



Reliable and durable: What makes HP Point of Sale Systems “retail hardened”?

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 retailer 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 selection 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, 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 rugged—able 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.

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 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 is 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.

Retail hardened: 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

Chassis Construction

HP chooses materials and components that are able to 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 of our 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 our HP POS systems feature a latching capability. For example, HP uses screw-locks on serial, parallel, and video connectors. Also, LAN jacks and powered USB ports 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.

High-endurance capacitors²

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 are able to 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.

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 in order to provide 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 customers may run their POS systems for extended hours.

Powerful and flexible connectivity

HP POS platforms are the most flexible, offering all of 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 point of sale platforms. 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. Future proof with 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 malfunctions 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.
- **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 material/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 are able to withstand the wear and tear of a retail or hospitality environment and continue to operate without failure. The following section will discuss design and manufacturing around:

- 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.

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 of 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 of the HP world-wide POS platforms meet this requirement.

RoHS regulation

HP also designs all of 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 regulators¹.

Thermal tolerance²

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.

Board flex/dye stain testing and cross section²

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 has 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.

TDR/PCB impedance

Retailers rely on their POS systems to run their business; 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 cycling²

In order to ensure that all voltage regulators, control signals, and clock signals within the POS system sequence 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 & receiving AC power.

Dust and spill resistance²

All of our Engage One Models and the HP POS Keyboard key areas are designed to the Ingress Protection standard to ensure they are minor spill resistant. Our HP Engage flex will keep the dust intrusion to a minimum helping to prevent operational interference by dust. They also withstand operation by “wet hands” commonly occurring in restaurant, cafeteria, and other hospitality environments.

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 are able to 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 testing²

In most retail and hospitality environments, the POS system is visible to the public and possibly one of the focal points in the store. For this reason, it is important that the system is able to maintain a clean and presentable exterior finish that can take the abuse of situations such as bumps, scratches, accidentally dropping inventory or supplies, inks, tapes, etc. All HP POS chassis are designed with a durable coating/finish to ensure that chassis will reduce corrosion. All tests are performed under cold and hot/humid conditions.

The tests consist of a “coat thickness test” to ensure that painted surfaces have a consistent paint thickness over the entire surface of sheet metal; an “adhesion test” to ensure tapes, items with rubber feet, sticky notes, etc. will not damage the finish; an “abrasion test” which is performed for 300 cycles to ensure paint will not peel or rub off; a “stain and fade test” which uses ink, coffee, wax, lipstick, soap, washing powder, and pencil/pen marks to ensure surfaces will not stain or degrade; and an “ultraviolet light test” where the system is placed under a special UV light for 100 hours at 70°C to ensure color will not fade. All external surfaces are inspected after each test. If any blemishes are found, the design is rejected and the design and/or the manufacturing process is improved until acceptable results are achieved.

Power supply industrial testin²

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 test²

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.

Fan reliability²

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/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 in order to meet their unique business needs; therefore, a comprehensive System Compatibility and Integration Test (HSCIT) is performed on all POS systems 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.

Dust Interface stress testing

POS systems, as with all electronic devices, have critical internal electrical interfaces and circuitry. Each electrical interface is put through its paces 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 in 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.

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 as a result 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 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

In the event that a retailer's location loses power, the HP POS system features 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 check-out, kiosk, or as a server application in the back office.

Radio frequency (RF) interference

In this day and age 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 electronic

Storage thermal²

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 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.

Drop test²

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 fall 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 testing²

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 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 is confident that the packaging is well designed to protect the POS system during shipping/handling.

Operational vibration²

Operational vibration testing is performed on all HP POS systems to ensure that they can survive retail and hospitality environment 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 shock²

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 45G square 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.

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 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 improving.

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, low temp/high power. The purpose of this test is to ensure 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. 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.

Active Power Factor Correction (PFC)

There are a lot of 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 into less energy waste and higher energy cost savings. All of the HP POS platforms use power supplies that are designed with Active PFC.

Power dip testing²

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 testing²

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.

Hinge Cycle and Wobble Testing²

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 10,000 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 location 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 wobble test requires that all test points induce less than one second of wobble.

Altitude testing²

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.

Acoustic testing²

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.

Electrical signal integrity²

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, ring back, duty cycle, jitter, etc. The full electrical parameters of each signal is 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.

Network Interface Connection (NIC) IEEE testing²

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 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 with the POS system so that down time is minimized. BeepLED provides visual and audible notification in the event of a failure by blinking the power LED red and sounding the buzzer

Category	Description	Blink / Beep Error Codes	Service Guide Descriptions
BIOS	The main area (DXE) of BIOS has become corrupted and there is no recovery binary image available	2.2 - Power LED (red.white)	Contact Service
	The embedded controller policy requires the user to enter a key sequence (SureStart 2.0)	2.3 - Power LED (red.white)	(SureStart manual recovery) To acknowledge proceeding with manual recovery of boot block, enter: NB: up arrow + dn arrow + ESC DT: 2 power button presses
	The embedded controller is recovering the boot block or DXE. Since it takes 10 sec. or so to load the DXE image and get video in the DXE case, this blink code is necessary. (SureStart)	2.4 - Power LED (red.white)	No action required
Hardware	The embedded controller has timed out waiting for BIOS to return from memory initialization	3.2 - Power LED (red.white)	Check memory modules
	The embedded controller has timed out waiting for BIOS to return from graphics initialization (4/13- Graphics adaptor not found)	3.3 - Power LED (red.white)	Check all graphics adapters, no functional graphics device found
	The system board displays a power failure (crowbar) *	3.4 - Power LED (red.white)	Check power cable connections, or verify that any external power adapter has sufficient capacity for your system
	The CPU is not being detected *	3.5 - Power LED (red.white)	CPU is not installed properly
	The CPU does not support an enabled feature (typically this applies only to TXT)	3.6 - Power LED (red.white)	No action required, but some functionality has been lost when CPU was swapped
Thermal	A CPU over temperature condition has been detected *	4.2 - Power LED (red.white)	Examine environment to provide better venting or cooling. Check if vents or fans are blocked or dusty.
	An ambient temperature over temperature condition has been detected	4/13 - TBD - 2016 <i>not currently implemented</i>	Examine environment to provide better venting or cooling. Check if vents or fans are blocked or dusty.
	An MXM over temperature condition has been detected	4/13 - NA	
System Board	The embedded controller cannot find valid firmware	5.2 - Power LED (red.white)	Contact Service
	The embedded controller has timed out waiting for the BIOS	4/13 - Not Implemented	Contact Service
	The embedded controller has timed out waiting for BIOS to return from system board initialization	4/13 - Not Implemented	Contact Service
	The embedded controller rebooted the system after a possible lockup condition had been detected through the use of a System Health Timer, Automated System Recovery Timer, or other mechanism.	4/13 - Not Implemented	No specific action required. Investigate source of reset.
	The system was powered on with a jumper on the FDO 2-pin header.	2015 - not currently implemented	Unplug the AC, open the unit and remove the jumper from E19 header (FDO)
Debug	Debug only – disabled by the development team prior to production release	4/13 - 6.3 No valid SIOCT entry found	
* Indicates hardware triggered event; all other events are controlled by the BIOS.			

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 of the 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 also 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.

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).

Computrace

Since sensitive data may be stored on the POS system, it is important to protect this data from 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 safe keeping. The removable hard drive has another benefit in that a retailer could install up to three hard drives into the Engage Flex POS system.

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

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- **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.
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IEEE 508 (Electronic and information technology accessibility standards checklist plan)

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



HP Engage Flex Pro

The expandable and highly configurable **HP Engage Flex Pro Retail System** 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. Keeping the environment in mind, the HP Engage Flex Pro is designed for energy efficiency. The sturdy HP Engage Flex Pro chassis is designed with reliable, retail-hardened engineering that helps reduce downtime. From the store front to the back office, the HP Engage Flex Pro is built to last with a retail-hardened design that offers consistent reliability and a five year platform lifecycle. The HP Engage Flex Pro features an optional dust filter as well as an oversized cooling system which can operate in a 40C environment through high-endurance temperature-rated capacitors that help resist heat. You can rely on the HP Engage Flex Pro to have a longer useful life, minimizing disruptions, avoiding long term equipment planning, and reducing the complexity of rollouts.



HP RP9 Retail Solution

The powerful, intuitive, modern, and versatile **HP RP9 Retail System** is designed to provide retailers an All-in-One that combines powerhouse performance with reliable engineering, all in a small footprint for space-saving efficiency. The system is reliability-tested with built-in security and manageability, Intel 7th Generation processor technology up to Core i7 with vPro and TPM 2.0. A versatile POS that can function as a POS, kiosk or self-service unit. Full retail connectivity are in the display head. High brightness backlight LED display, in 15.6" (500 nits) and 18.5" (450 nits). Compact stand or performance stand with tilt and height adjustment. Tool free access to core components for easy upgradability. 5 year manufacturing lifecycle with 3 years service and support with onsite warranty standard and optional carepacks up to 5 years



HP Engage One All-in-One

Make a modern impression on your customers with the **HP Engage One All in One Retail System**. The Engage One give you the look you want at the performance you need. A powerhouse platform built to withstand the demands of retail and hospitality environments. Power through the day with 7th generation Intel® processors, M.2 storage, DDR4 memory. HP Engage One All in One built with sturdy, anodized aluminum chassis that resists spills by channeling liquids away from the screen. The Engage One passes HP's Total Test Process and is designed to pass MIL-STD 810G testing. HP Engage One doesn't just look good, it's performance and durability are uncompromised. The Engage One All in One come with 5-year manufacturing lifecycle and up to a 3-year standard limited warranty with an Optional HP Care Services for extend levels of service to save you on TCO over the long run. Follow the footsteps of proven successful retailers choose the HP Engage One



HP Engage One Convertible

HP Engage Go Convertible converges the elegance of design with ultimate Point of Sale functionality through its beauty, versatility, scalability, physical and integrated security features with ruggedness and reliability to operate over extensive hours in fast paced, demanding environments. The tablet is equipped with many optional integrated features including barcode scanner, fingerprint reader and NFC, and easily detaches from and attaches to the convertible dock for charging, locking and additional connectivity. The dock is tested for 50,000 on/off cycles and up to 50 kg of pull force to prevent theft. Once mobile, the system is protected from 3ft drops (4 ft drops with the Retail Case). The Convertible system passes the HP Total Test Process and MIL-STD 810G testing. The Engage Go comes with a 3 year manufacturing lifecycle and a 3 year standard warranty with optional HP Care Services for extended level of service to save you on TCO over the long run



HP Engage 2QH 3ULPH

HP Engage One Prime offers a SMB focused Point of sale system that offers a premium design at affordable price. It is modern, compact and maximizes the counter space for mom & pop stores. The large 14-inch diagonal Full HD touchscreen comfortably tilts and easily flips between associates and customers. The unit comes with built-in peripherals like a magnetic stripe reader and NFC to authenticate associates, and a camera-based scanner to scan QR codes and merchandise. This system is designed with the Android™ 8.1 OS which comes with an added layer of security, a powerful multi-core heterogeneous Qualcomm® APQ8053 processor and your choice of CPU speed, memory, and storage. It is IP52 certified, so it will withstand dust and water that is part of the retail environments. With the reassurance of an included one-year HP limited warranty, you focus on customers and business goals, instead of technical support

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 than 1000 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).

requires an optional HP Accidental Damage Protection Care Pack.

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

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. In order 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 Software.

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