadao and his father Shigeru started Kashio Seisakujo, a company whose main product was a cigarette holder called a Yubiwa pipe. After seeing early versions of electronic calculators at a Tokyo trade show in 1949, Tadao, an engineer, used the profits from the Yubiwa pipe to invest in the development of the company's own calculators. The business became Casio Computer when Tadao's brothers came to work with him in 1957. ("Casio" is an Anglicized version of the family name "Kashio," much as "Toyota" is of that company's founder's name, "Toyoda.") Tadao presided over years of growth for the company and had a hand in many of its creative milestones. The year of its founding, Casio Computer released the world's first all-electronic calculator, a desk-sized device powered by solenoids rather than the mechanical motors and hand cranks of previous calculators. (This historic invention is roped off in a corner of the museum.) The company followed this invention up with the much more compact Casio Mini, the first personal calculator, which sold more than 10 million units, and the SL-800, an early, lightweight card-sized model. Tadao, a music lover,



A tray of G-Shock Aviation watches being prepared for water-pressure testing

also spearheaded the development of the Casiotone in 1980, one of the first musical synthesizers. As computers and other personal tech devices became more widespread throughout the late 20th and early 21st century, Casio continued to have a hand in them: the company introduced the first digital camera for consumers, the QV-10, in 1995, and it entered the mobile phone market in 2000 with the water-and shock-resistant C-303CA cell phone.

Tadao retired in 1988 and died in 1993, leaving the company reins in the hands of the three remaining Kashio brothers, all of whom are still in executive positions at Casio despite being septuagenarians or older. Each brings his own type of expertise: Toshio, the chairman, is an inventor at heart, involved in research and development of new products. Yukio, the executive vice president, is in charge of manufacturing and the technical end of production. Kazuo, the president and



THE HUMBLE G-SHOCK PIONEERED TRENDS THAT CAME LATER TO LUXURY WATCHES, LIKE BULKY, MULTI-PART CASES, UNCONVENTIONAL MATERIALS AND BLACK-ON-BLACK COLOR SCHEMES.

CEO, is the sales and marketing guru, and has been the driving force in the company's recent push to refocus on its watch business by expanding beyond the lower end of the market and introducing more sophisticated products with higher price points. In his large office, surrounded by views of the Tokyo skyline, Kazuo Kashio says that the introduction of new products like the Oceanus in recent years is part of a larger strategy of growth in the watch market. "When I think about the future," he says, "I realize that if we only serve the market with existing products, then that market will not grow very much."

Photo: Michael Condon

WATCHES JOINED CASIO'S product portfolio with the debut of the Casiotron digital watch in 1974. The Casiotron, which showed the precise minutes, hours, and seconds, along with the date, day, and a.m. or p.m. indication, all on an LCD screen, was the world's first watch with a digital automatic calendar. Unlike with other quartz and mechanical watches, no hands or date disks meant no need to ever reset the calendar based on the length of the month. The Casiotron embodied the philosophy that the company still follows for its watches — to treat them not just as timekeepers but as information devices for the wrist. The company followed it up

The museum at Casio's corporate headquarters in Tokyo



Photo: Michael Condon

“THE G-SHOCK’S LOOK WAS SO DIFFERENT FROM CONVENTIONAL WATCHES AT THE TIME. IT WAS AMAZING TO SEE PEOPLE STAND IN LINE TO BUY THE NEW MODELS.”

— KAZUO KASHIO

Kazuo Kashio, a co-founder, and now CEO, of Casio Computer, Ltd.



Photo: Michael Condon

with other multifunction models, like the Databank Telememo, a high-tech watch that could save telephone numbers in its memory, and the PELA FS-10, a super-thin, lightweight digital watch that Casio says has the distinction of being the first-ever wristwatch to sell one million units. Others included calculator, dictionary, and even thermometer functions (this last evolved into today’s Pathfinder line). Casio also claims to be the first to use plastic for a watch case and strap, beating Swatch to the punch by several years.

The wildly popular Casio G-Shock was the game-changer for Casio’s timepiece division. The concept came from the fertile imagination of Kikuo Ibe, today Casio’s chief engineer of module development at its timepiece division. Ibe works at Casio’s research-and-development facility in Hamura, where I spend the second day of my Casio tour.

Ibe, who still projects a youthful vigor and takes pride in his contributions to Casio’s most successful watch, loves to tell the story of its creation. In 1981, Ibe broke a watch, given to him by his father, when he dropped it. Upset at the loss of the precious timepiece, he set about the task of making a watch that would be indestructible. Ibe developed the first prototype for such a watch in his workspace at Casio, and dropped it from the first floor window of the building. It broke. When he developed another prototype that withstood the first-floor drop without breaking, he dropped it from the second floor. That one also broke. Several prototypes later, he arrived at one that could fall from the third floor without breaking, but still sustained damage to the movement inside. Ibe ultimately found the missing piece of the puzzle after watching a young boy playing with a rubber ball. He reasoned that a watch whose movement was suspended inside a protective rubber casing could absorb shocks and impacts to the case. The result was the very first G-Shock watch, with a digital display, shock-protected movement, and a hard, plastic case with a protruding bezel to guard against the crystal shattering if the watch was dropped. The case was integrated into the urethane strap, which also acted as a shock absorber: it was cleverly curved so that the

watch would never land flat on its case-back. This concept is the foundation of the so-called “Hybrid Mount” case construction — which combines lightweight resin with strong metal parts — that Casio still uses in G-Shocks and other models.

That first, now-legendary G-Shock watch, officially designated with the model number DW-500C, actually received a lukewarm response in its native Japan, which was not yet ready for such a large, offbeat timepiece, when it was introduced in 1983. However, it sold very well in the United States, where customers appreciated its toughness, unconventional sporty design, and accessible price point. The chunky G-Shock was a breath of fresh air in an era known for thin, compact watches, and quickly caught on with outdoorsmen and athletic types who finally had a watch they could wear for their rugged pursuits without worrying about breaking it.

G-Shock has been Casio’s leader collection ever since. It is now available in numerous colors, several styles and even in some collectible limited editions, many of them associated with the celebrities that have become fans (and in some case, paid “ambassadors”) of the brand, which include actors, athletes, and musicians, primarily rap and hip-hop stars like Kanye West and L’il Wayne. Recent models have boasted specialized functions or attributes specific to the watch, as in the “Master of G” quartet: Frogman, with divers’ functions, 200-meter water-resistance and a tide graph; Riseman, with a thermometer, altimeter, and barometer for climbers; Gulfman, with rust-resistant titanium parts; and Mudman, with a dust-and-mud-resistant case structure.

In 1994, Casio expanded the popular G-Shock line into models more suitable for women and teens. Called the Baby-G collection, this line is today a major part of Casio’s watch strategy. Baby-G watches are also shock-resistant and water-resistant and they are available in an array of colors and styles (LCD, analog, or a combination of both, round or rectangular cases). Casio’s commitment to its feminine-sporty line was evident when it introduced the pop singer Kesha (who, appropriately

enough, sings a hit song called “Tik Tok”) as a celebrity endorser this year.

The initially reticent Japanese also, eventually, embraced the watch. Today, high-end Tokyo jewelers proudly display and sell it alongside Rolex, Omega, TAG Heuer, and other luxury sports-watch purveyors. And while a G-Shock collection does not have the cachet (or cash value) of a collection of fine Swiss-made mechanicals, the brand does have its diehard fans who track down every new-color model and limited edition. Even the Casio CEO, an unabashed booster of the G-Shock, was surprised when the watch achieved a level of pop culture cred with the youth. “G-Shock was something very new, with its shock-resistance and durability,” Kashio recalls. “It was intended to be a casual watch. We did not expect it to be accepted as a fashion watch so enthusiastically.”

All G-Shock models go through a battery of toughness tests, which I witnessed at the R&D labs in Hamura. These include two shock-resistance tests, one in which the watch is dropped from a great height onto a concrete block, the other in which it is hit by a swinging hammer into netting; a

The Casio building in the Shibuya district of Tokyo



Photo: Michael Condon

Below: the G-Shock Riseman; right: a new Baby-G model





Above: The G-Shock Aviation
Below: The Edifice EQW-M1100



CASIO PRODUCES 30 MILLION
WATCHES PER YEAR. WATCHES
ACCOUNT FOR \$900 MILLION OF
CASIO'S \$5 BILLION ANNUAL SALES.

water-resistance test, where watches are submerged in a tank under the equivalent of 200 meters of water pressure; and a vibration test, where a machine shakes the watch at high speed. Some models, like the new G-Shock Aviation, undergo a centrifugal gravitational force-resistance test, where a watch is hooked up to a spinning turntable that subjects it to the same continuous acceleration that vital aircraft equipment, like flight data recorders and voice recorders, must withstand before being approved for cockpit use.

The humble, plastic, mass-market G-Shock, in fact, pioneered some of the trends that have emerged only recently in the expensive, luxury end of the sports-watch market: big, bulky, shaped cases; unconventional materials; multi-part case construction; black-on-black color schemes; and an emphasis on hardening the case and protecting the movement from shocks. All of these were novel ideas when the G-Shock made its debut. According to Kashio, "The G-Shock's mostly black look was so different from conventional watches at the time. It was amazing to see people stand in line to buy the new models."

IN THE 1990S, with quartz technology evolving, Casio chose to update much of its watch line around a trio of technological cornerstones: solar-powered rechargeable batteries, radio-controlled multi-band atomic timekeeping and the so-called "Tough Movement" concept. In Hamura, Casio engineers explain the nuts and bolts of the various technologies.

The first Casio watch with radio-controlled timekeeping was 1995's FKT-

100L model. Watches using this technology receive signals from towers that transmit time-calibration radio signals calculated by atomic clocks. There are six of these towers worldwide: two in Europe (Mainflingen, Germany and Anthorn, England); three in Asia (Shangqiu, China; Fukushima, Japan; and Kyushu, Japan) and one in the United States (Fort Collins, Colorado). These account for the number "6" in "Multiband 6," the term Casio uses for the technology that enables watches equipped with it to receive signals from all six stations using tiny, highly sensitive antennas built into the movement. The result is a watch that always shows the precise time, whether its display is analog, digital, or a combination, and never needs manual resetting, even if you're changing time zones: the push of a button will indicate the new zone and move the hands automatically.

As Casio loves to point out, sticklers for timekeeping accuracy could scarcely do better than a radio-controlled timepiece: even a very accurate mechanical watch can lose several seconds per day of accuracy; a standard quartz watch can lose several seconds every month; but a radio-controlled watch, the company claims, might lose one second in 100,000 years. Casio is the market leader in radio-controlled watches, with 3 million units sold this year.

"Tough Movement" is the term used for Casio's automatic hand correction technology, wherein a built-in algorithm detects the positions of the hour, minute and seconds hands and shifts their positions if even the smallest slippage has occurred. Thus, the time received from the



The Oceanus, Casio's luxury-sport chronograph, and its component parts

radio signals is always precise.

The auto-hand correction, like the radio-wave reception that controls the time-keeping, is powered by a high-capacity solar battery. Solar power in quartz watches originated in the 1970s, and is today most associated with another Japanese watch brand, Citizen, which uses it in its line of Eco-Drive watches. Casio first incorporated this technology in a watch in 2001. Tiny solar panels on the face of the watch converts sunlight (or light from any source, really) into thermal and electrical energy that recharges the watch's battery, so the wearer can dispense with the bother and expense of regularly replacing it. In Casio's system, the 10-year battery powers tiny motors that control regular timekeep-

ing functions along with a multitude of others, including chronographs, alarms, calendars, and various sensor functions. Casio's umbrella term for this system is "Tough Solar" technology.

Admittedly, it's a lot of electronic, space-age stuff for a mechanical-watch purist to accept, and for the owner of a new watch to learn — Casio watches come with instruction manuals befitting a new camera or smart phone — but for some, a watch with all these bells and whistles can be a very hassle-free time-keeper.

IN 2004, Casio entered the premium tier of the analog quartz watch market with the launch of the Oceanus line, marketed

CASIO LAUNCHED THE OCEANUS AS A
LUXURY SPORTS CHRONOGRAPH
FEATURING BOTH SOLAR AND RADIO-
CONTROLLED TECHNOLOGIES.

The new G-Shock
Ultimate Tough GX56



as Casio's first luxury sport chronograph, priced to compete with similar quartz models from Seiko, Citizen, Tissot, Swiss Army, and others. The first Oceanus, which incorporated both solar power and radio-controlled atomic timekeeping, was an ana-digi model with a plethora of features: chronograph, second time zone, calendar, alarm, even a backlight that illuminated the dial when the wearer tilted his wrist. Most newer models, while maintaining all the technology and the nautical-themed blue color schemes on the dial, are all-analog, less bulky, arguably more luxurious, and priced higher. In 2007, the Oceanus Manta debuted as the world's thinnest solar-powered chronograph. This year's elegant OCW-S1400P model — which has a full gamut of complications, including chronograph and world time, sports a titanium case with blue IP highlights and a light blue mother-of-pearl oyster shell in the center of the dial. It's also got the "Tough Movement" auto-hand correction, and retails for \$1,300.

Another premium analog watch recently introduced to the U.S. market that Casio is excited about is Edifice, the brand's new line of high-performance, sporty chronographs. The most advanced model is the EQW-M1100. It incorporates Multi-Band 6 and Tough Solar technology and boasts a chronograph accurate to 1/1,000 of a second. Its multilayered dial has a 3D effect and uses disk hands. The disk hand at 9 o'clock alternates between clockwise and retrograde rotations while the stopwatch is in operation. The 1/1,000-second measurement and 1/100-second measurement are indi-

cated in, respectively, the upper and lower rings of the dial. Other Edifice models have a 1/20-second chrono (with disk hand) and a standard 1-second chrono (with gold-IP-plated case and bracelet). Edifice watches are priced between \$150 and \$500.

The Pathfinder collection — marketed in the rest of the world as Pro-Trek; a trademark issue necessitated a name change in the U.S. — is an analog-digital model targeted at hikers, mountain climbers, and other outdoorsmen. The first version made its debut in 1995 as an all-digital watch and has evolved since then into the current model, adding solar power in 2002, radio-controlled timekeeping in 2005, and analog elements this year, in the PRW-500 model. This watch is packed with sensor-based functions, including an altimeter, barometer, thermometer and digital compass, along with alarms, world time, LED light and a chronograph. The rugged, ultra-masculine case mixes resin and stainless steel and features oversized buttons with a skid pattern for easy gripping. Prices on the Pathfinder range from \$250 to \$450.

And, of course, the G-Shock line continues to expand. This year saw the debut of the first G-Shock designed in classic pilots'-watch style, the G-Shock Aviation, an all-analog watch. It's got an extra-wide, textured, double-layer dial with oversized Arabic numerals and indices in colors (orange or blue) that provide high contrast with the black dial. The large, protected buttons on the side of the case control an array of functions, including a

1/100-second stopwatch, world time, day/date, and alarm.

The G-Shock is also looking to reclaim its “big boy” status in these days of expanding case sizes. The G-Shock Ultimate Tough GX56 model is a monstrous 55 ½ x 53.6 mm, the biggest case ever on a G-Shock. It has gel inserts beneath the 12, 3, 6 and 9 o’clock positions on the dial to absorb impacts, and its strap is secured to the case by lug screws. The GX56 is available in the brand’s signature black or in “hazard” orange, each selling for \$150. Another new model that I glimpsed in Japan that is planned to hit the U.S. market is a G-Shock (model GW-S560) that uses a thin layer of carbon fiber to strengthen the standard urethane strap, making it nearly as unbreakable as the case. Carbon fiber, of course, has been a popular material in luxury watches the past few years, but Ca-

sio believes its new G-Shock model will be the first time it is used as a functional element of the strap.

Casio appears committed to an aggressive strategy for continued growth in its timepiece division. Despite the boom of recent decades in the luxury watch sector, it’s been speculated that wristwatches will, perhaps even in the near future, go the way of the dodo — made obsolete by cell phones and other technological devices on which their owners can check the time. That may be so, but judging by Casio’s dedication to its wristwatch business, one of the world’s foremost producers of such electronic devices doesn’t fear that day is coming any time soon. ○



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The new analog-digital Pathfinder, with altimeter, barometer and thermometer