



Highlights:

- Delivers retail-hardened systems and peripherals based on more than three decades of experience
 - Incorporates the principles of retail hardening during design, testing and manufacturing
 - Addresses extremely high operability standards that often exceed accepted industry requirements
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Retail-hardened store solutions from IBM

Are your point-of-sale systems designed to withstand hazards in your retail environment?

Reliability is one of the most important performance factors for any point-of-sale (POS) device, for one very simple reason: if the system goes down, even for a few minutes, the store cannot complete the transaction. When that happens, the customer is frustrated and customer loyalty falls, followed shortly by a decline in revenue.

Reliability is the most important performance factor for any POS system.

As retail businesses grow and expand, system reliability becomes even more important. Minor problems—so-called quick-fix failures that take only a few moments to resolve—can scale rapidly in frequency and severity as stores add checkout lanes or businesses acquire more stores. In other words, a headache for a retailer supporting 10 POS systems becomes a more serious disruption for one with 50 systems—and practically an unmanageable problem for one with 10,000 or more.

Retail-hardened solutions can help retailers maintain high uptime in extreme environments so transactions can be completed and technical support costs can be minimized.

Compared with a typical office environment, a retail store has far more environmental hazards—including temperature extremes, dirt, dust, grease, static electricity, shock, vibration, spills, magnetic fields and radio frequency interference. POS systems usually operate for long hours—sometimes 18 and even 24 hours a day, seven days a week. They are used by many different employees and too often handled roughly. This combination of environment, usage and extended hours means that retail systems not specifically designed for the hazards of retail environments are far more susceptible to early failures.



POS systems must meet a higher standard of retail hardening. Designed to provide a stable and robust platform for many years, genuinely retail-hardened solutions can help retailers maintain high uptime, so transactions can be completed and technical support costs can be minimized.

Designing a robust system

IBM POS solutions are specifically designed for the unique demands of the retail world. IBM retail-hardened systems are not generic office PCs repackaged or customized for retail; they are true POS systems engineered to deliver high uptime and long-term reliability under harsh conditions. Compared with the expected three- to five-year lifecycle of a typical PC with a cash drawer, IBM systems are known to be actively in retail service for seven or more years.

IBM POS solutions are specifically designed for retail. They are not office PCs repackaged for retail applications.

Heavy-duty chassis design

The basic chassis for POS systems from IBM is composed of high-quality materials, including impact-resistant plastics and heavy grades of sheet metal. The plastic of the exterior components of the system, including the monitor and peripherals, is flame resistant. It is also resistant to ultraviolet light, which helps prevent the yellowing or cracking that can occur when systems are exposed to direct sunlight. The sheet metal has a special coating designed to maximize surface electrical conductivity and improve electrostatic discharge performance.

IBM invests heavily in quality assurance programs with key POS suppliers so that components are designed to deliver longer service life. IBM designs POS systems for long-term reliability in retail. Although all customer environments are unique, the target service life is seven years in a typical retail environment.

Component selection

All POS parts are not created equal. IBM works with a core group of long-term suppliers and invests heavily in quality assurance programs to support first-rate component design and manufacturing. IBM designers select components that are designed to deliver longer life spans under retail conditions. For example, POS systems from IBM typically include gold-plated connectors, which reduce the likelihood of corrosion. Commercial PC manufacturers use tin-plated connectors that are not as robust.

Moreover, IBM guidelines require design teams to choose components that have high design margin and reliability ratings. If proper retail-ready and long-life parts are not available for a system, IBM designs them. In many cases, the component parts themselves are the same parts that are used in IBM's server products. Circuits and building blocks such as power supplies are designed with conservatively rated components to enhance long-term reliability. Fans utilize more-expensive ball bearing construction and have electronic fan speed control to maximize reliability and quiet operation.

IBM designs POS systems for long production and service life.

A technology purchase decision and rollout cycle in retail can last more than two years. Many manufacturers typically produce products for only six months before moving onto the next model. This is often driven by the component suppliers eliminating production of the parts. As a leader in the industry, IBM has a "preferred customer" status with our key technology suppliers. We work with them to identify the key components we need to have in order to manufacture products over a long period. These choices are made at the beginning of a program to help ensure a long production life for our customers. IBM retail systems are designed with a production life of at least two years (but often more), and service parts are available for a minimum of seven years after a product reaches the end of its production life.

Designing a holistic system

Unlike some other POS manufacturers, the IBM Retail Store Solutions team designs the logic unit, display, keyboard, printer and other peripherals to fit and work together as a single unit. The result is a stylish, cohesive package of retail components that complement each other both in appearance and in function. With the unified design, cables can be hidden within the unit to provide a cleaner appearance, and peripherals and features can be seamlessly integrated. Moreover, a retailer can choose IBM POS configurations for a specific store design or layout. For example, a retailer can choose to place only the display and keyboard on the checkout counter to maintain a streamlined, modern appearance.

IBM designs comprehensive POS solutions, including the logic unit, display, keyboard, printer and other peripherals.

The one-stop design approach offers more than just pleasing aesthetics: it helps reduce the time it takes to diagnose a system problem. In any situation where there are multiple parties responsible for the design of a system, a business typically must call several vendors to identify the problem and then determine which party is responsible for resolving it. IBM provides a single resource for identifying and resolving any concern—including user-friendly diagnostics and central site monitoring and management built into the POS systems.

IBM Light-Path Management, a distinctive IBM feature, aids in local diagnostics and helps service technicians bring the right parts to the store for a service call. IBM systems management tools, including IBM Remote Management Agent, help retailers monitor the health and software status of POS systems—in one store, a chain of stores or the entire enterprise. The tools can also monitor input and output (I/O) store devices from both IBM and third-party vendors. Systems can be managed locally or from one central site.

Building systems for the retail environment

IBM designs POS systems for long-term reliability in retail environments. Keyboards, for example, are made using a complex laser engraving process to label the keys, rather than printing letters and numbers on a POS keyboard that can rub off with constant wear. Power supplies are designed to survive severe dips and spikes of power caused by brownouts or utility switching—even a nearby lightning strike. They can withstand up to a 20 percent momentary drop in power without being reset and without secondary uninterruptible power supply equipment. The retail-optimized power supplies also promote energy-efficient operation and reduce the need for separate peripheral power bricks and associated cabling.

IBM POS systems feature numbered ports and latching connectors to facilitate easy installation and integration into the store without special tools or expertise. These latching connectors also help prevent cables from being accidentally unplugged, which can render a system inoperable.

IBM retail systems are designed for maximum flexibility. This provides a choice of installation configurations as well as investment protection.

Designing for retail requires systems to be configurable and upgradable. IBM offers POS systems with processor sockets, feature card slots, upgradable I/O configurations and other features that allow for easy enhancements. Retailers can evolve their store technology as their needs change, instead of ripping and replacing systems, so they can make the most of their IBM investments.

IBM systems are offered in a variety of formats with different functionalities that meet unique retail requirements. For example, 12-inch-wide systems are available for space-constrained areas, integrated units for clean and simple presentation, and distributed units that can be hidden under a counter.

Manufacturing innovations

To produce retail-hardened systems and peripherals, IBM employs a number of special practices:

Burn-in and power cycling

Retail testing is much more rigorous than common PC testing of 30 minutes at room temperature. POS systems from IBM are subjected to an extended burn-in and power cycling test. They are powered up and down numerous times and are run for as long as 12 hours at elevated temperatures. Extended burn-in and power cycling help eliminate out-of-box and early-life failures.

Round-robin testing during manufacturing helps identify issues that can result from nearly imperceptible differences in component quality.

Round-robin testing

In every batch of systems, IBM takes a number of units off the production line to run more extensive testing. The systems are loaded with an operating system, POS software and drivers, and then each is tested to check if the product is meeting its specifications. A burn-in test is run for several weeks during which systems are operated in elevated temperatures. This round-robin testing helps identify issues that result from nearly imperceptible changes in component quality, which could affect long-term reliability.

Preshipment integration

As a service offering for clients, IBM can assemble and test the parts of the POS solution—including peripherals, hard file, memory, adapter card and software—and ship it as an intact unit. Once it arrives, the retailer can simply plug the system in and start using it. This service provides a final quality check that not only helps reduce out-of-box failures but also speeds the installation process.

Testing to higher standards

POS systems and peripherals from IBM are tested rigorously to meet a wide range of industry, international and IBM standards for quality. IBM tests assembled systems in typical retail configurations—not just as an isolated system unit, keyboard or printer. IBM performance testing simulates worst-case scenarios.

IBM performance testing simulates worst-case scenarios. Systems must pass a battery of tests to be designated as retail hardened.

Although some POS vendors claim that they manufacture retail-hardened systems, only products that have passed an extensive series of test can truly stake such a claim. Below are examples of some of the tests.

Thermal envelope testing

IBM retail systems operate on cruise ships, at gas stations, in amusement parks, at mountaintop resorts and in the mist of scenic waterfalls. They sit in drive-through windows, are rolled out into parking lots for sidewalk sales and are shipped in a variety of conditions, from a tractor trailer passing through the desert to the subzero temperature of an aircraft cargo container. Because IBM products need to withstand prolonged exposure to a wide range of temperatures and humidity levels, they are tested in environmental chambers to help ensure that they can address these requirements in operating and shipping environments.

IBM retail systems operate on cruise ships, at gas stations, in amusement parks, at mountaintop resorts and in the mist of scenic waterfalls.

Operational tests simulate temperature and humidity conditions—from 5°C (41°F) to 40°C (105°F)—that occur in store environments. The systems are even operated beyond the condition end points to promote added protection. During these tests, IBM monitors the internal temperature of key components to help ensure that they do not exceed our test limits, which are conservative compared with the manufacturer's maximum ratings.

During thermal testing, the humidity is varied between 10 to 90 percent and often includes rapid increases and decreases in temperature. POS devices that pass these tests can be moved from inside to outside a store and continue to operate in a normal manner.

Test systems are also exposed to air temperatures from -40°C (-40°F) to 60°C (140°F) to help ensure that components are not damaged and that connectors don't crack or become loose during the most extreme shipping conditions.

IBM hardware is designed, manufactured and tested to limit lint contamination in critical components.

Dirt and lint particles can reside in stores, restaurants and other places where people gather and over time can lodge in the cracks and crevices of checkout systems. IBM hardware is designed, manufactured and tested to minimize the effect of dirt and lint contamination in critical components, which could result in overheating and costly downtime.

On many products, IBM performs two liquid tests, both of which exceed prevailing requirements in the PC industry.

Spill and drip testing

Spilled beverages and other liquid hazards can wreak havoc on a POS system that is not properly defended. This is especially critical in food service environments, where POS systems are regularly exposed to sticky beverages and other liquids.

IBM performs two liquid tests, both of which exceed prevailing requirements in the PC industry. One involves slowly dripping a variety of liquids on the system over a period of time. The other involves dumping an extra large cup of liquid—a frequent occurrence at the POS in sports arenas, pubs and bars. During the test, the system must continue to operate after such exposure to accidental spills.

POS systems from IBM have containment areas that direct the liquid away from sensitive electronics and toward drains, so it can exit the unit. Displays, printers and keyboards also have design features—such as seals and gutters—that divert liquid away.

Electromagnetic compatibility testing

Electromagnetic compatibility is a broad term that defines a product's ability not to affect, and not be affected by, other devices that transmit or receive electromagnetic signals. This testing is divided into two types of tests:

- **Interference testing** determines if the POS terminal interferes with other devices such as radios, televisions and the like. This type of interference is strictly limited by the U.S. Federal Communications Commission and other regulatory bodies.
- **Susceptibility testing** helps ensure that the POS terminal is not affected by other devices that might interfere with operating proper operation. This type of test is not typically regulated by regulatory agencies. Examples of these kinds of tests are immunity testing to strong radio fields, magnetic fields and static electricity.

IBM uses specific tests for these types of interference. The test criteria are significantly higher than industry norms.

IBM tests for susceptibility to a wide variety of electronic devices that can cause interference.

Radio frequency field testing

All POS products from IBM are tested to check for resistance to the effects of nearby radio transmitters. Although cell phones seldom present a problem because of their low power, more powerful radio frequency fields occasionally encounter POS systems through transmitters such as walkie-talkies.

Magnetic field testing

To protect POS products from antitheft demagnetizing units, IBM quality teams use testing hardware from several of the antitheft industry providers. During these tests, product performance is evaluated in relationship to the devices that demagnetize antitheft tags. These devices emit strong magnetic fields that can disable the system's magnetic stripe reader, distort the display image or corrupt the hard file. These tests provide retailers peace of mind in that the antitheft device will not affect system performance or reliability when placed at a reasonable distance away from the POS unit.

Electrostatic discharge testing

Electrostatic discharge (ESD) is the transfer of static electricity from one person or object to another. ESD occurs in all types of environments, but it can be found most often in low-humidity environments and in areas with carpeting. For example, a clothing store in winter typically creates a harsh ESD environment. An ESD discharge to an unprotected terminal will typically cause the terminal to hang or reboot. If the discharge is severe enough, it can cause damage.

Some countries require ESD testing to 8,000 volts. By contrast, all POS products from IBM are tested up to 15,000 volts to help facilitate proper operation in the most stressful situations. IBM tests to 15,000 volts based on feedback from clients over many years—an example of how the closed-loop process translates field experience into better products.

During ESD tests, IBM systems—including peripherals—are placed on a grounded metal table and repeatedly exposed to high levels of ESD. Testers apply different voltages and probes to different test points selected to provide worst-case conditions. In the test, the terminal is started with exerciser software, and thousands of discharges are applied to the various points to test for ESD impact. Multiple units are subjected to this test, and, as a result, IBM systems have a low risk of being affected by ESD, even when exposed to elevated ESD voltages.

IBM power supplies are designed to withstand a power line surge at amplitudes of 2,000 volts, which is equivalent to the effects of a lightning strike occurring nearby.

Lightning strike testing

POS systems can't be unplugged every time a thunderstorm rolls in. IBM tests all POS systems to help ensure they can withstand power line surges at amplitudes up to 2,000 volts, which is equivalent to a lightning strike to a nearby object outside the store. No system can survive a direct strike to its store's incoming power line, but POS systems from IBM are designed to stop the energy from a nearby strike at the power supply. This means the energy is not transferred to the other electronics in the system, including peripherals.

IBM tests all POS systems to help ensure they can withstand mechanical shock, vibration and long-term application of common cleaners.

Vibration testing

IBM conducts a variety of vibration tests to simulate the abuse systems receive during shipment and once installed in a normal retail store. A set of tests simulate the kind of vibrations experienced on an airplane flying through turbulence or a tractor trailer driving on a bumpy road—both common occurrences during shipping.

IBM uses motor-driven tables to shake test systems violently along all three axes to identify any potential weaknesses in the design or in the packaging materials. Other shaker tables simulate a less violent vibration but for a longer period. Systems are powered up and run during both of these tests and must continue to operate flawlessly for the duration of the vibration tests for them to pass.

Another test simulates the constant opening and closing of a cash drawer and the shock of breaking coin rolls against its edge. The test involves weighing down the cash drawer with coins and repeatedly opening and shutting the drawer with a pneumatic arm millions of times.

IBM conducts a variety of tests to simulate the abuse system units receive in a normal retail store, as well as during shipping and delivery.

Drop and fragility testing

POS systems from IBM are designed to be robust enough to withstand rough handling during shipping and delivery. To test their mettle, IBM performs several drop tests. Test systems, while in their shipping packages, are dropped multiple times from heights of 30 to 36 inches. Each device is dropped on all six sides, three edges and a corner to make sure it will not crack or shatter. The system must power up and operate without incident after each drop to pass the test. Depending on the product, some out-of-packaging drop tests are also performed.

Chemical resistance testing

Retailers use a wide range of cleaners in their stores, many of which are used around POS displays. Experience has proven that long-term exposure to cleaners can damage internal POS electronics and plastics. Chemical resistance testing checks if cleaners, solvents and other harsh substances often found in retail settings can penetrate the specially designed seals on IBM displays. Consumer-grade monitors, for example, do not have front seals to prevent cleaners from penetrating the unit. Testing helps IBM determine which materials and designs are most resilient.

More than 30 years of industry experience

IBM is the global marketplace leader in POS technology. Years of significant investments in resources, industry commitment and real-world experience have resulted in comprehensive solutions for retail that clients can trust, including IBM SurePOS™ units, IBM SureMark™ printers, IBM SurePoint™ displays and self-service solutions such as IBM Anyplace™ kiosks and IBM Self-Checkout systems.

We can tap into the entire IBM corps of scientists for their expertise in materials, metallurgy and other engineering disciplines, as well as their award-winning research.

World-class resources

The commitment IBM makes to designing, manufacturing, testing and supporting POS products is not limited to the Retail Store Solutions organization. Scientists throughout IBM are enlisted for their expertise in materials, metallurgy and other engineering disciplines, as well as their award-winning research. This investment results in a higher-quality product that helps IBM clients provide exceptional customer service, operate smarter and save money along the way

IBM Retail Store Solutions has been dedicated to POS equipment since 1972.

Focus and commitment

Many retailers choose IBM for its ability to deliver products designed exclusively for the unique demands of the retail environment. Dedicated to providing industry-leading POS solutions since 1972, the IBM Retail Store Solutions engineers invented the barcode for use by the retail industry. These years of experience enables the group to make expert design decisions and to customize POS solutions based on retailers' unique needs, whether a client needs 50 POS systems or 50,000 units worldwide.

With more than five million POS systems shipped and installed, IBM solutions can be found in practically every segment of the retail industry.

Global presence and experience

With over five million POS systems shipped and installed, IBM solutions can be found in practically every segment of the global retail industry. This effectively acts as the world's largest retail test laboratory, and we pride ourselves in taking what we learn in each segment and applying it to every client we serve.

About the authors

Breck Barker, manager, Technical Sales Support

Breck Barker joined the IBM Retail Store Solutions team in 1982 as a member of the 4680 POS development team. During his more than 30 years with IBM, he has participated in and led development teams for several retail hardware products. He has also managed the POS hardware and software development organization and provided technical support as the retail hardware product manager for Europe.

Dave Landers, system unit development manager, IBM Retail Store Solutions

Dave Landers is an IBM senior technical staff member and is now responsible for the overall hardware strategy for IBM Retail Store Solutions. He has been responsible for designing and continuously improving many of the POS systems in the current Retail Store Solutions portfolio. Dave has a deep understanding of how specific design choices affect performance in the short and long term. He has been with the Retail Store Solutions team since 1979.

**Don Smith, hardware test architect, development,
IBM Retail Store Solutions**

Don Smith joined the IBM Retail Store Solutions team in 2004 as the manager of its hardware support team. During his nearly 30 years with IBM, he has been a member of and led complex systems integration and flight test teams for several large-scale airborne projects. Through his involvement with the rigor and demands of flight safety testing, he knows the impact of inadequate testing on both IBM and the customer.

For more information

To learn more about how POS solutions from IBM can address the requirements of your unique retail environment, contact your IBM sales representative or IBM Business Partner, or visit: ibm.com/products/retail



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IBM Retail Store Solutions
P.O. Box 12195
3039 Cornwallis Road
Research Triangle Park, NC 27709
U.S.A.

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