Latitude Rugged Extreme

Summary of Independent Environmental Testing

General information

Tests performed	MIL-STD-810G testing IEC ingress testing ANSI/ISA.12.12.01 hazardous location testing UL and CE safety testing / ESD, emissions, immunity testing MIL-STD-461F electromagnetic interference testing
Equipment tested	Latitude 14 Rugged Extreme / 7404 Latitude 12 Rugged Extreme / 7204
Independent testing facilities	**SGS Taiwan Ltd.** 31, Wu Chyuan Road, New Taipei Industrial Park, Wu Ku District **SGS USA Ltd. - Environ Laboratories LLC.** 9725 Girard Avenue, South Minneapolis, MN 55431 **UL Taiwan Ltd.** 1/F, 260, Da-Yeh Road, Peitou, Taipei City, Taiwan 112 **UL China Ltd.** **Office:** Building A1, 1F & 2F, Nansha Science and Technology Innovation Center, No. 25, South Huanshi Avenue, Nansha District, Guangzhou 511458, China **Lab:** 163 Ping Yun Rd., West Of HuangPu Ave, Guangzhou, P. R. China, 510656

Notes

All environmental testing listed in the accompanying tables was performed and reported independently by the accredited testing companies listed above.

Documented MIL-STD-810G, IEC, UL, emissions, immunity and ESD testing guidelines were followed. All tests were performed with I/O and expansion doors closed. A summary listing of tests appear in the tables included in this document.

MIL-STD-810G environmental testing

Test name	Test procedure	Description	Operational	Result
Altitude - Storage / Air transport	MIL-STD-810G, Method 500.5, Procedure I	Chamber at 30,000ft for 1 hour	No	Pass
Altitude - Operational / Air carriage	MIL-STD-810G, Method 500.5, Procedure II	Chamber at 15,000ft for 1 hour	Yes	Pass
High temperature - Storage	MIL-STD-810G, Method 501.5, Procedure I	**160°F (71°C)** - 7 day exposure (7x 24hr cycles).	No	Pass
High temperature - Operational	MIL-STD-810G, Method 501.5, Procedure II	**145°F (63°C)** - 5 day exposure (5x 24hr cycles)	Yes	Pass
High temperature - Tactical standby to operational	MIL-STD-810G, Method 501.5, Procedure III	**158°F (70°C) to 140°F (60°C)** - Unit is presoaked at high temperature for 2 hours after temperature stabilization. Temperature is ramped to lower temperature and operational test is performed	Both	Pass
Low temperature - Storage	MIL-STD-810G, Method 502.5, Procedure I	**-60°F (-51°C)** - 24 hour exposure	No	Pass
Low temperature - Operational	MIL-STD-810G, Method 502.5, Procedure II	**-20°F (-29°C)** - 24 hour exposure	Yes	Pass
Thermal shock	MIL-STD-810G, Method 503.5, Procedure I	**-60°F (-51°C) to 160°F (71°C)** - Cyclic temperature exposure with 3 shocks; unit is not operating with functional test between cycles	No	Pass
Solar radiation	MIL-STD-810G, Method 505.5, Procedure I	Category A1, Paragraph 4.4.2, Figure 505.5-1 (cyclic) - three 24-hour cycles of testing	No	Pass
Rain - Blowing / Aggravated	MIL-STD-810G, Method 506.5 Procedure I	5.8" (147mm) per hour of blowing rain with a 70 mph wind source for 30 minutes on each surface	Yes	Pass
Humidity - Aggravated	MIL-STD-810G, Method 507.5, Procedure II	0% to 95% - non-condensing humidity - ten 24-hour cycles - temperature cycled between 86°F (30°C) and 140°F (60°C); relative humidity maintained at 95%	No	Pass
Salt fog (optional)	MIL-STD-810G, Method 509.5, Procedure I	5% saline exposure for 2 cycles x 48 hours (24 hours wet / 24 hours dry); requires a model configured with a rubberized keyboard	No	Pass[2]
Sand and dust - Blowing dust	MIL-STD-810G, Method 510.5, Procedure I	Particle density: 10 ± 7 g/m3. Air velocity: 300 to 1,750 ft/min (8.9 m/s or 19.5 mph). Operating temperature of 140°F (60°C).	Yes	Pass
Sand and dust - Blowing sand	MIL-STD-810G, Method 510.5, Procedure II	Sand density: 1.2 g/m3. Air Velocity: 28 m/s (8.9 m/s or 19.5 mph). Operating temperature of 140°F (60°C).	Yes	Pass
Explosive atmosphere	MIL-STD-810G, Method 511.5, Procedure I	Unit must be operating and perform various functions in an explosive environment without igniting the atmosphere	Yes	Pass

Test name	Test procedure	Description	Operational	Result
Vibration - Minimum integrity test	MIL-STD-810G, Method 514.6, Procedure I, Category 24	Category 24 - Figure 514.6E-1 - power spectral density = 0.04g2/Hz at 20Hz –1000Hz, -6dB/Octive at 1000Hz – 2000Hz; 60 minutes x 3 axes; unit is not operating during tests; functional test after each axis	No	Pass
Vibration - Composite wheeled vehicle	MIL-STD-810G, Method 514.6, Procedure I, Category 4	Category 4 - Figure 514.6C-3	No	Pass
Vibration - Ground vehicle	MIL-STD-810G, Method 514.6, Procedure I, Category 4	Category 4 - Figure 514.6C-1	Yes	Pass
Vibration - Loose cargo	MIL-STD-810G, Method 514.6, Procedure II	Figure 514.6C-4 - 300 rpm for 60 minutes total; unit is not operating during tests with functional test after each axis	No	Pass
Shock - Functional shock	MIL-STD-810G, Method 516.6, Procedure I	40g, 11ms, saw-tooth, 3 shocks +/- per axis, 3 axes; unit is operating	Yes	Pass
Shock - Materials to be packaged	MIL-STD-810G, Method 516.6, Procedure II	30g, 304 ips square wave shock; 1 shocks/axis/direction for a total of 6 shocks; unit is non-operational during test	No	Pass
Shock - 48" transit drop	MIL-STD-810G, Method 516.6, Procedure IV	48" (4', 1.22m) drops to 2" of plywood over concrete; one drop to each face, edge and corner; unit is closed and not operating; 26 total drops on a single test unit	No	Pass
Shock - 60" transit drop	MIL-STD-810G, Method 516.6, Procedure IV	60" (5', 1.52m) drops to 2" of plywood over concrete; one drop to each face, edge and corner; unit is closed and not operating; 26 total drops on a single test unit which also passed all transit drops at 48"	No	Pass
Shock - 72" transit drop	MIL-STD-810G, Method 516.6, Procedure IV	72" (6', 1.83m) drops to 2" of plywood over concrete; one drop to each face, edge and corner; unit is closed and not operating; 26 total drops on a single test unit which also passed all transit drops at 48" and 60"	No	Pass
Shock - 36" operating drop	MIL-STD-810G, Method 516.6, Procedure IV	36" (3', 0.91m) drops to 2" of plywood over concrete; one drop to each face, edge and corner; unit is open and operating; 26 total drops on a single test unit	Yes	Pass
Shock - Crash hazard	MIL-STD-810G, Method 516.6, Procedure V	185g, 2ms half sine; 2 shocks/axis/direction for a total of 12 shocks; unit is non-operational during test	No	Pass
Shock - Bench handling	MIL-STD-810G, Method 516.6, Procedure VI	Figure 514.6E-1 - power spectral density = 0.04g2/Hz at 20Hz – 1000Hz, -6dB/octive at 1000Hz – 2000Hz. 60 minutes x 3 axes; unit is not operating during tests with functional test after each axis	No	Pass
Freeze/thaw - Rapid temperature change	MIL-STD-810G, Method 524, Procedure III	Unit stabilized at 77°F (25°C) and relative humidity of 97% for 1 hour, then transferred rapidly to a freezing chamber at 14°F (-10°C); unit is allowed to stabilize plus one additional hour; unit is brought back to above-freezing test; unit is not operating during the test with operational test performed at the end of cycles	No	Pass

IEC ingress protection

Test name	Test procedure	Description	Operational	Result
Dust ingress protection	IEC 60529, IP-6x	**IP-6x** - No ingress of dust; complete protection against contact; unit is not operating	No	Pass
Water ingress protection	IEC 60529, IP-x5	**IP-x5** - Water is projected in jets against the enclosure from any direction with no harmful effects; unit is not operating	No	Pass

Emissions and safety

Test name	Test procedure	Description	Operational	Result
Hazardous locations	ANSI/ISA.12.12.01[3], Class 1, Division II, Groups A, B, C, D	Certified safe operation of system in potentially hazardous environments as defined; tested by UL Labs, Department of Hazardous Locations	Both	Pass
Conducted and radiated emissions	EN55022: 2006 ANSI C63.4-2003	FCC 47 CFR Part 15, Class B	Yes	Pass
Electrostatic discharge, various conducted, and radiated susceptibility and immunity tests	EN55024: 1998+A1:00+A2:03 ANSI C63.4-2003	EN 61000-3-2, EN 61000-3-3, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4, EN 61000-4-5, EN 61000-4-6, EN 61000-4-8, EN 61000-4-11 8Kv/4Kv, 3Vrms, 3 V/M, >95%-0.5p, 30%-25, >95%-250p	Yes	Pass
Electromagnetic interference	MIL-STD-461F	CE102[4], CS101, CS114, CS115, CS116, RE101, RE102[4], RS101, and RS103[4] profiles	Yes	Pass
Safety	UL/IEC mark - 60950	UL/IEC mark		Pass

Other testing

Test name	Test procedure	Description	Operational	Result
Vehicle vibration	ASTM D4169-04 (99), Schedule E, Truck Assurance Level II	1-200Hz, 0.52grms in all three axis; 90 minutes per axis	Yes	Pass
Cold boot test	Custom	Cold soak for 8 hours (unit off), 1 cycle; cold soak for 8 hours at varying temperatures (-18°C, -20°C, -23°C, -29°C); system boot: remove system from cold environment and begin boot process immediately **Cold boot specification:** warm up time from power button to start of boot = < 5 minutes; unit is booted on external power; unit configured with SSD; 1x 8-hour cycle for cold boot thermal tests	Both	Pass

Pass criteria and test scope information

For operational tests, a pass indicates that the unit remained operational during the entirety of the test. For non-operational tests, a pass indicates that a functional verification was performed immediately after the test exposure, in which the unit was powered on and booted to the primary operating system. Cosmetic damage does not constitute a failure unless there is a safety concern. Sample sizes tested are not statistically significant.

1 Based on testing and certification to MIL-STD-810G, IEC 60529 (IP-65), MIL-STD-461F, and ANSI/ISA.12.12.01 standards, performed and reported independently by accredited testing companies.
2 Salt Fog (MIL-STD-810G, Method 509.5, Procedure I) requires a model configured with a rubberized keyboard
3 ANSI/ISA.12.12.01 must be specified at time of order for certification. Contact your sales representative for more information.
4 Requires a MIL-STD-461F compliant adapter. Specified profiles passed with the supplied Dell adapter.