Intel® NUC Kits, NUC Compute Element, Compute Card, and Compute Stick Sustained Operation

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Revision History

Revision	Description	Date
1.0	First Release	17 May 2018
1.1	Added NUC Compute Element	11 Mar 2020
1.2	Update dates and logo	7 Jul 2021
1.3	Update dates, hyperlinks and added information about MTBF	19 October 2021

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Tables

1 Introduction

This document covers the sustained operation of the Intel® Compute Card, Compute Stick, NUC Compute Element and NUC kit. The definition of sustained operation, or 24x7 support, will be explained, including what is and what is not included in the definition.

For more information about the Intel® Compute Card, visit the **Intel® Compute Card website**.
For more information about the Intel® Compute Stick, visit the **Intel® Compute Stick website**.
For more information about the Intel® NUC Compute Element, visit the **Intel® NUC Compute Element website**.
For more information about the Intel® NUC, visit the **Intel® NUC website**.

1.1 Sustained Operation Definition

"24x7 operation for 5 years with 50% system utilization on average with an expected service rate of 1% per year during this period"

Table 1 and Table 2 provide details for this definition.

Table 1. What is supported

Item	Details
Intel Compute Cards	All versions of the Intel Compute Card
Intel Compute Card Docks	All versions of the Intel Compute Card Dock
Intel Compute Sticks	All versions of the Intel Compute Stick
Intel NUC Compute Element	All versions of the Intel NUC Essentials Compute Element and Intel NUC Pro Compute Element
Intel NUC Board Element	All versions of the Intel NUC Board Element
Intel NUC Chassis and Assembly Element	All versions of the Intel NUC Rugged Chassis Element, Intel NUC Chassis Element and Intel NUC Assembly Element
Intel NUC L10 Kits	All of the hardware components that are included in the L10 NUC Kit
Intel NUC L6 Kits	All of the hardware components that are included in the L6 NUC Kit
Hardware	Only the hardware that came with the Compute Card, Compute Stick, Compute Card Dock, Compute Element, Board Element, Rugged Chassis Element, Chassis Element, Assembly Element, L10 NUC Kit and L6 NUC Kit.
The stock thermal solution	Changing or modifying the stock thermal solution invalidates the above 24x7 statement.
The stock fan	Changing or modifying the stock fan invalidates the above 24x7 statement.
The stock enclosure	Changing or modifying the stock enclosure invalidates the above 24x7 statement.

Table 2. What is not supported

Item	Details
Board only products	Integration and handling of Intel NUC board-only products may induce failures. Enclosure selection may also influence 24x7 operation.
Operating System	Operating System issues cannot be covered by the above 24x7 definition.
Any installed software	Unknown software and use of the software may also influence 24x7 operation.
Environmental conditions	Use of the product outside the published specifications will influence 24x7 operation.
Electrostatic Discharge (ESD)	Integration in an environment where electrostatic discharge is not controlled will influence 24x7 operation.
Electric utility power source	Inconsistent, irregular, or improperly grounded power sources will influence 24x7 operation.
3rd party integration process	The integration process may influence 24x7 operation.
Any added 3rd party components	The selection of components added to the system may influence 24x7 operation. See the tested components list on the Intel Support Site for suggestions.

2 Testing

Product testing is a part of the development process. Tables 3 & 4 list the testing done during validation for all products listed in this document.

2.1 Temperature and Humidity

Table 3. Temperature and Humidity

Test	Purpose
Temperature Cycling	Assesses the ability of the board, components and solder joints to withstand thermo-mechanical fatigue.
Thermal Baseline	Assesses the ability of the heat sink and thermal interface material (thermal solution) to maintain acceptable component operating temperatures before the application of any stress conditions.
Bake	Assesses the impact of long-term temperature exposure on the thermal solution performance.
Thermal Temperature Humidity	Assesses the impact of long-term temperature and humidity exposure on the thermal solution performance.
Temperature Humidity	Ensures that the system function/cosmetics are not impacted following exposure to high temperature/humidity.
Operating Temperature Humidity	Assesses the ability of system to function at temperature and humidity extremes.
Temperature and Voltage Margining	Assesses the ability of the system to boot at temperature and voltage extremes on the onboard power rails.
Boot Cycle	Assesses the ability of the system to boot repeatedly using AC power cycles and Ctrl-Alt-Del cycles under temperature extremes.

2.2 Mean Time Between Failures (MTBF)

Each Intel NUC family undergoes MTBF testing, where 40 units are functionally tested continuously for 90 days (~86,000 accumulated hours), conforming to 50K hours of MTBF

2.3 Table 4. Shock and Vibration

Test	Purpose
Drop	Assesses the ability of the system to retain functionality after multiple drops onto a concrete surface.
Mechanical Vibration	Examines the ability of the system to withstand mechanical vibration stress caused during shipping and use.
Packaged Mechanical Shock	Confirms that the product shipping package adequately protects the product against mechanical shock.
Packaged Mechanical Vibration	Confirms that the product shipping package adequately protects the product against mechanical vibration.
Thermal Shock	Assesses the impact of mechanical shock stress caused from shipping and use on the performance of the heatsink solution.
Thermal Vibration	Assesses the impact of mechanical vibration stress caused from shipping and use on the performance of the heatsink solution.