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Reliable and Durable: What makes HP Point of Sale Systems "Retail Hardened"?

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HP is committed to offering point-of-sale (POS) platforms that are designed, manufactured, and tested to meet the demands of the retail and hospitality markets.

HP understands the needs of retailers and hospitality operators and is focused on providing POS systems that are reliable, durable, and can operate under extreme conditions; HP calls this "retail hardening."

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Executive summary

The focus of retail hardening starts with the materials and components selected for the POS platforms. HP selects materials such as the steel chassis and gold-plated connectors that will be able to withstand extended use and extreme temperatures. HP is conscious of the space limitations within retail and hospitality environments and therefore selects connectivity components that allow for flexibility, and yet provide the power and security features needed in a retail setting.

Additionally, HP is mindful of the environment when selecting materials and components for the POS systems, and strives for the platforms to be built with materials and components that are greater than 90% recyclable. This far exceeds the "Waste of Electrical and Electronic Equipment" (WEEE) requirements.

A focus on retail hardening can also be found in HP's design and manufacturing of the POS platforms. They are built to be ruggedable to stand up to the everyday wear and tear of a retail or hospitality environment yet they are also energy efficient. In many instances, HP POS platforms consume less energy than a 60W light bulb when sitting idle.

Test procedures help ensure you get a durable product for your retail or hospitality environment. For example, HP POS systems can be housed in a small space or operate in protected outdoor locations where thermal temperatures may be higher. Additionally, HP POS systems are manufactured to ensure power and electrical integrity.

HP performs a multitude of tests to help ensure that the POS systems will continue to operate under extreme conditions.

Tests are performed on the exterior materials and components to ensure their ability to endure retail wear without being damaged. The internal systems and components are also put through rigorous tests to make certain that they will continue to operate should there be variations in factors such as AC power and thermal temperatures. HP POS systems are also tested for shock and vibration.

Executive summary

In addition, there are other materials, design factors, and tests that HP uses to ensure that HP POS systems are ready for various retail usage scenarios. These additional design factors such as cable construction, diagnostic indications, and security features are not limited to the HP POS systems, but they do help to ensure that the POS systems are reliable, durable, and ready to meet the needs of retailers.

Retail hardened

HP POS platforms are designed for retail and hospitality with reliability and durability in mind. Retailers need a POS system that can withstand the typical wear and tear of the retail and hospitality environments, from extended operational hours and higher temperatures than typical computing devices, to dust and accidental impacts. Any failures or downtime can be detrimental to their revenue and profitability.

HP understands the needs of retailers and hospitality operators; therefore, HP POS systems are designed and tested to meet high standards, HP calls this "retail hardening." This whitepaper describes some of the steps that HP takes to ensure a retail-hardened design is achieved, from the meticulous selection of components and materials; to the key design and manufacturing details and the extreme testing methodologies that are instilled in every one of the HP POS platforms. This ensures that HP POS systems are of the highest quality and are some of the toughest in the industry.

Simply put, HP POS platforms are built to last.

Materials and components

HP POS platforms are constructed with materials and components to help ensure you get a durable product for your retail or hospitality environment. HP is focused on how the POS system operates in these types of environments, which many times are in small, high-traffic dusty environments.

The following section will discuss the retail-hardened materials and component selection for:

- Chassis construction
- High-quality connectors
- High-endurance capacitors
- Robust power supplies
- Powerful and flexible connectivity
- Material recyclability

Retail hardened

Materials and components

Chassis construction

HP chooses materials and components that can hold up in retail and hospitality environments. The chassis is constructed by using thick grades of sheet metal and plastics that are UV & flame resistant.

The internal plastics are of the highest flammability rating as well. In addition, many of the chassis' seams and edges are hemmed to provide additional strength and durability where needed. The modular POS chassis has passed a 75 lbs. weight test without warping or bending. All HP POS chassis are ready to meet the challenges of any retail or hospitality environment.

Gold-plated connectors

HP selects high-quality connectors that are gold-plated for most of the internal and external connectors. With many POS systems running continuously for long periods of time in various climates, connectors may be more vulnerable to corrosion, which can lead to faulty connection points between the POS platform and the POS peripherals. Gold-plated connectors provide longer insertion life and lower susceptibility to corrosion. In addition, most of the connectors on HP POS systems feature a latching capability.

For example, HP uses screw locks on serial, parallel, and video connectors. LAN jacks and powered USB ports also have a latching mechanism. In a busy retail or hospitality environment where systems are bumped or where cables can get caught and pulled out easily, these latching mechanisms allow for the peripherals to stay connected to the POS system.

Retail hardened

Materials and components

High-endurance capacitors[2]

In many retail and hospitality environments, the POS system operates in small, confined spaces for extended hours where thermal conditions may tend to be higher. Therefore, it is important that components, such as capacitors can function in these extreme conditions without failure. HP selects only the highest-quality, high-endurance capacitors for extended life and better thermal susceptibility.

Most of the capacitors are rated for 3,000-4,000 hours, running at their highest temperature rating. In retail and hospitality environments, this translates into many years of operation without bulging or failure. All capacitors are tested at maximum system thermals to ensure they can sustain the temperatures of a POS system that may be placed in an ambient environment of up to 40°C.

This means HP POS systems are designed to have a longer life and will be able to handle the stressful demands of point-of-sale environments.

Retail hardened

Materials and components

Robust power supplies

HP POS systems use strong and robust power supplies that reduce the need for separate peripheral “power bricks” (external power supplies that come with many other peripherals) and can support powered peripherals. This means HP power supplies are rated to handle any POS peripheral load, and it also means that in a tight-spaced retail or hospitality environment, less power supply adapters (“power bricks”) laying around will help to free up valuable counter space. HP power supplies are rated well above the power needed for the base POS system to provide the power needed for typical POS peripherals.

HP only selects high-endurance capacitors and ball-bearing fans for the power supply designs. This allows the power supplies to withstand higher thermal conditions and longer run-times as many businesses may run their POS systems for extended hours.

Powerful and flexible connectivity

HP POS platforms are the most flexible, offering all the standard I/O connections while also supporting point-of-sale specific connections for powered POS peripherals.

This eliminates the need for external peripheral “power bricks” which cuts down on cable clutter and allows for more counter space. HP POS systems offer optional “Powered USB” ports and configurable “Powered Serial” ports on all platforms.

Retail hardened

Materials and components

Powerful and flexible connectivity	
Some key benefits of powered ports:	
Flexibility:	Allows the use of Powered USB peripherals or standard USB 2.0 peripherals since either type of peripheral will work in a Powered USB port, or you can future-proof with a USB-C connector.
Power:	Powered USB ports and Powered Serial ports are designed to deliver the power needed to support POS peripherals without the need for an external power supply adapter (power brick), which is commonly seen on POS peripherals.
Protection:	Each Powered USB, Standard USB, Serial, VGA, and PS/2 ports have polyfuse protection so that if a peripheral should malfunction due to an over current condition or power to ground short, the polyfuse will open and protect the platform from permanent damage. The polyfuses are self-resetting, which means after a trip condition, the polyfuse will reset, enabling the circuit automatically and the ports will again function normally.

Retail hardened

Materials and components

Powerful and flexible connectivity	
Some key benefits of powered ports:	
Locking :	Each Powered USB port has a self-latching feature so that POS peripheral connectors lock into the port. Each serial port has a screw-lock feature so that the serial port peripherals can be screwed into the port. These are both valuable features in a populated environment, like a retail store, where non-latching cables could accidentally be unplugged.
Material recyclability:	All HP POS platforms are designed with the environment in mind. HP targets the POS platforms to be built with materials/components that are greater than 90% recyclable. This far exceeds the “Waste of Electrical and Electronic Equipment” (WEEE) requirements, which state that a system must be at least 65% recyclable with less than 25% that can go into landfills. In designing its products to be mostly recyclable, HP helps reduce the negative impact on the environment and the amount of waste into landfills.

Retail hardened

Design and manufacturing

HP POS systems are designed with the retail and hospitality environment in mind. They are built to be rugged, yet energy efficient. HP is focused on designing POS platforms that can withstand the wear and tear of a retail or hospitality environment and continue to operate without failure. The following section will discuss the design and manufacturing for:

- Chassis stability
- Energy efficiency
- RoHS regulation
- Thermal tolerance
- Board flex/dye stain testing and cross section
- TDR/PCB impedance
- Power cycling
- Dust and spill resistance

Chassis stability

In addition to the strength of the chassis itself, stability is also important for POS systems especially with the HP Engage One All-in-One family.

When the operator interacts with the touch screen, the screen and system need to remain stable for fast, accurate, and comfortable input. The system weight along with base body construction is designed to provide both chassis stability and excellent user experience chassis are ready to meet the challenges of any retail or hospitality environment.

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Design and manufacturing

Energy efficiency

The HP POS platforms are designed to be energy efficient, in that they do not waste valuable electrical energy when sitting idle or powered off. In many instances, HP POS platforms consume less energy than a 60W light bulb when sitting idle. All the POS platforms are designed to conform to the latest European Union (EU) mandate for power consumption when off (plugged into an AC outlet): less than 0.5W for all systems currently ship into the EU. Although this mandate is only required for products that ship into the EU, all the HP world-wide POS platforms meet this requirement.

RoHS regulation

HP also designs all our POS platforms to be compliant with the "Restriction of Hazardous Substances" (RoHS) regulations. RoHS mandates that harmful substances such as lead, mercury, hexavalent chromium, polybrominated biphenyls (PBBs), polybrominated diphenyl ethers (PBBDE), cadmium, and more are greatly reduced below defined limits set by the RoHS regulators.

Thermal tolerance[2]

Many POS systems are exposed to a wide range of temperatures when placed in areas such as a drawer, closed cabinet/ closet, cubbyholes, or protected outdoor environment. Because of this, HP POS systems are designed to operate in a 40° C/104°F ambient temperature and 85% relative humidity environment. HP also conducts many tests and component/material evaluations to validate the designs and ensure this claim is met.

Retail hardened

Design and manufacturing

Board flex/dye stain testing and cross section[2]

HP understands that in busy retail and hospitality environments, POS systems may get frequently moved or bumped; therefore, we conduct board flex/dye stain testing to make sure that our circuit boards will continue to function normally in the event of an impact. In this testing motherboards are flexed, and a dye-stain test is performed to ensure sensitive Ball Grid Array (BGA) connections are soldered robustly. After the board flex test, the boards are dipped in a special dye. Once the dye cures, all BGAs are removed, and balls/pads are inspected. If any cracks are noted that are more than 50% of the ball/pad surface, the design is rejected and a re-design of the board and/or chassis takes place until acceptable results are achieved.

The motherboards are also cross-sectioned, and all through-hole barrels are inspected to ensure proper plating and soldering have thoroughly flowed. All surface mount components are visually inspected under a high-powered microscope to verify solders are solid and that pads have not lifted during the manufacturing process. This not only ensures that board flex will not cause failures, it also provides assurances that the manufacturing processes are of the highest quality.

Retail hardened

Design and manufacturing

TDR/PCB impedance

Retailers rely on their POS systems to run their businesses; therefore, system stability is extremely important. The Time Domain Reflectometry (TDR) is used to verify that the impedance of all printed circuit board (PCB) traces on the motherboard, riser cards, and daughter cards are within specification as outlined by their corresponding interface guidelines. If any impedance measurement is out of specification, the board must be redesigned to bring the impedance back into specification.

This ensures good electrical and electromagnetic signal integrity, which translates into system stability especially when intensive software applications are running in an environment with unstable AC power and thermal conditions.

Power cycling

To ensure that all voltage regulators, control signals, and clock signals within the POS system sequence are on and off correctly, HP performs power cycling tests during all design and prototype phases and during manufacturing up until production.

The power cycling test is performed by cold power cycling, removing alternating current (AC) power—power that comes from the electrical outlet—and warm power cycling-graceful shutdown but the POS system is still plugged into the wall and receiving AC power.

Retail hardened

Design and manufacturing

Dust and spill resistance[2]

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Retail hardened

Testing methodologies[2]

HP is committed to offering reliable and durable retail point-of-sale platforms. Therefore, meticulous testing is performed on the POS systems to ensure that they can operate under extreme conditions without failure. The following section will discuss the various tests that are performed on:

- Exterior materials and components
- Internal systems
- Power and thermal variations
- Impacts and vibrations

Cosmetic finish testing

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Retail hardened

Testing methodologies[2]

Power supply industrial testing[2]

As previously mentioned, HP POS systems are often required to operate in extreme environments, and power supplies can sometimes be a point of failure. To mitigate this, various aspects of the power supplies are checked to assure a robust design and solid construction. The industrial tests check solder joints, glue adhesion/positioning, mounting structures of internal heatsinks, locations of all through-hole components, and internal cable/wire management. Shock, vibration, and drop tests are performed to ensure solid solder joints and to ensure that the power supply will continue to operate should the system be dropped, bumped, jarred, or subjected to continuous vibration.

Battery life test[2]

The battery life test ensures that key system information that is stored in CMOS, such as hard drive configuration, memory configuration, processor information, date, time, etc., will not be lost should the POS system be without power for an extended period of time. The purpose of the battery life test is to ensure the coin cell CR2032 battery, which keeps this critical circuitry powered on when the POS system is unplugged from an AC power outlet, will not prematurely fail if the system is unplugged from an AC outlet for an extended period of time. If a battery dies before its life rating, then the electrical circuit design is checked to ensure unnecessary loads on the battery do not exist when the system is unplugged from AC power. If unnecessary loads are found, the circuit is redesigned as necessary to ensure battery life is optimized and will not prematurely die before its life rating.

Retail hardened

Testing methodologies[2]

Fan reliability[2]

Retail and hospitality environments vary, and many retailers are operating for extended hours; therefore, it is important that fans do not fail inside the POS system. Such failure may cause the POS system to overheat and shut off. To safeguard against internal fan failure, only the highest quality, ball-bearing fans are used in HP POS systems. To ensure the highest quality fans, HP tests a sample of 55 fans from different fan suppliers for 2,000 hours running at full speed in a 70°C/60% RH humidity environment, non-stop. This is a very intensive test for fans.

A sub-standard fan will undoubtedly fail such a test; however, HP insists that the fans run the full 2,000-hour duration without failure. Once the test is complete, five sample fans are torn apart and evaluated for wear and corrosion. If a fan fails, or if any unusual wear or corrosion is found, HP will work with the fan suppliers to improve their fan design or choose another fan model/supplier. A retailer should never have to worry about their POS system overheating due to internal fan failure.

System Compatibility and Integration Testing (HSCIT)

Retailers need flexibility with their POS systems to meet their unique business needs; therefore, a comprehensive System Compatibility and Integration Test (HSCIT) is performed on all POS systems that HP designs. This test consists of mixing and matching internal and external accessories and components to ensure the POS system will operate normally. Retailers can rest assured that many combinations of internal and external modules on their HP POS system operate and perform as expected.

Retail hardened

Testing methodologies[2]

Interface stress testing

POS systems, as with all electronic devices, have critical internal electrical interfaces and circuitry. Each electrical interface is put through its pace by utilizing stressful test suites in our evaluation lab. The stress tests are designed to maximize and stress all electrical interfaces using tests written by the HP Evaluation Test Design (ETD) team and by using industry benchmark applications and high-power applications.

All major interfaces are margin tested for voltage and timing to ensure that fluctuations in power and timing (clock generators) will not result in system hangs, blue screens, or reboots. These tests ensure that the POS system is highly reliable and robustly designed.

Power measurements

HP POS systems are robust enough to handle typical retail accessories (component or peripheral) as well as a possible faulty accessory that may get unknowingly installed. Power consumption of all key critical components is checked as well as many 3rd party (non-HP) peripherals to ensure that each peripheral will not exceed the power which the power supply can deliver.

Fault conditions are also checked such as shorting devices to ensure the power supply and on-board regulators shut down as designed to help prevent overheating. This helps protect the POS system from system overload or permanent damage.

Retail hardened

Testing methodologies[2]

Electrostatic Discharge (ESD) [2]

Electrostatic Discharge (ESD) can occur without warning and can be very detrimental to a retailer's business if the POS system gets damaged because of ESD. An ESD event can permanently damage a system if the system is not designed properly to handle such an event.

HP POS systems are designed to survive an ESD of up to 4,000 volts (direct contact) and 8,000 volts (air contact). In many cases, the POS systems can withstand an ESD of up to 15,000 volts of air contact discharge. This is extremely important in a retail or hospitality environment where ESD events occur all the time.

Power-on after power loss in BIOS

If a retailer's location loses power, HP POS systems feature a "power-on after loss" in F-10 setup. The retailer can enable this setting so that if a power outage is experienced, the system will power back on automatically and boot back into the operating system after a power loss.

This feature is extremely important if the POS system is in a remote location where staffing is at a minimum and the POS system needs to be on at all times—such as a self-checkout, kiosk, or as a server application in the back office.

Retail hardened

Testing methodologies[2]

Radio frequency (RF) interference

Currently, with the multitude of devices that use radio frequency (RF) signals, it's important that these signals not interfere with one another. HP tests all POS systems for a wide range of RF signals to ensure that RF interference will not cause the systems to lock up, blue screen, or shut down.

The systems are also tested to verify that they do not exceed the acceptable RF emittance into the environment as specified by regulatory agencies. Designing the HP POS systems with this in mind allows the retailer to continue operating without failure to their POS system or having to worry that their POS system will cause failure to nearby electronics.

Storage thermals[2]

HP POS systems are exposed to severe temperatures when the system is powered off to simulate storage/warehousing conditions for all climate types. The temperature range tested is -40°C to 60°C.

After this test, all internal system components are inspected to ensure corrosion has not started to occur or that degradation in the thermal paste for internal heatsinks has not occurred. This ensures that the system will not be susceptible to extreme temperature conditions that may be present in storage environments.

Retail hardened

Testing methodologies[2]

Drop test[2]

HP POS systems are tested to sustain 19 drops from 30" and 36" depending on weight when packed in their shipping boxes. The drop test simulates what might happen during shipping/handling, such as a forklift that may drop a pallet load or a boxed system that may fall off a shelf.

If the system can pass this test, i.e. no components are damaged or have fallen off, and the system can boot and successfully run a system stress test without any failures, then HP is confident that it can survive the typical shipping/handling events.

Packaging testing[2]

The packaging test is also designed to simulate shipping/handling events that may possibly damage the system such as a truck rollover or a forklift dropping a pallet load.

The packaging test is focused on the design of the cardboard box and cushions. If the system can pass this test, i.e. no components are damaged or have fallen off, and the system can boot and successfully run a system stress test without any failures, blue-screens, lock-ups, or reboots, then HP is confident that the packaging is well-designed to protect the POS system during shipping/handling.

Retail hardened

Testing methodologies[2]

Operational vibration[2]

Operational vibration testing is performed on all HP POS systems to ensure that they can survive retail and hospitality environments where vibrations may occur, such as a system that is placed on a rolling cart. Operational vibration tests are performed on all three axes (side/side, front/back, top/bottom). The system must successfully remain powered on during these tests without any failures, blue-screens, lock-ups, or reboots.

Random vibration, trapezoidal shock, half-sine shock[2]

The purpose of this test is to ensure the system can survive harsh vibrations and shock. This test is similar to the operational vibration test, except the vibration and shock events are random. The test is designed to simulate an extreme, highly unrealistic, environment.

The system must also pass a 45Gs wave shock. If the system can pass this test, i.e. no components are damaged or fall off, and the system can boot and successfully run a system stress test without any failures, blue-screens, lock-ups, or reboots, then HP feels confident that it can survive the typical daily shocks and vibration events in a retail or hospitality environment.

Retail hardened

Testing methodologies[2]

HALT (Highly Accelerated Life Test)[2]

HP POS systems are tested under an accelerated vibration and thermal scenario to find out where the first point of failure may occur. The test runs in steps and if the POS system continues to pass, the vibration and thermals are increased at each step until a failure is noted.

This helps determine how much vibration and thermal margin are in the POS systems, which therefore allows HP to build confidence in the designs knowing that the POS systems can withstand a lot of abuse before failing. HP's goal is to have a good margin so that the end-user will not experience a failure. Many of the units do not see failures until 12-17 Grms of vibration or at 70°C thermals. All failures are evaluated and then a decision is made if the failure is acceptable or if the design needs further improvement.

Strife testing (stressful life testing)[2]

The strife test is designed to shock the system thermally under various power loads and various time durations. This test ensures that the POS system will operate correctly under any extreme thermal or power load environment. The test is performed in a chamber that can instantly change power loads and thermal loads in a matrix of conditions, checking all four corners and combinations therein.

The four corners are equal to high temp/low power, high temp/high power, low temp/low power, and low temp/high power. The purpose of this test is to ensure the reliability and robustness of the POS system.

Beyond retail hardened

There are additional tests, checks, and features that HP uses to ensure that not only HP POS systems, but all HP products are designed, manufactured, and tested to be highly reliable and durable. The next section details how these relate to retail and hospitality environments

SATA Cable Test Identification (TID)

In a retail or hospitality environment, protecting your data is paramount and therefore HP attempts to mitigate data failure by ensuring robust connectivity between the POS system's internal hard drive and motherboard. Since SATA cables can be a point of failure, HP only selects SATA cable suppliers that have a Test Identification (TID) on file with the serial ATA organization.

The Serial ATA organization has a standardized test suite that checks the construction and durability of SATA cables. When the tests are completed with passing results, a SATA Test ID (TID) is assigned to the SATA cable supplier. The tests verify connector-housing quality, connector mating, surface insertion, angle insertions, front and back inclined forces, cable crimping, and separation. SATA cables must pass this test to receive a TID, and HP only selects SATA cables that have a TID.

Socketed components

Many of the HP POS systems are the ultimate in flexibility and serviceability, which allow the retailer to focus on growing their business because it offers them the ability to easily enhance their POS systems as needed. The HP Engage Flex Pro POS System, for example, uses socketed processors, memory, and card slots for maximum upgrade flexibility, and to allow for quick and easy service repair in the unlikely event of a part failure.

Beyond retail hardened

Active Power Factor Correction (PFC)

There are many inefficiencies in a power distribution network as the power circuits perform “work” to deliver power (voltage x current) to a load. Inefficiencies can occur due to energy stored in a load and returned to the source (power supply) or due to non-linear loads that distort the wave shape of the current drawn from the power supply. Power Factor Correction is the ability to correct these inefficiencies. There are two types of power factor correction: Active PFC and Passive PFC. Passive PFC is the most common and less costly solution because it uses a passive network of capacitive filters on the AC input to correct power inefficiencies.

Passive PFC is not as robust as Active PFC because it requires the AC input voltage to be set manually and does not use the full energy potential of the AC input. Active PFC allows power distribution to be as efficient as possible by using an active circuit to correct power inefficiencies. The circuit is “active” meaning it can respond to harmonics and is capable of a full range of AC input voltages, versus a limited manually set range for Passive PFC.

Simply put, Active PFC translates into a more efficient power distribution network, which equates to less energy waste and higher energy cost savings. All HP POS platforms use power supplies that are designed with Active PFC.

Beyond retail hardened

Power dip testing[2]

Many retailers are subjected to unstable power conditions at some point in time, especially in emerging countries. HP power supplies can withstand a 20% dip in power without the need for secondary UPS. They are designed to operate between 90Vac - 132Vac. So a 20% drop to nominal 115Vac voltage equals 92Vac which is above the minimum rating for all countries except Japan. In Japan, the nominal voltage is 90Vac. For this region, HP power supplies can withstand a 10% dip in power. Therefore, HP POS systems will operate seamlessly even under unstable power conditions.

Power line testing[2]

Power line conditions can change unexpectedly, especially in emerging countries. Therefore, HP performs power line testing. This test ensures the POS system will be stable even when unstable AC power scenarios might exist. The test is performed at various temperatures under the following AC voltages: 90V/63Hz, 180V/53Hz, 90V/57Hz, 180V/47Hz, 132V/63Hz, 264V/53Hz, 132V/57Hz, and 264V/57Hz. For each AC voltage, a system stress test is performed and the system must pass each voltage for 8 hours of continuous operation without failures, blue-screens, lock-ups, or reboots. This helps ensure that HP POS systems will operate seamlessly even under unstable power conditions.

Altitude testing[2]

Altitude testing is performed to ensure that HP POS systems can operate normally at extreme altitudes. This test is performed in a chamber that can simulate an altitude of 3,048m (10,000 feet). The test is performed at 100% max power load at this elevation. No blue-screens, lock-ups, or reboots are allowed.

Beyond retail hardened

Hinge Cycle and Wobble Testing[2]

The Hinge Cycle Test includes both a vertical position test as well as a tilt position on the POS system. The vertical position tests the unit's support arm reliability for 10,000c cycles. The unit is subsequently checked for any changes in performance or unusual sounds. The tilt position tests the unit's hinge reliability for 10,000 cycles. The unit is subsequently checked for changes in performance and for any unusual sounds. The unit must pass both the tilt position test as well as the vertical position test, showing no change throughout all the cycles while hinge retention force reduction not to exceed 15%.

The Wobble test consists of applying a force at various locations of the display head, and with display head in minimum and maximum height positions. At each point, the force required to lift the unit from the base is calculated and then a force equal to 90% of the lift-off value (but not less than 8N) is used for the wobble test at that input point. Pass criteria for the wobble test requires that all test points induce less than one second of wobble.

Acoustic testing[2]

Some retailers have quiet, serene environments. In such an environment, the last thing they need is a POS system with a loud fan. Therefore, acoustic testing is performed on the HP POS systems to optimize the acoustic levels of the internal fans, hard drives, and optical drives. A sophisticated algorithm is implemented in the HP BIOS that optimizes acoustic levels while maintaining good thermal margin of key components within the POS system.

Beyond retail hardened

Electrical signal integrity[2]

POS systems, as with all electronic devices, have critical internal electrical interfaces and circuitry. Electrical signal integrity testing is performed on all signals and interfaces on the motherboard, power supply board, riser boards, etc. Signal integrity includes noise measurements, cross talk evaluation, setup/hold time evaluation, signal overshoot/undershoot, ringback, duty cycle, jitter, etc. The full electrical parameters of each signal are tested, and the results are compared against the interface specifications from PCI, PCI-express, SATA, USB, Powered USB, DDR, eSPI, PS/2, UART, DMI, HDMI, DP, and Type C.

HP also checks and verifies the operation of power sequencing signaling, thermal signaling, and control signaling. Power rail noise, power rail margining, and clock and differential pair margining are also measured. All signals must be within specification or the design is rejected and re-designed as necessary to bring the signals within specification.

Memory compatibility testing

Tests are performed on all possible system memory configurations which includes mixing and matching various sizes, speeds, cache latency, models, and vendors to ensure all memory is compatible under any configuration in the system without failures, blue-screens, lock-ups, or reboots. If a failure is noted, the root cause is located, and the design is corrected and/or HP will work with the memory supplier to correct their memory module design. This helps ensure that the HP POS systems will run with any memory mix.

Beyond retail hardened

Network Interface Connection (NIC) IEEE testing[2]

Network connectivity is an important necessity for many retailers, allowing them to take orders or process transactions. The purpose of the NIC IEEE test is to ensure good network connectivity and end-to-end signal integrity over a cable length of 160m (525 feet). All signal integrity measurements must be within specification with no bit errors. This helps to ensure that the HP POS platform can be placed anywhere within the store and will have solid network connectivity, even on long network cable runs.

Diagnostics

In the unlikely event that the POS system experiences a failure, HP has designed each of the POS platforms with a critical event self-diagnostic feature, called “BeepLED.” This feature quickly allows the retailer or service technician to identify critical failures in the POS system so that downtime is minimized. BeepLED provides visual and audible notification in the event of a failure, by blinking the power LED red and sounding the buzzer/speaker synchronously in a series of beeps or blinks connectivity, even on long network cable runs.

Beyond retail hardened

Diagnostics		
This feature only works at boot/POST and checks for the following:		
Category	Major/Minor Code in Spec	Description
BIOS	2.2	The main area (DXE) of BIOS has become corrupted and there is no recovery binary image available
	2.3	The embedded controller policy requires the user to enter a key sequence (SureStart)
	2.4	The embedded controller is recovering the boot block or DXE; since it takes approx 10 seconds to load the DXE image and get video in the DXE case, this blink code is necessary(SureStart)
Hardware	3.2	The embedded controller has timed out waiting for BIOS to return from memory initialization
	3.3	The embedded controller timed out waiting for BIOS to return from graphics initialization; or graphics adaptor not found; or integrated panel not attached (M-AiO)
	3.4	The system board displays a power failure (crowbar)*

Beyond retail hardened

Diagnostics		
This feature only works at boot/POST and checks for the following:		
Category	Major/Minor Code in Spec	Description
Hardware	3.5	The CPU is not detected* or not supported
	3.6	The CPU does not support an enabled feature (typically this applies only to TXT)
Thermal	4.2	A CPU over temperature condition has been detected*
	4.3	An ambient temperature over temperature condition has been detected
	4.4	An MXM over temperature condition has been detected
System Board	5.2	The embedded controller cannot find valid firmware
	5.3	The embedded controller has timed out waiting for the BIOS
	5.4	The embedded controller has timed out waiting for the BIOS to return from system board initialization.

Beyond retail hardened

Diagnostics		
This feature only works at boot/POST and checks for the following:		
Category	Major/Minor Code in Spec	Description
System Board	5.5	The embedded controller rebooted the system after a possible lockup condition has been detected through the use of a system Health timer, Automated System Recovery Timer, or other mechanism
	5.6	The system was powered on with a jumper on the FDO 2 - pin header
	5.7	The booter cannot find valid embedded controller firmware.
Debug	6.x	Debug only - disabled by the development team prior to production release.
	6.3	Debug only - No valid SIO configuration table (SIOCT) entry found for this platform ID

*Indicates hardware triggered event; all other events are controlled by the BIOS

Beyond retail hardened

Security

Security is important in a busy retail or hospitality environment. Store owners should never have to worry about their POS systems getting stolen or being tampered with; therefore, HP designs all POS systems with security in mind. For instance, each of the HP POS systems features locking support that accepts a Kensington lock, a Noble lock, or a padlock. The lock kit keeps the hood of the POS system from being opened and keeps the system from being easily stolen. Additionally, to reduce unwanted tampering, all USB ports can be disabled in F-10 setup. In F-10 setup, the user can setup a "power-on-password" and an "F-10 setup password."

These password capabilities are available to keep personnel or others from changing critical system and CMOS configuration information on the POS system the root cause is located, and the design is corrected and/or HP will work with the memory supplier to correct their memory module design. This helps ensure that the HP POS systems will run with any memory mix.

Under desk mount/wall mount security sleeve

An under-desk mount/wall mount security sleeve was designed for the HP Engage Flex Pro Retail System. This sturdy, all-steel sleeve was designed to mount the RP5 POS system out of the way, to free up valuable counter or floor space. The sleeve also allows a retailer to lock the POS system into the sleeve with any of the three lock kits mentioned previously (Kensington lock, Noble lock, pad lock) connectivity, even on long network cable runs.

Beyond retail hardened

Computrace

Since sensitive data may be stored on the POS system, it is important to protect this data from the risk of breach or theft. Computrace3, which is supported on all HP POS systems, is a possible solution to protect sensitive data. All HP POS systems contain the appropriate BIOS code to support Computrace; however, a subscription and downloadable software must be obtained from Absolute Software at absolute.com. With Computrace you can:

- Delete data remotely on stolen systems and get a record of sensitive data that's been accessed
- Accurately track remote computers on or off a corporate network
- Obtain alerts about unauthorized or illegal software such as file sharing applications that could jeopardize sensitive data

Removable hard drive option

HP offers an alternative option to protecting sensitive data that may be stored on the POS system's hard drive. That alternative is an optional removable hard drive. The RP5 was designed to support a removable hard drive that can be installed in lieu of an optical disk drive.

The removable hard drive features a steel case that is fire-resistant and lockable. At the end of the business day, a store owner or manager can simply power down the POS system and remove the hard drive from the front of the system without opening the hood. The hard drive stays inside the steel case and the entire case is removed which can then be stored in a safe or taken home for safekeeping. The removable hard drive has another benefit in that a retailer could install up to three hard drives into the Engage Flex POS system.

Beyond retail hardened

Redundant Array of Independent Disks (RAID)

Many retailers need to protect the data stored on their POS system's hard disk drive in the event of a hard drive or POS system failure. Redundant Array of Independent Disks (RAID) offers this protection as an affordable back-up alternative. RAID is designed to allow several hard disk drives function as one storage area (array) to provide the following benefits:

- Data redundancy for back up security
- Faster performance by striping read/write data to/from the hard disk drives

NOTE: HP ships RAID level 1 when configured to order. RAID level 0 is supported but must be enabled by the user. RAID level 5 is supported but requires an optional 3rd hard disk drive via the optional removable storage device in lieu of an optical disk drive.

Removable hard drive option

HP offers an alternative option to protecting sensitive data that may be stored on the POS system's hard drive. That alternative is an optimal removable hard drive. The RP5 was designed to support a removable hard drive that can be installed in lieu of an optical disk drive. The removable hard drive features a steel case that is fire resistant and lockable. At the end of the business day, a store owner or manager can simply power down the POS system and remove the hard drive from the front of the system without opening the hood.

The hard drive stays inside the steel case and the entire case is removed which can then be stored in a safe or taken home for safekeeping. The removable hard drive has another benefit in that a retailer could install upto three hard drives into the Engage Flex POS System.

Beyond retail hardened

IEEE 508 (Electronic and information technology accessibility standards checklist plan)(RAID)
This test plan contains a checklist for products to make sure that they are compatible with the government regulation implementing Section 508 of the Rehabilitation Act of June 21, 2001. Section 508 applies to “normal operation,” which excludes initial setup (such as driver setup, application setup), initial configuration, maintenance (such as desktop management), diagnostic, repair tasks, and adding or replacing parts. This test also ensures that the hardware and software is compatible with certain disabilities such as deafness, blindness, color-blindness, etc.

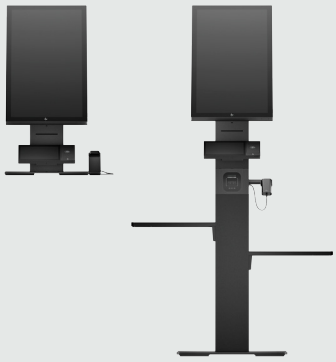
HP Point of Sale Systems

See below for the current HP POS portfolio, with links for learning more about each product.

Images	Description
	The HP Engage One Essential All-in-One system is flexible and ruggedly durable, with a fan-less, IP54 certified design that is fully sealed to protect from dust and liquid intrusion—all in a sleek package. Intel® Celeron® or Pentium® processors provide a combination of performance, power consumption, and value, and deployment is available with various mounting options.
	The HP Engage Flex Mini is highly configurable, enabling you to design a system for your unique business with abundant options across storage, memory, and processor. Further customize with two configurable I/O ports to attach peripherals.
	The HP Engage Flex Pro G2 is a modular retail system that is expandable, highly configurable, and allows for flexibility and easy integration within your existing ecosystem with a choice of operating systems, Intel processors, SATA or M.2 storage, and tool-less access to media and memory.
	The HP Engage Go 10" and HP Engage Go 13.5" Convertible Systems are built to deliver across today's demanding business landscape and easily transition from all-in-one system(s) to mobile tablet(s). They're durable, highly secure, ideally sized, and integrate essential accessories so you can seamlessly conduct business where and how it's needed.

HP Point of Sale Systems

See below for the current HP POS portfolio, with links for learning more about each product.

Images	Description
	The HP Engage One All-in-One system is specifically built to withstand the demands of retail and hospitality environments. It features security, durability, and flexibility incorporated into its streamlined design, offering versatility with an accessory ecosystem. Additionally, it is available in a choice of colors.
	The HP Engage One Pro All-in-One system combines a sleek yet durable design with powerhouse computing and an abundance of deployment options so you can tailor it to your specific needs. It passes HP's Total Test Process and MIL-STD-810 testing and is built with sturdy, anodized aluminum chassis that resists spills by channeling liquids away from the screen.
	The HP Engage Express self-service kiosk delivers powerhouse self service computing in a sleek, small footprint design. Choose from countertop or full pedestal stands, three screen sizes, and portrait or landscape orientation.

1. Printed boards and substrate laminates must not contain more than 1500 ppm of total halogens with a maximum chlorine of 900 ppm and maximum bromine of 900 ppm, and plastic within other components must contain less than1000 ppm of bromine (if the source is from BFRs) and less than 1000 ppm of chlorine (if the chlorine source is from chlorinated flame retardants, PVC, or PVC copolymers).
2. HP Test results are not a guarantee of future performance under these test conditions. Damage under the HP test conditions, or other accidental damage requires an optional HP Accidental Damage Protection Care Pack.
3. The Computrace agent is shipped turned off and must be activated by customers when they purchase a subscription. Subscriptions can be purchased for terms ranging from one to four years. Service is limited, Check with Absolute for availability outside the U.S. The Absolute Recovery Guarantee is a limited warranty. Certain conditions apply. For full details visit: absolute.com/en/products/absolute-computrace. Data Delete is an optional service provided by Absolute Software. If utilized, the Recovery Guarantee is null and void. To use the Data Delete service, customers must first sign a Pre-Authorization agreement and then purchase one or more RSA SecurID tokens from Absolute.



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