POSIFLEX™

WHITE PAPER

The Importance of HALT/HASS Testing

Why Quality Should Guide Your POS Purchase

Not all POS terminals are created equally—even when an initial look at the spec sheet makes them seem similar. The difference is what's inside. How the terminal was designed and manufactured. The difference can have a profound effect on the experience you have with the device. Therefore, when considering the price of a POS device, it is also wise to consider total cost of ownership. Some companies design their POS systems to attain a price point. The best products are designed and manufactured—with the help of HALT and HASS testing—to faultlessly meet your needs through a life made long through a commitment to quality and durability.

HALT Testing

Highly Accelerated Life Test (HALT) exposes the product during the design stage to step-by-step cycling of environmental variables such as temperature, shock, drop, particulate matter, static electricity, emission and vibration. The purpose is to expose devices—and the circuit boards and other components—to environmental stresses that are far beyond what would be expected during even the most rugged everyday use.

"HALT is a discovery test as opposed to a compliance test, that is, we want to find problems and we do everything necessary in order to do so and then to remove the weaknesses found," says Dr. Gregg K. Hobbs, a pioneer in HALT and HASS testing. "The HALT and HASS techniques represent a paradigm shift of major proportions. Companies using these evolving techniques correctly have obtained outstanding reliability, yet most of them do not publish their results given the significant competitive advantage that these techniques provide to them."

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To ensure the rigor of its HALT and HASS testing, organizations should use an independent third-party laboratory with a special chamber that, among other things, can repeatedly and rapidly cycle between high and low temperatures while applying increasing levels of vibration and other challenges. Ideally, HALT testing should be used iteratively to identify any weaknesses, improve upon them, and then subject the revised product to more HALT testing.

HASS Testing

Highly Accelerated Stress Screen (HASS) testing provides a next step beyond HALT testing. While HALT testing guides the design phase of the product lifecycle, HASS testing is used to verify the ruggedness of the final product. As with HALT, the stress screens represent discovery testing, where products are taken beyond the limits. "These screens use the highest possible stresses (frequently well beyond the 'QUAL' level) in order to attain time compression in the screens," Hobbs says. "Note that many stimuli exhibit an exponential acceleration of fatigue damage accumulation with stress level." Hobbs points out: "HASS is generally not possible unless a comprehensive HALT has been performed as, without HALT, fundamental design limitations will restrict the acceptable stress levels to a great degree and will prevent the large accelerations that are possible with a very robust product."

HASS is an on-going screening test, performed on regular product units. This testing is done to verify that actual production units continue to operate properly when subjected to the cycling of environmental variables far beyond what would ever be expected in normal use.

For the POS industry, a dedication to HALT and HASS testing means that terminals are tested during the design process, and during and after manufacturing, to ensure that all the bugs were (literally) shaken out in the

lab, not at a customer site. A live store operation is the last place you want to test equipment. A terminal should work every day, every time—even under the most extreme of conditions.

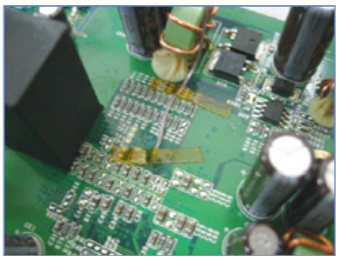
Inside the Test Chamber

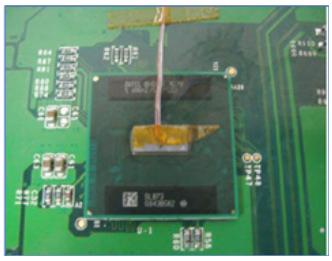
HALT testing is conducted within a dedicated chamber in which temperature, humidity, and other factors can be precisely controlled—and rapidly changed as part of the stress testing. Typically the POS device being tested is plugged into a hard drive located outside the chamber so that throughout the testing process, demanding software can be run and monitored to ensure that the motherboard, CPU, and other elements continue to function.

Temperature readings are accomplished through attaching thermocouples to 7 locations, including the device's case, its CPU, and multiple locations on the device's motherboard. All readings are captured by a thermos-recorder. Vibration step testing is performed through attaching the device to a vibration table within the chamber, and recording movement with an accelerometer.

As with the temperature testing, the POS device should be operating throughout the vibration testing, and monitored to ensure it continues to function.

Examples of HALT testing include:





- Cold Temperature Step Stress Test
- Hot Temperature Step Stress Test
- Rapid Thermal Transitions Stress Test
- Vibration Step Stress Test
- Combined Environment Stress Test

Cold Temperature Step Stress Test – Testing Procedures

Cold temperature step stress testing begins with a chamber temperature of perhaps 20 degrees Centigrade (68° Fahrenheit). The temperature can then be decreased in 10° C increments with 10 minutes of dwell time at each step to find the lower operating limit.

Continuous monitoring verifies whether the high-demand test applications on the device continue to run without interruption, up to the -50° C point.

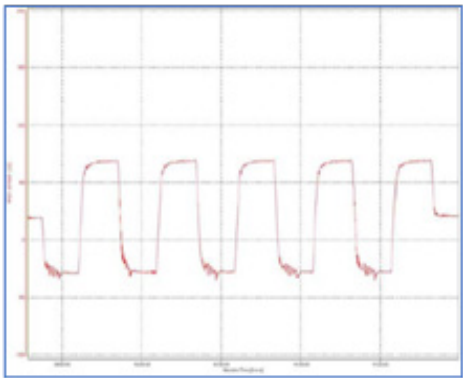
Hot Temperature Step Stress Test – Testing Procedures

Hot temperature step stress testing typically begins with a chamber temperature of 20° C. The temperature is increased in 10° C increments with 10 minutes of dwell time at each step to find the upper operating limit.

Rapid Thermal Transitions Stress Test – Testing Procedures

Rapid thermal transitions stress testing is performed in the chamber with extreme temperature changes. Beginning from a chamber temperature of 20° C, the device is subjected to a rapid temperature drop to -30° C (-22° F). After a dwell time of 10-minutes, the temperature is then rapidly raised to 70° C (158° F), with a 10-minute dwell time. This cycle of rapid thermal transitions is generally repeated five times.

As with the other tests, continuous monitoring verifies whether the high-demand test applications on the device continue to run without interruption.



Vibration Step Stress Test - Testing Procedures

Vibration step stress testing is performed in a chamber using a vibration table and an accelerometer. The test is typically conducted at a temperature of 20° C, with a set point of 5 grams of acceleration. The vibration is increased in 5-gram increments, with a 10-minute dwell time before the next increase.

Continuous monitoring verifies whether the high-demand test applications on the device continue to run without interruption.

Combined Environment Stress Test – Testing Procedures

The combined environment stress test brings together the thermal cycle testing with the vibration testing. As the temperature cycles from -30° C (-22° F) to 70° C (158° F), vibration is stepped up in 10 gram increments, beginning at 10 grams of vibration and, with 10-minute dwells between steps, increasing to 50 grams.

The Process Continues with HASS Testing

During the manufacturing process the same testing, using the same equipment and procedures should be repeated as part of the HASS quality assurance commitment. Successful HALT testing shows that POS devices can function in harsh environments that go far beyond what would ever be expected of real-world usage.

Summary: Why Quality Should Guide Your POS Purchase

The take-home lesson is that POS terminals are not created equally. The difference is what's inside. How the terminal was designed and manufactured. The difference can have a profound effect on the experience you have with the device.

Therefore, when considering the price of a POS device it is also wise to consider total cost of ownership. Some companies design their POS systems to attain a price point. The best products are designed and manufactured—with the help of HALT and HASS testing—to faultlessly meet your needs through a life made long through a commitment to quality and durability.

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