Performance Test Report

ROC200-DL

Product Manager	R&D Leader	Mechanical Engineer	System Engineer	Test Engineer
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Revision Date: November 20, 2024

Performance Test

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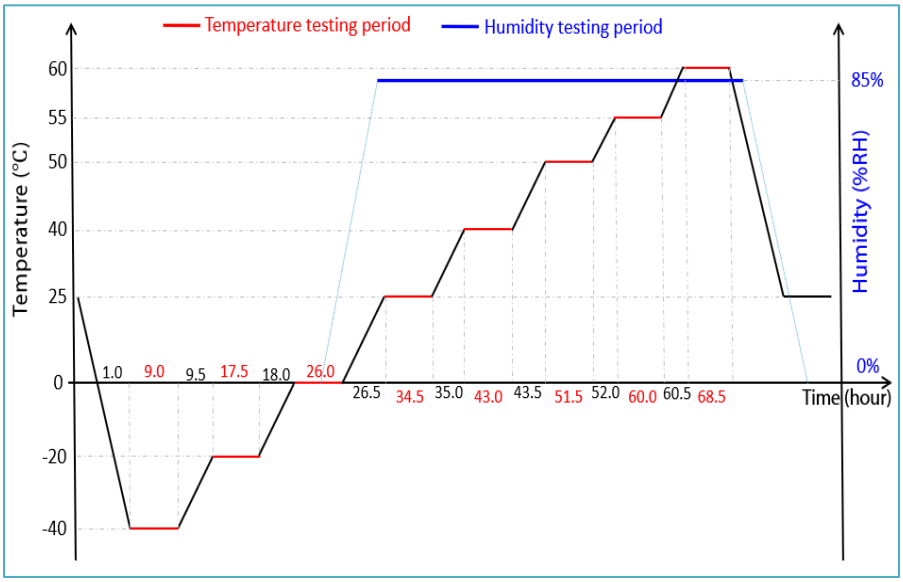
1. SPECIFICATION

1-1. System Configuration

Motherboard	SK517 COM Express Type 7 Support Intel Ice Lake D-LCC Family Processor Standard MXM Type 3.1 Support NVIDIA® Quadro® RTX/ Intel® Arc™ PCIe/104 Express Expansion Slot for Modular Open Structure Multi-Expansion Slots include Dual Mini PCIe Express Slots, 1x M.2 Slot Extreme Temperature Support -40 to 85°C
CPU	Intel® Xeon® D-1715TER Processor Total Cores: 4 # of Performance-cores: 4 Total Threads: 8 Max Turbo Frequency: 3.50 GHz Processor Base Frequency: 2.40 GHz TDP 50 W
Memory	32GB DDR4 SO-DIMM wide temp.
Storage	256GB SATA SSD wide temperature
GPU	Nvidia RTX A2000 Embedded GPU BIOS Version: 94.07.5E.00.3E CUDA parallel-processing cores: 2560 CUDA® cores GPU base/boost clock: 1117 MHz / 1612 MHz Max Power Consumption: 35 W
Power Module	SK715_9V~36V 400W DC/DC Module Wide Input Range: 9V to 36V 12V DC Output up to 33 Amp Over voltage protection Over current protection Efficiency: typ.(91%) Extended Temperature -40°C to 85°C

2. TEST PLAN

2.1. THERMAL MEASUREMENT PROCESS

Test Purpose	The purpose of performing thermal profile testing is to identify potential thermal issues with the EUT. Considering that semiconductor failure rates rise rapidly with increasing junction temperature, it can aid product reliability assessment. As the system cools down, the mode will change with stack selection, temperature/heat. Mapping can help develop the best tracking arrangements.
Test Equipment	1. KSON THS-B4T-150 Chamber.
Quantity Tested	Minimum 1 Set
Test Software	1. Stress CPU: PassMark Burn-in Test Software Ver 9.0 2. Stress GPU: AIDA64 extreme690
Test Procedure	1. Thermal pre-scan measurement: Temperature: **-40˚C～60˚C** Humidity: **85%RH (Temperature above 25℃)** 2. Actual thermal measurement: 2-1. Select the test point based on the infrared photo and connect the thermocouple to the hot spot. 2-2. Place the EUT into the hot chamber and set the test temperature curve Specification. 2-3. Open the hot cell and power up the EUT, enter the Windows 11 environment and perform a maximum power test + stress application. 2-4. After the EUT executes the test software for 8 hours, record the maximum heat generation of each thermocouple point. 2-5. Turn off the hot cell and EUT. 2-6. Verify and check that the recorded information for each component complies with the operating temperature range listed in the specification/approval sheet for each component being tested.
Test Diagram of Curves	Environment defines for 60 hours. 

2.2. TEST RRESULT <TEST ITEM>

2.2.1. Temperature Cycle

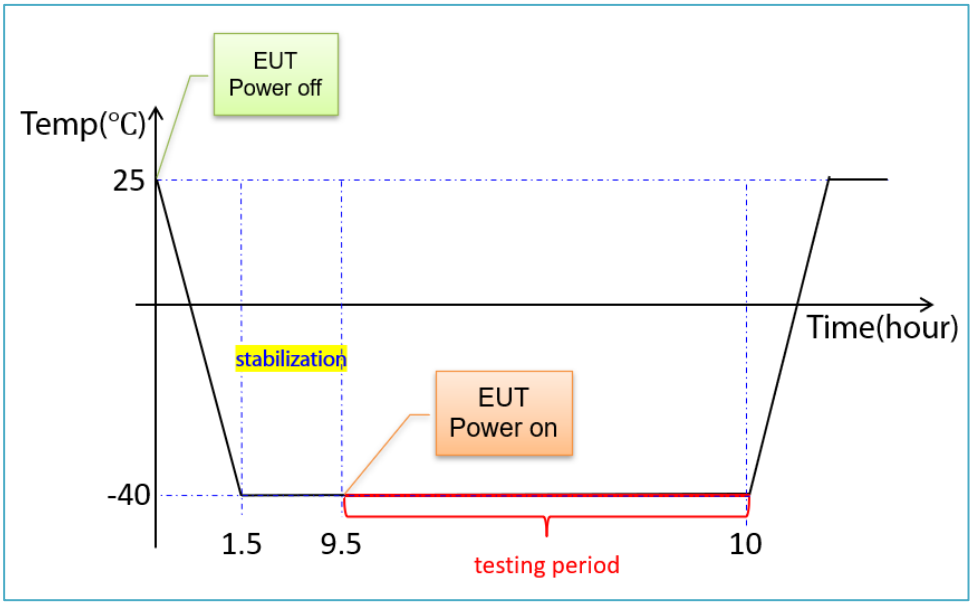
Aging test of various parts at different temperatures under maximum load and full load conditions.

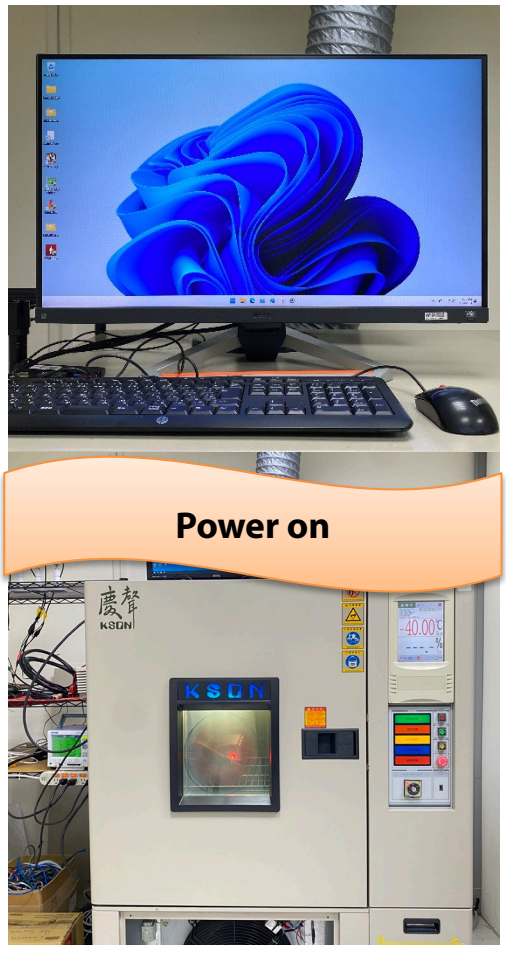
Test Temperature	Test Result
-40˚C	PASS
-20˚C	PASS
0˚C	PASS
25˚C / 85%RH	PASS
40˚C / 85%RH	PASS
50˚C / 85%RH	PASS
60˚C / 85%RH	PASS

2.2.2. Low-temperature & Boot-up

#Power supply under -40°C and ensure that the system boot up properly

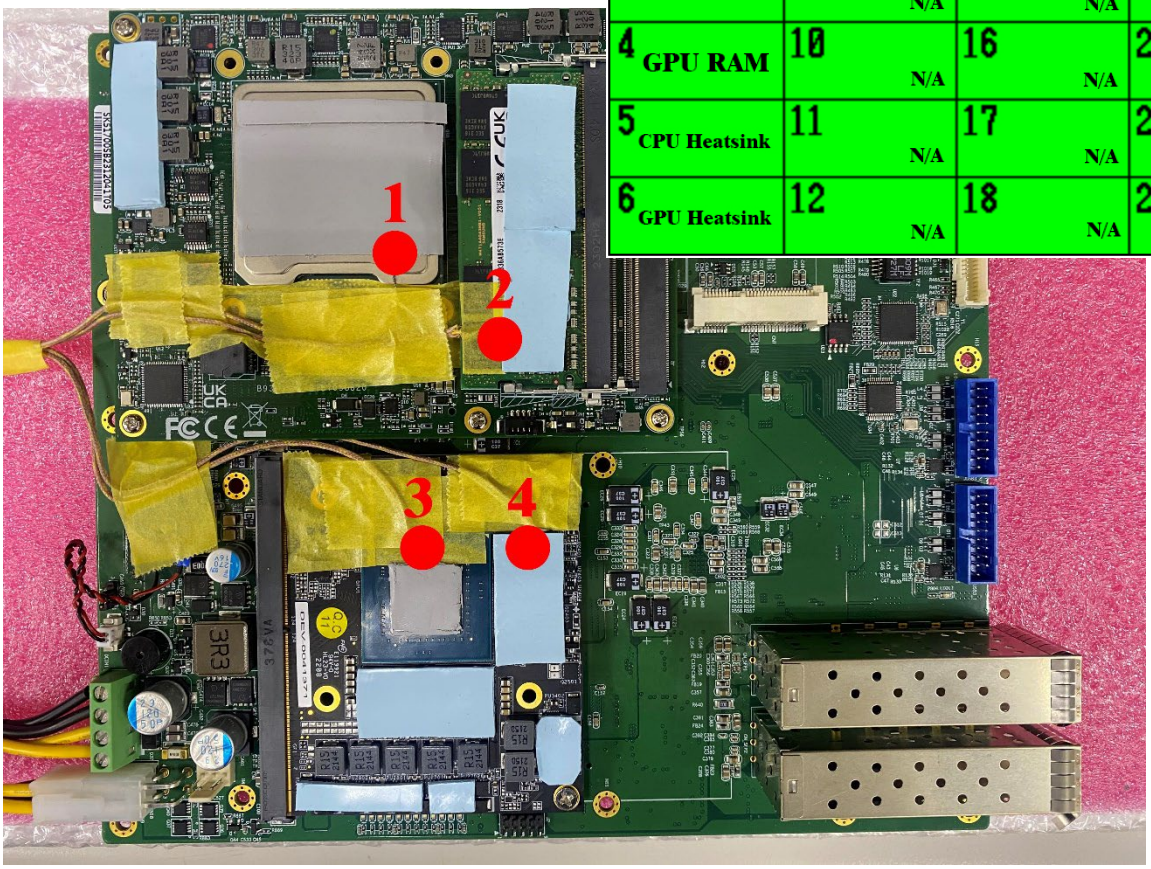
Ambient Temp.	Test Result
-40°C	PASS

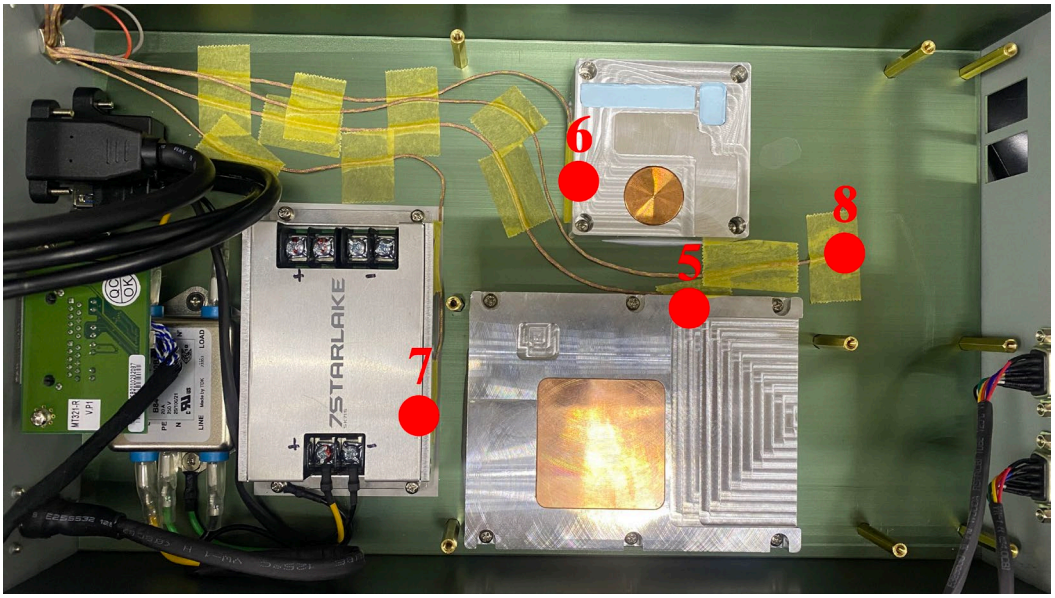




3. THERMAL TEST POINT

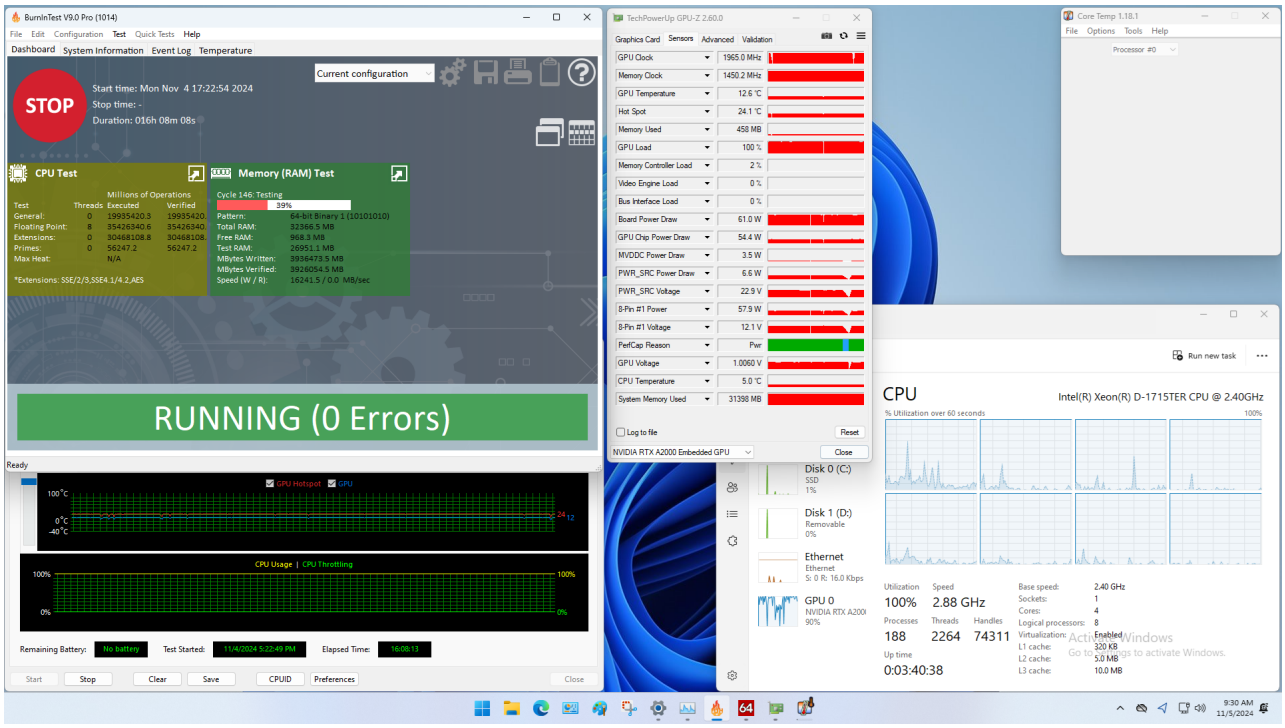
1 CPU	7 SK715 Power Module	13 N/A	19 N/A
2 DRAM	8 TOP Heatsink	14 N/A	20 N/A
3 GPU	9 N/A	15 N/A	21 N/A
4 GPU RAM	10 N/A	16 N/A	22 N/A
5 CPU Heatsink	11 N/A	17 N/A	23 N/A
6 GPU Heatsink	12 N/A	18 N/A	24 N/A





4. TEST PHOTO IN LAB

- Chamber in -40°C



Measuring Point	Ambient Temp.	-40°C
	CPU Cores Max Temperature	15.0 ℃
	CPU Cores Frequency (Unit: GHz)	2.88 GHz
	GPU Temperature	12.6 ℃
	GPU Hot Spot Temperature	24.1 ℃
	GPU Frequency (Unit: MHz)	1965 MHz
CH1	CPU	1.5 ℃
CH2	DRAM	5.4 ℃
CH3	GPU	2.0 ℃
CH4	GPU RAM	2.3 ℃
CH5	CPU Heatsink	6.5 ℃
CH6	GPU Heatsink	4.2 ℃
CH7	SK715 Power Module	7.4 ℃
CH8	TOP Heatsink	9.0 ℃

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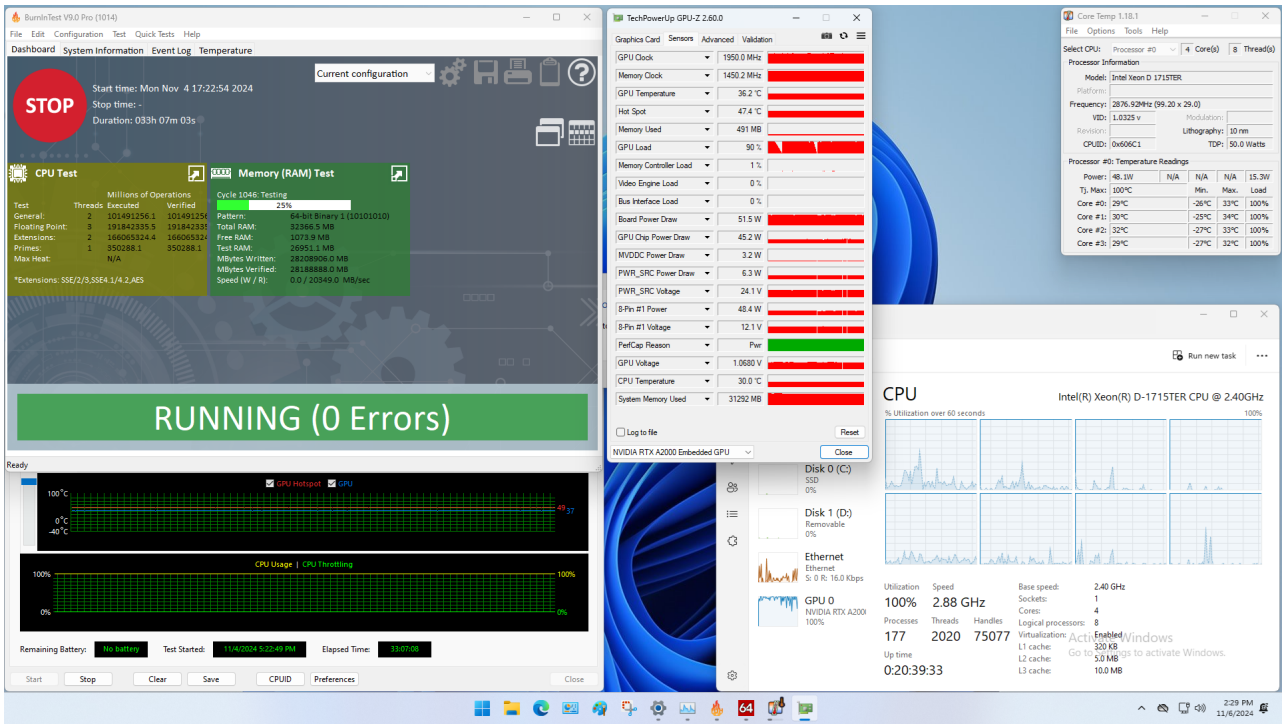
- Chamber in -20°C



Measuring Point	Ambient Temp.	-20°C
	CPU P-Cores Max Temperature	30.0 °C
	CPU E-Cores Frequency (Unit: GHz)	2.88 GHz
	GPU Temperature	36.2 °C
	GPU Hot Spot Temperature	47.4 °C
	GPU Frequency (Unit: MHz)	1950 MHz
CH1	CPU	21.5 °C
CH2	DRAM	18.0 °C
CH3	GPU	25.3 °C
CH4	GPU RAM	20.8 °C
CH5	CPU Heatsink	16.8 °C
CH6	GPU Heatsink	19.2 °C
CH7	SK715 Power Module	16.0 °C
CH8	TOP Heatsink	14.3 °C

Performance Test

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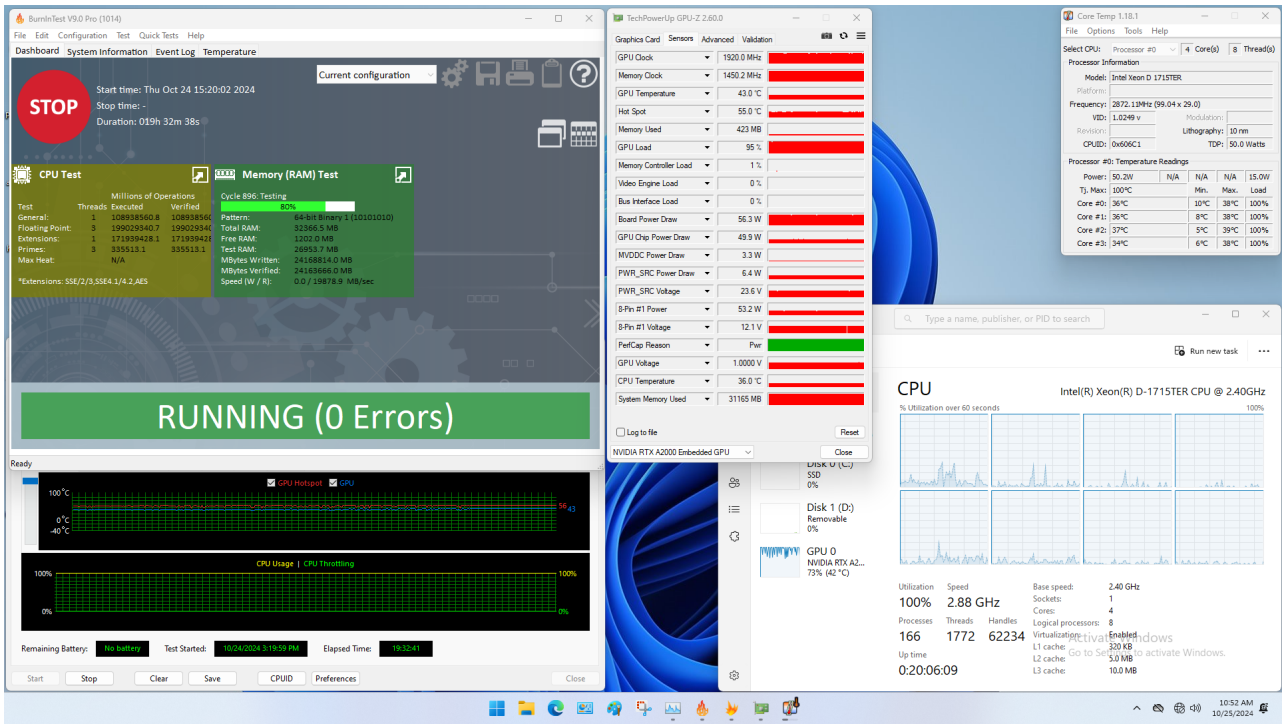
- Chamber in 0°C



Measuring Point	Ambient Temp.	0°C
	CPU P-Cores Max Temperature	36.0 ℃
	CPU E-Cores Frequency (Unit: GHz)	2.88 GHz
	GPU Temperature	43.0 ℃
	GPU Hot Spot Temperature	55.0 ℃
	GPU Frequency (Unit: MHz)	1920 MHz
CH1	CPU	26.2 ℃
CH2	DRAM	28.8 ℃
CH3	GPU	29.0 ℃
CH4	GPU RAM	24.3 ℃
CH5	CPU Heatsink	21.1 ℃
CH6	GPU Heatsink	22.9 ℃
CH7	SK715 Power Module	19.5 ℃
CH8	TOP Heatsink	19.6 ℃

Performance Test

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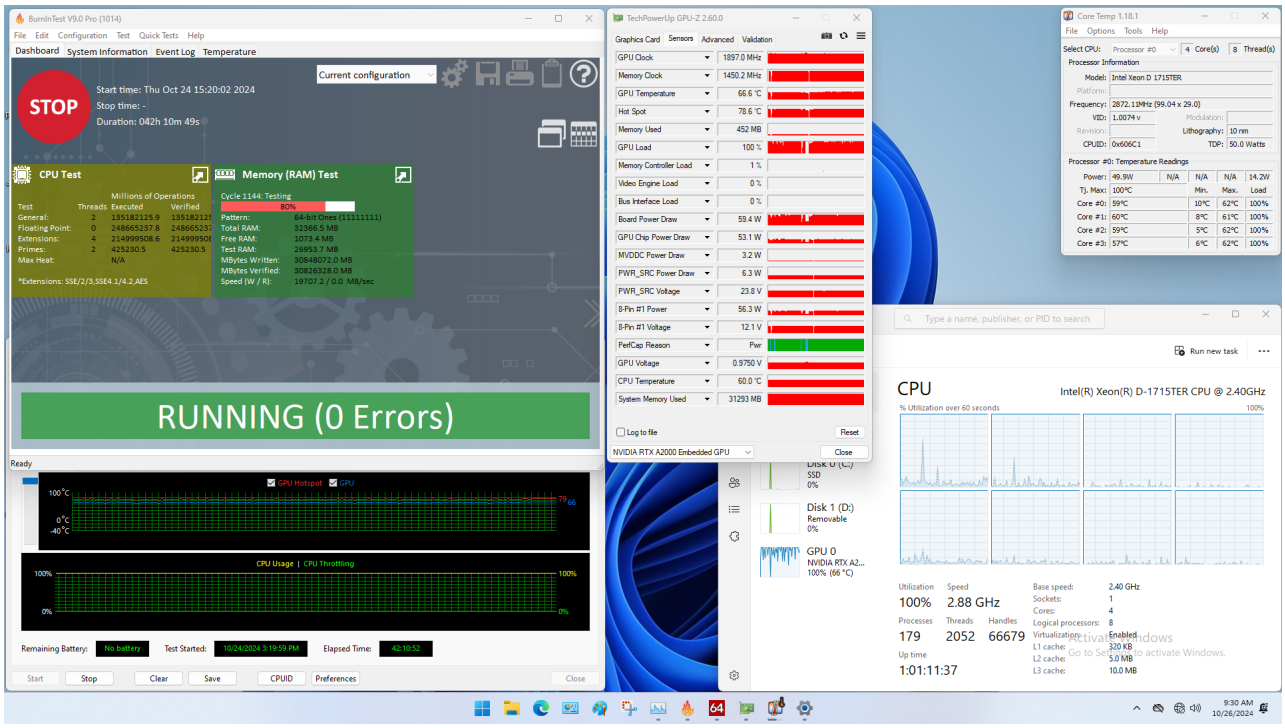
- Chamber in 25°C / 85%RH



Measuring Point	Ambient Temp.	25°C
	CPU P-Cores Max Temperature	59.0 ℃
	CPU E-Cores Frequency (Unit: GHz)	2.88 GHz
	GPU Temperature	66.6 ℃
	GPU Hot Spot Temperature	78.6 ℃
	GPU Frequency (Unit: MHz)	1897 MHz
CH1	CPU	49.6 ℃
CH2	DRAM	52.3 ℃
CH3	GPU	53.8 ℃
CH4	GPU RAM	48.6 ℃
CH5	CPU Heatsink	44.8 ℃
CH6	GPU Heatsink	47.2 ℃
CH7	SK715 Power Module	43.5 ℃
CH8	TOP Heatsink	42.7 ℃

Performance Test

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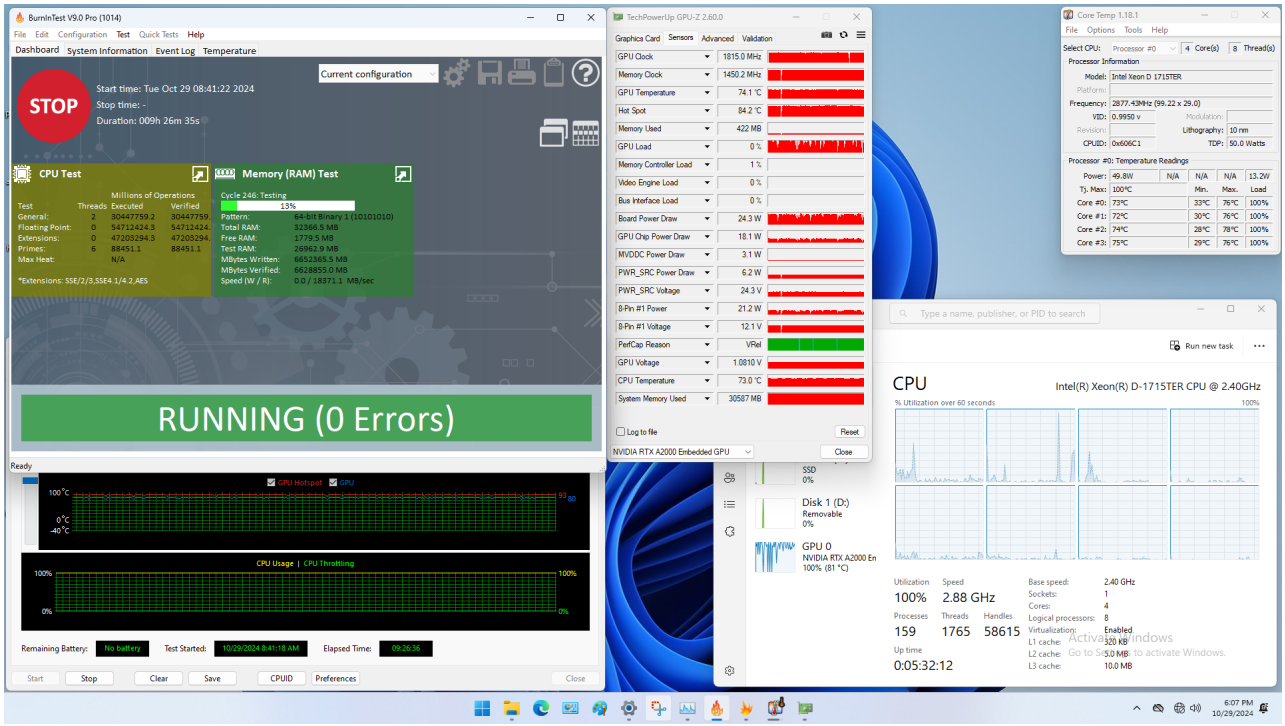
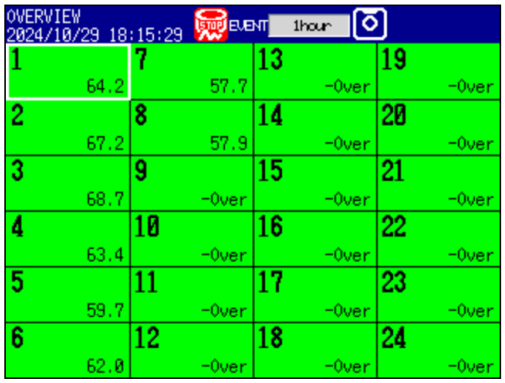
- Chamber in 40°C / 85%RH





Measuring Point	Ambient Temp.	40°C
	CPU P-Cores Max Temperature	74.0 ℃
	CPU E-Cores Frequency (Unit: GHz)	2.88 GHz
	GPU Temperature	74.1 ℃
	GPU Hot Spot Temperature	84.2 ℃
	GPU Frequency (Unit: MHz)	1815 MHz
CH1	CPU	64.2 ℃
CH2	DRAM	67.2 ℃
CH3	GPU	68.7 ℃
CH4	GPU RAM	63.4 ℃
CH5	CPU Heatsink	59.7 ℃
CH6	GPU Heatsink	62.0 ℃
CH7	SK715 Power Module	57.7 ℃
CH8	TOP Heatsink	57.9 ℃

Performance Test

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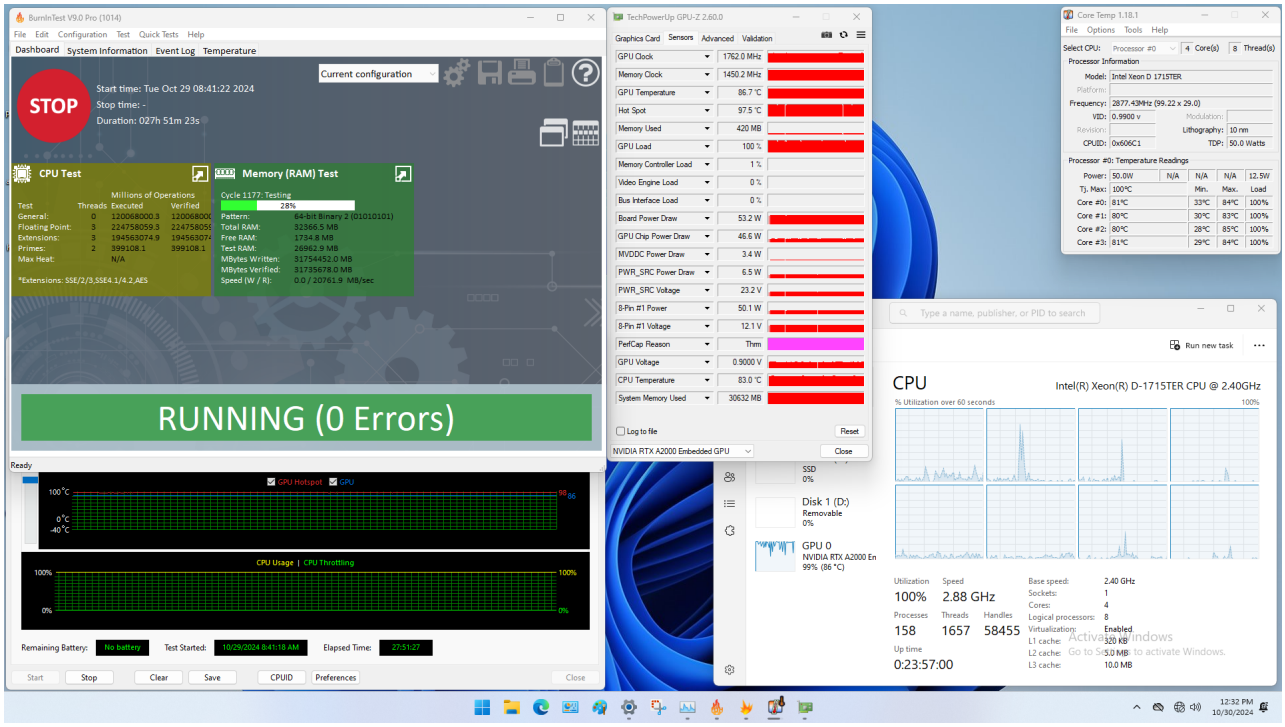
- Chamber in 50°C / 85%RH



Measuring Point	Ambient Temp.	50°C
	CPU P-Cores Max Temperature	81.0 ℃
	CPU E-Cores Frequency (Unit: GHz)	2.88 GHz
	GPU Temperature	86.7 ℃
	GPU Hot Spot Temperature	97.5 ℃
	GPU Frequency (Unit: MHz)	1762 MHz
CH1	CPU	72.1 ℃
CH2	DRAM	75.2 ℃
CH3	GPU	75.1 ℃
CH4	GPU RAM	70.5 ℃
CH5	CPU Heatsink	67.6 ℃
CH6	GPU Heatsink	69.1 ℃
CH7	SK715 Power Module	65.6 ℃
CH8	TOP Heatsink	65.8 ℃

Performance Test

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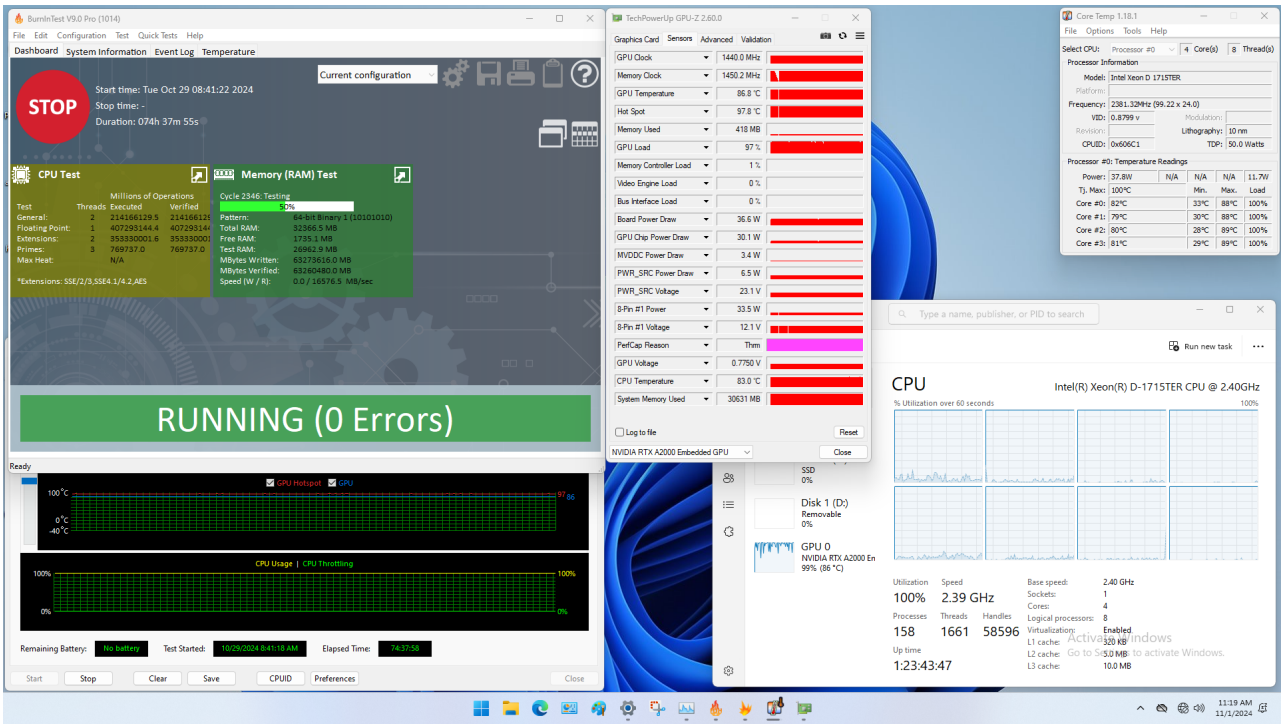
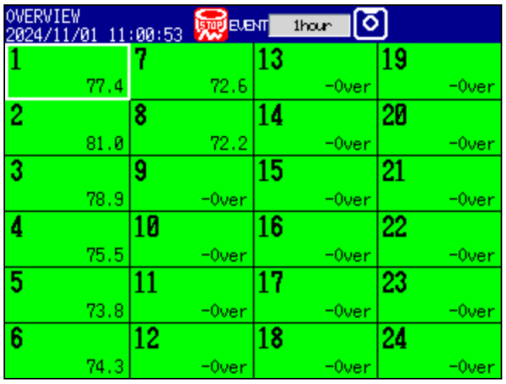
- Chamber in 60°C / 85%RH





Measuring Point	Ambient Temp.	60°C
	CPU P-Cores Max Temperature	82.0 ℃
	CPU E-Cores Frequency (Unit: GHz)	2.40 GHz
	GPU Temperature	86.8 ℃
	GPU Hot Spot Temperature	97.8 ℃
	GPU Frequency (Unit: MHz)	1440 MHz
CH1	CPU	77.4 ℃
CH2	DRAM	81.0 ℃
CH3	GPU	78.9 ℃
CH4	GPU RAM	75.5 ℃
CH5	CPU Heatsink	73.8 ℃
CH6	GPU Heatsink	74.3 ℃
CH7	SK715 Power Module	72.6 ℃
CH8	TOP Heatsink	72.2 ℃

5. THERMAL TEST RESULT(-40˚C ~ +60˚C)

CPU/GPU - Temperature & Frequency / Thermocouple Measurements

Temperature / Ambient / Frequency		-40°C	-20°C	0°C	25°C 85% RH	40°C 85% RH	50°C 85% RH	60°C 85% RH
CPU Cores Max Temperature (Unit: °C)		15.0	30.0	36.0	59.0	74.0	81.0	82.0
CPU Cores Frequency (Unit: GHz)		2.88	2.88	2.88	2.88	2.88	2.88	2.40
Temperature / Ambient / Temp.		-40°C	-20°C	0°C	25°C 85% RH	40°C 85% RH	50°C 85% RH	60°C 85% RH
GPU Temperature (Unit: °C)		12.6	36.2	43.0	66.6	74.1	86.7	86.8
GPU Hot Spot Temperature (Unit: °C)		24.1	47.4	55.0	78.6	84.2	97.5	97.8
GPU Frequency (Unit: MHz)		1965	1950	1920	1897	1815	1762	1440
Thermocouple / Ambient / Temp.		-40°C	-20°C	0°C	25°C 85% RH	40°C 85% RH	50°C 85% RH	60°C 85% RH
CH1	CPU	1.5	21.5	26.2	49.6	64.2	72.1	77.4
CH2	DRAM	5.4	18.0	28.8	52.3	67.2	75.2	81.0
CH3	GPU	2.0	25.3	29.0	53.8	68.7	75.1	78.9
CH4	GPU RAM	2.3	20.8	24.3	48.6	63.4	70.5	75.5
CH5	CPU Heatsink	6.5	16.8	21.1	44.8	59.7	67.6	73.8
CH6	GPU Heatsink	4.2	19.2	22.9	47.2	62.0	69.1	74.3
CH7	SK715 Power Module	7.4	16.0	19.5	43.5	57.7	65.6	72.6
CH8	TOP Heatsink	9.0	14.3	19.6	42.7	57.9	65.8	72.2

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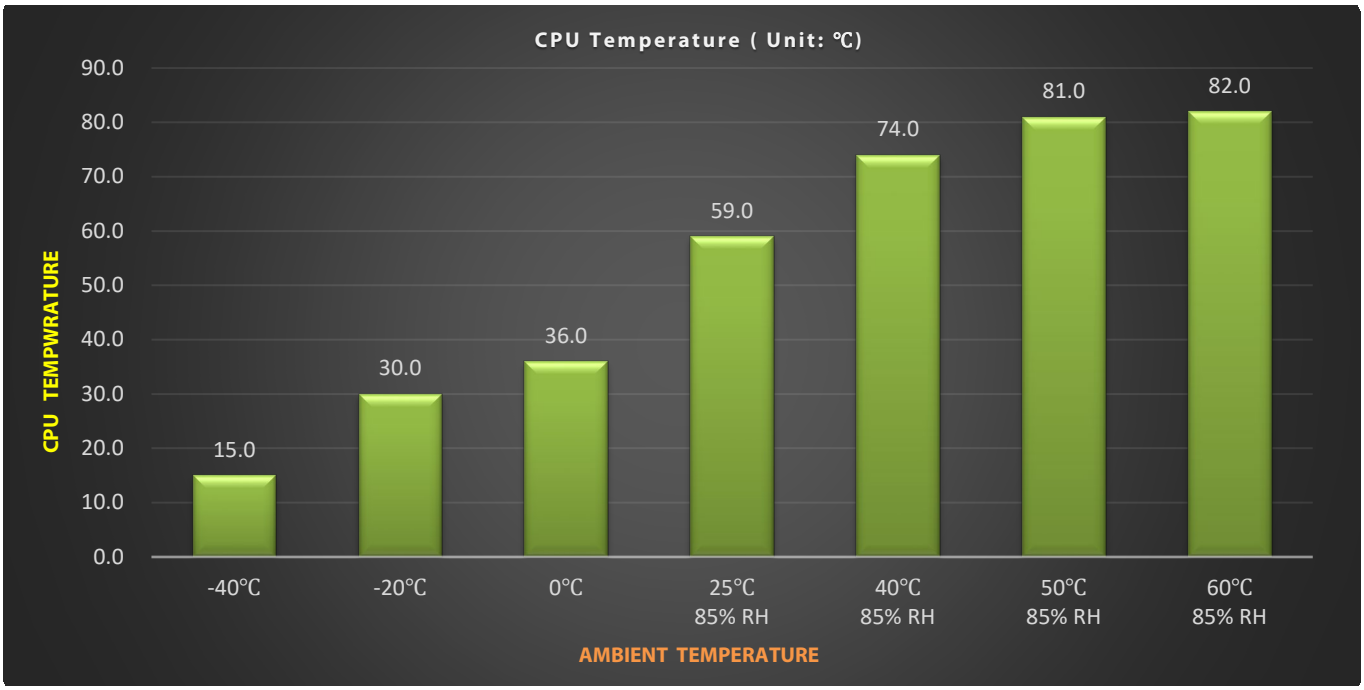

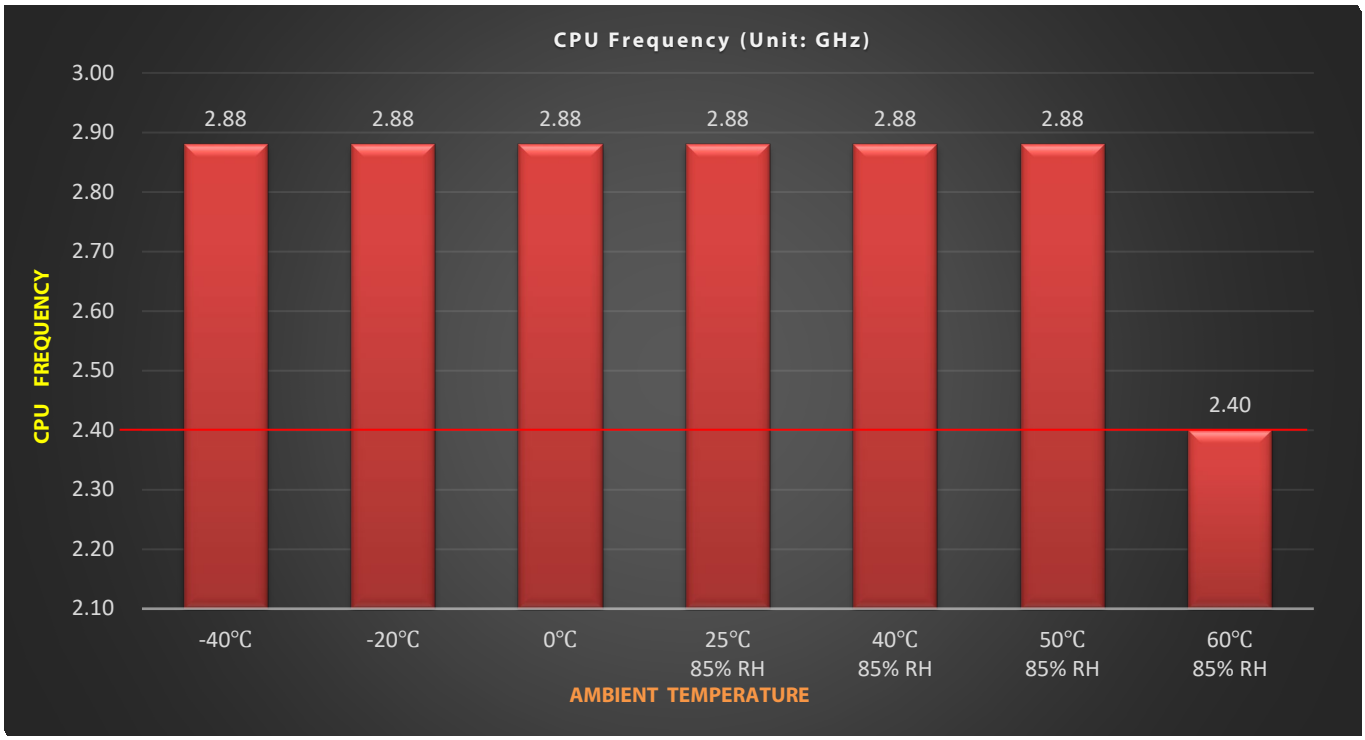

Performance Test

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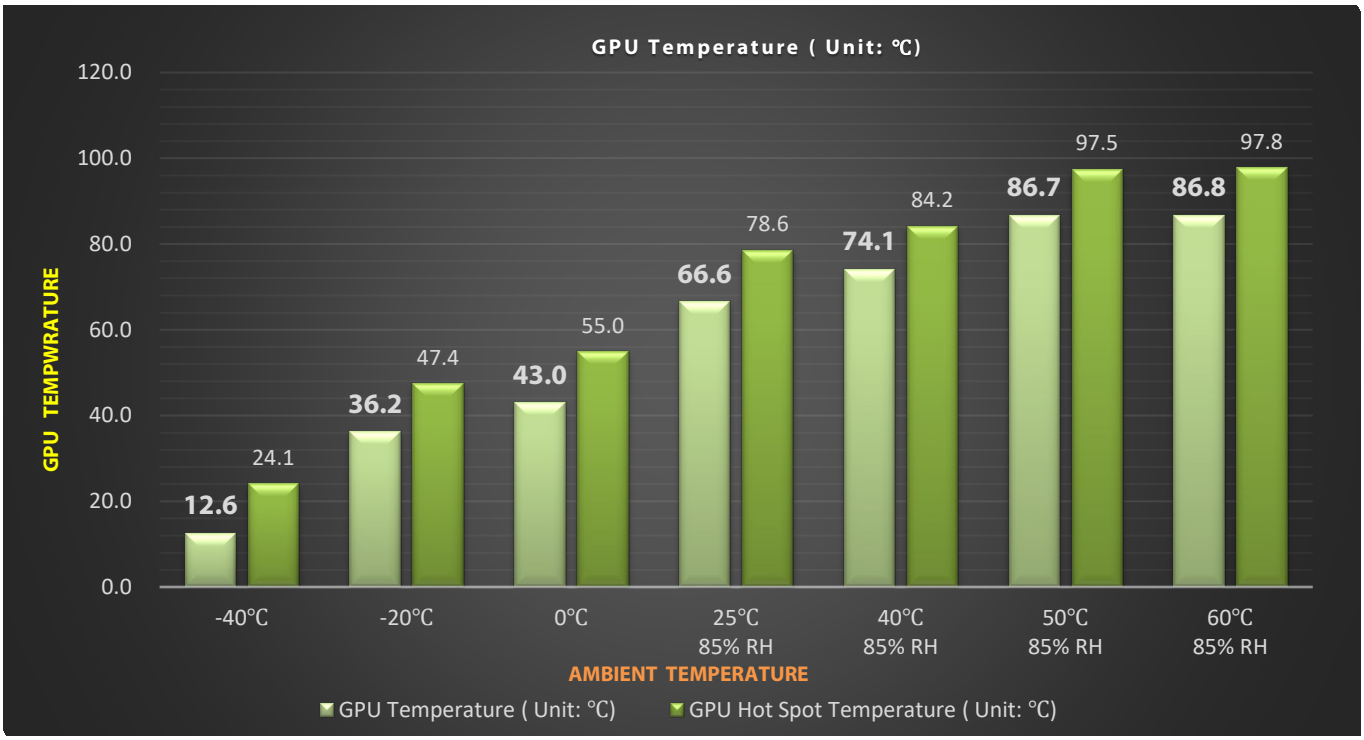
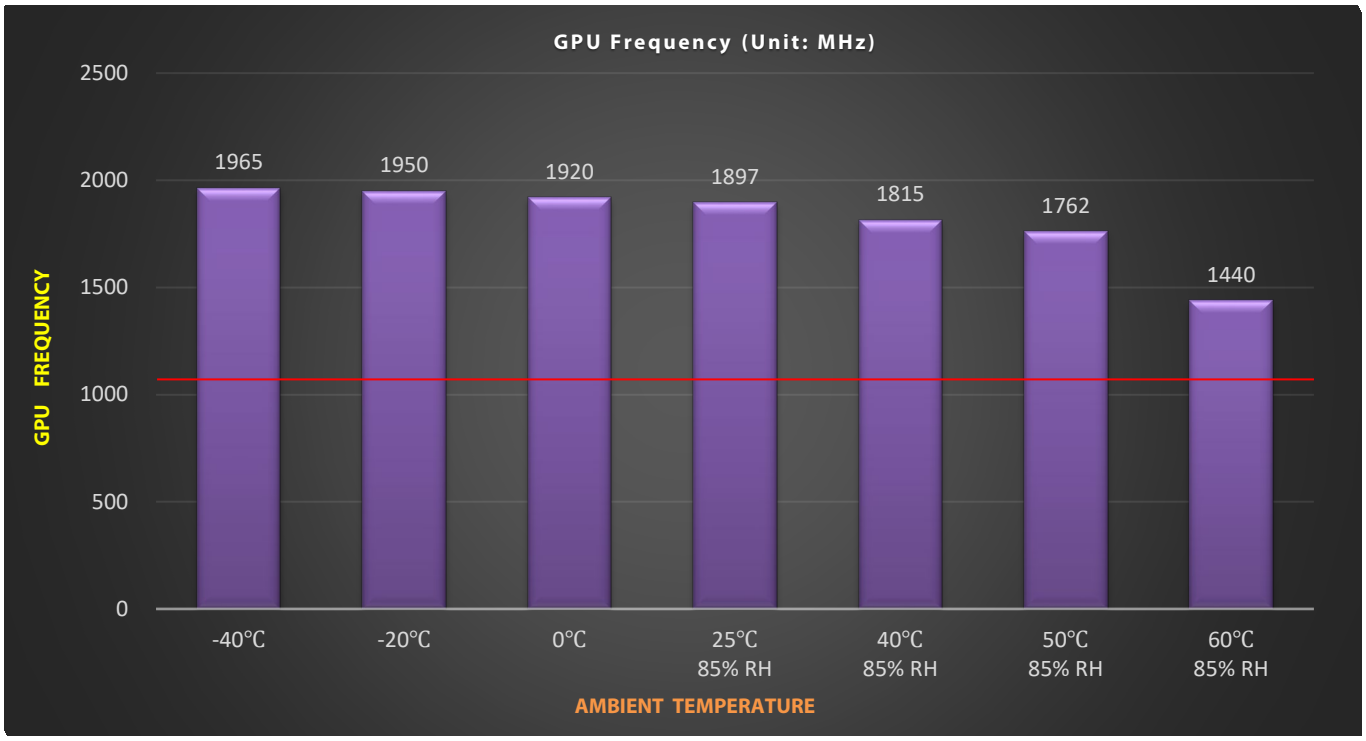
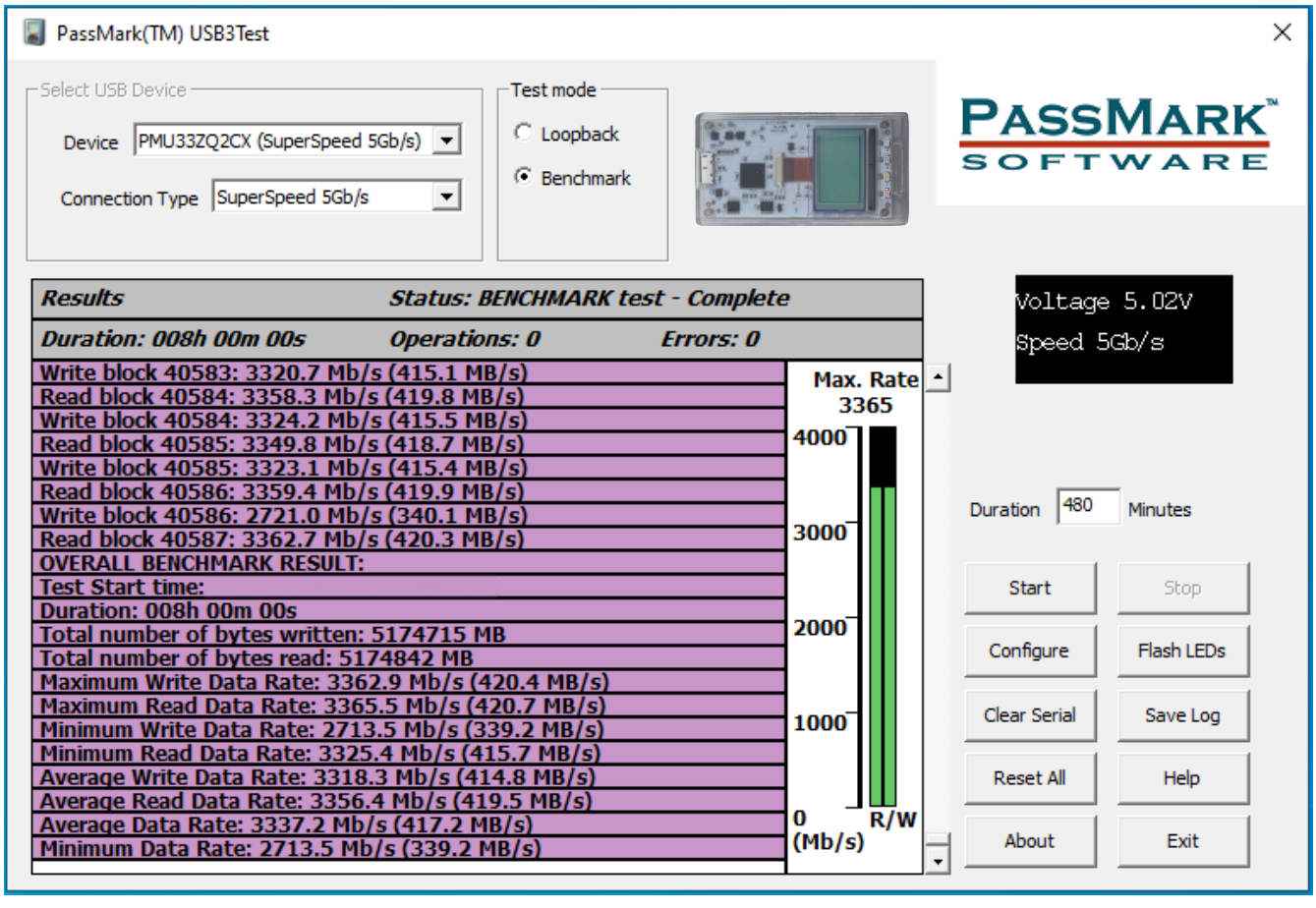




6. I/O FUNCTION TEST

6-1. USB3.0

USB 1



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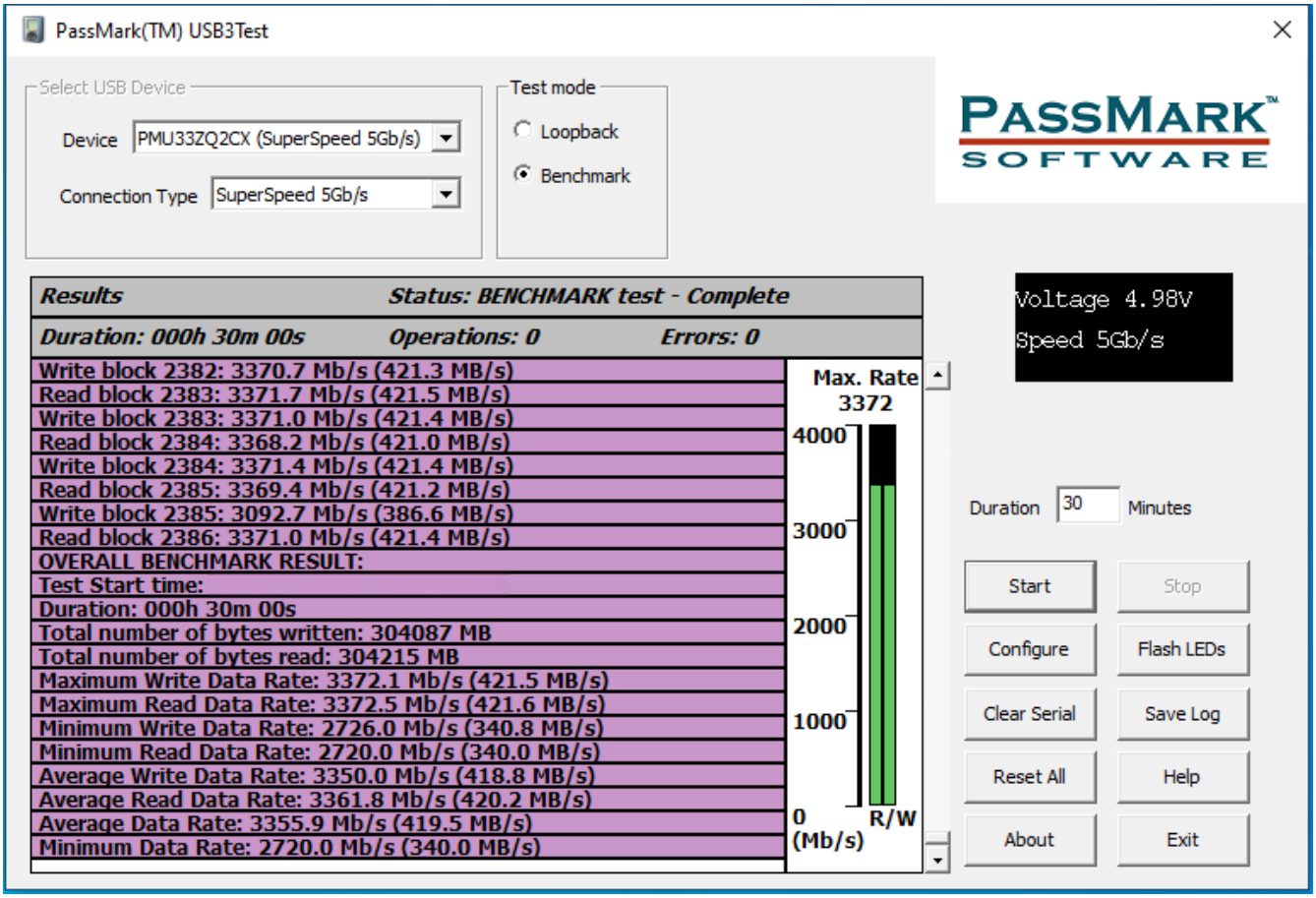
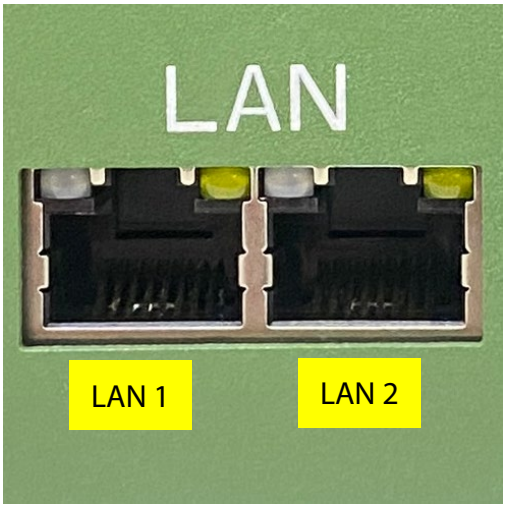
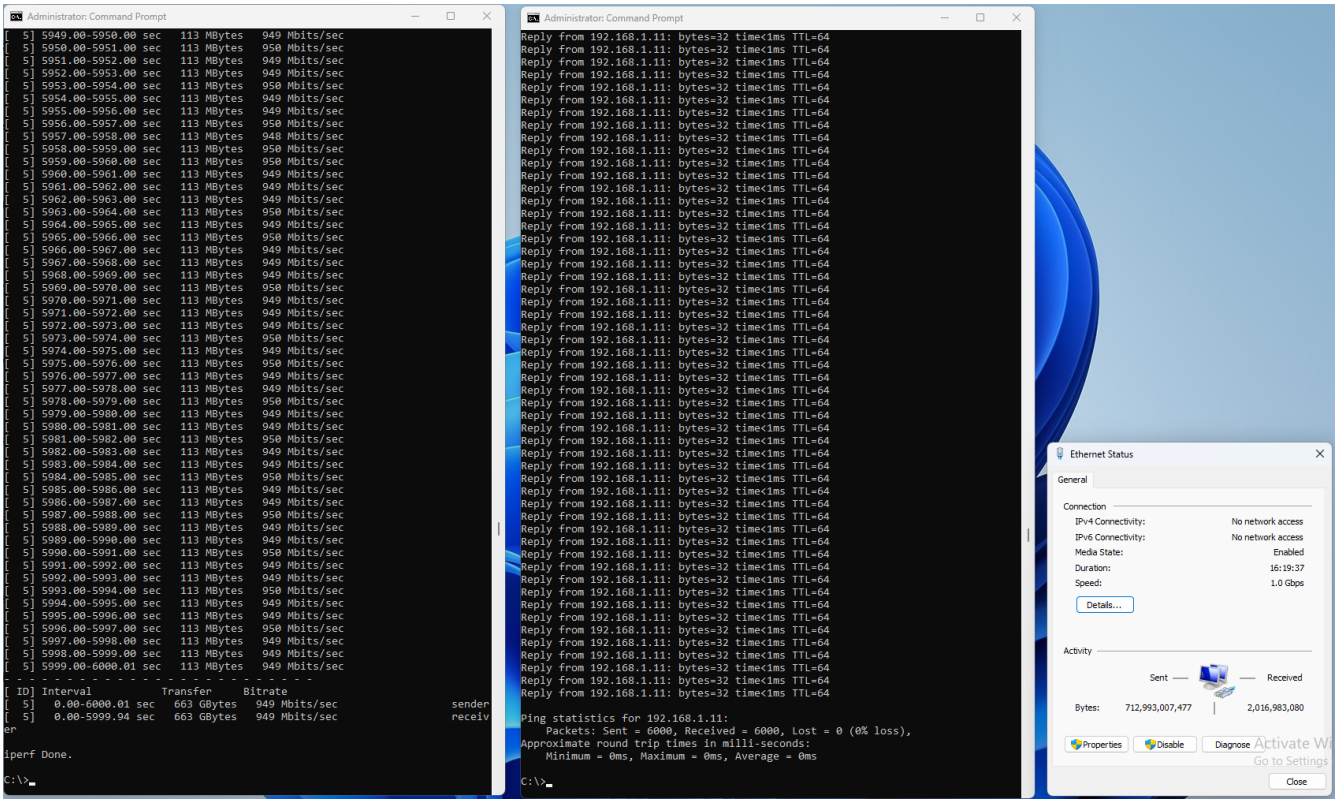
USB 2



6-2. 1Gbps Ehternet



LAN 1



LAN Speed Test Result: Pass
LAN Datapacket Test Result: 0 Lost

Performance Test

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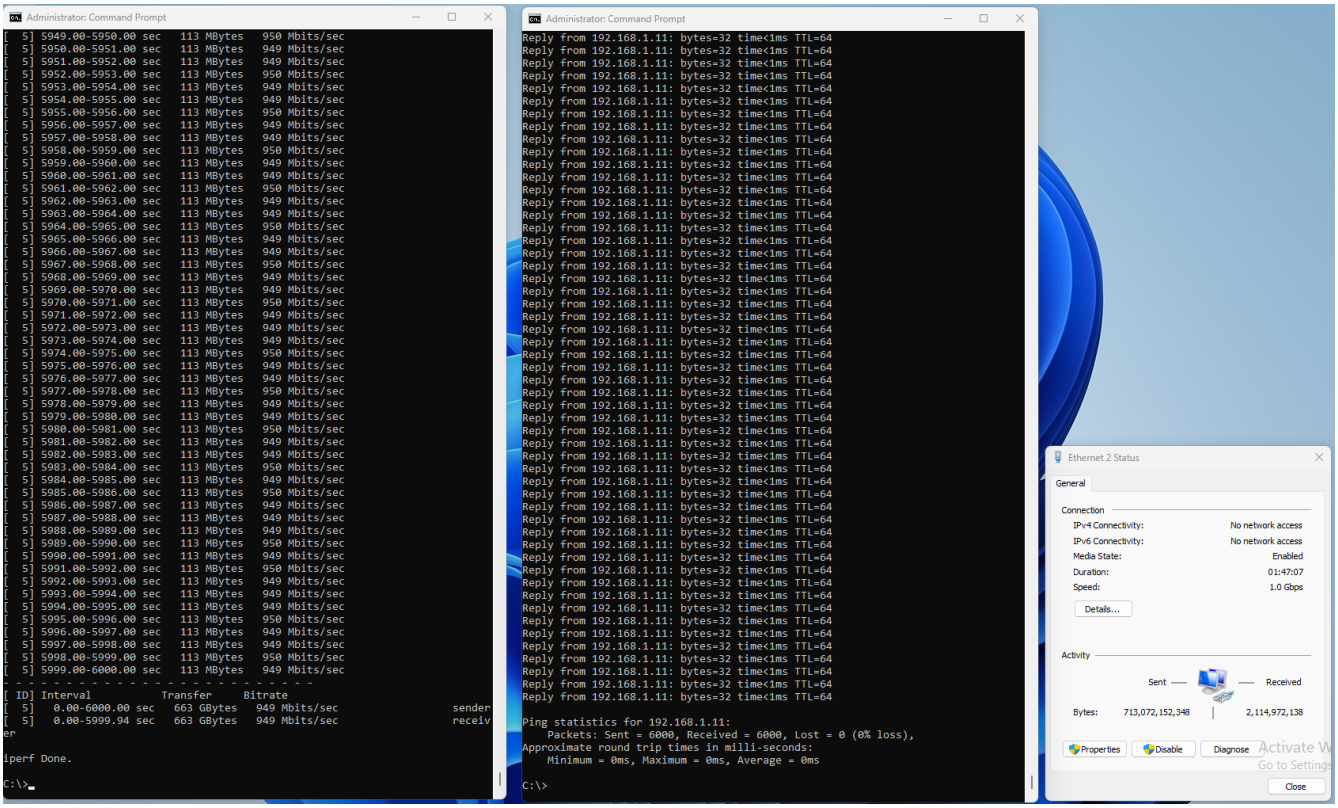
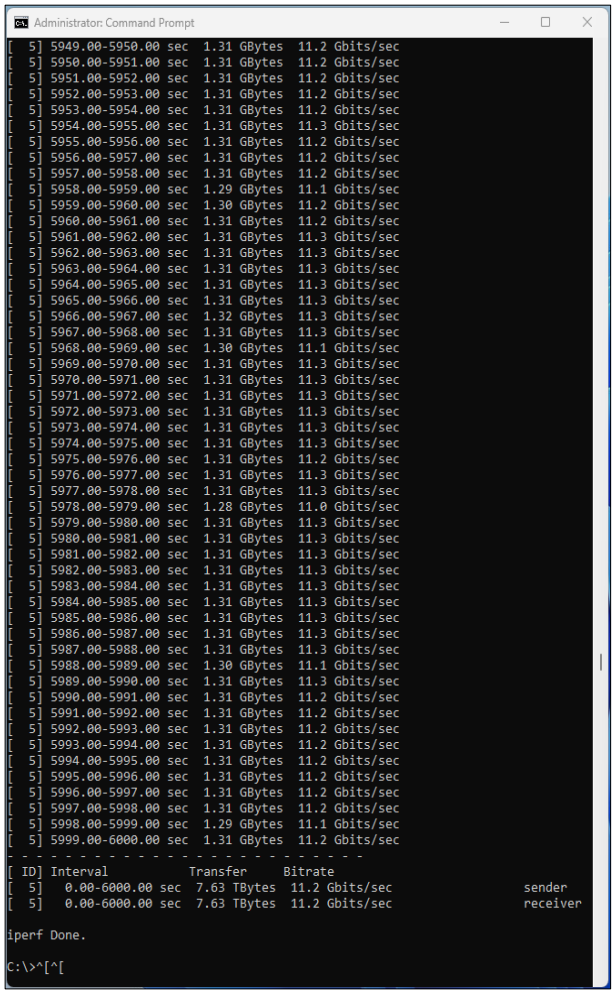
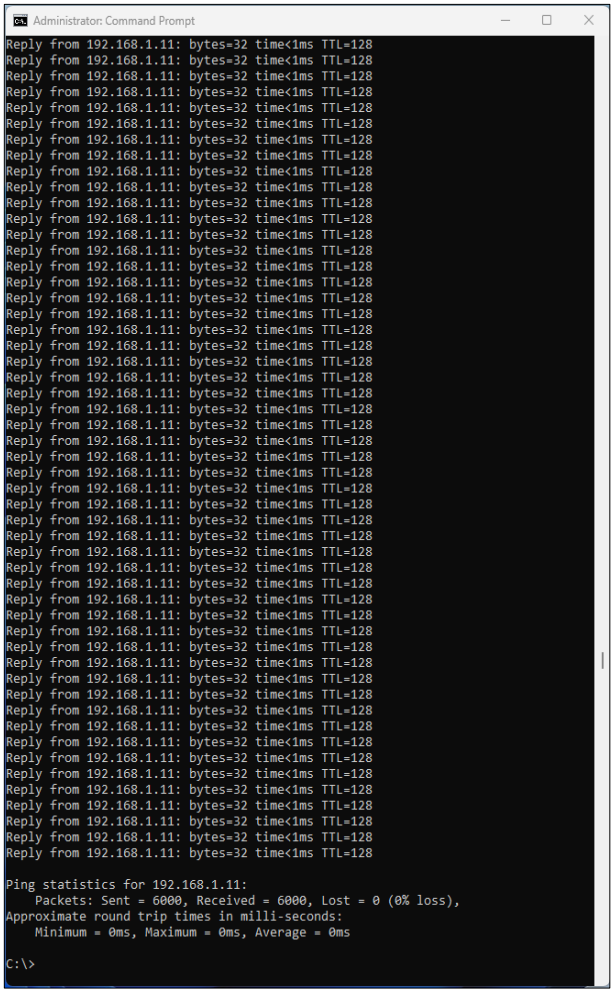
LAN 2



LAN Speed Test Result: Pass
LAN Datapacket Test Result: 0 Lost

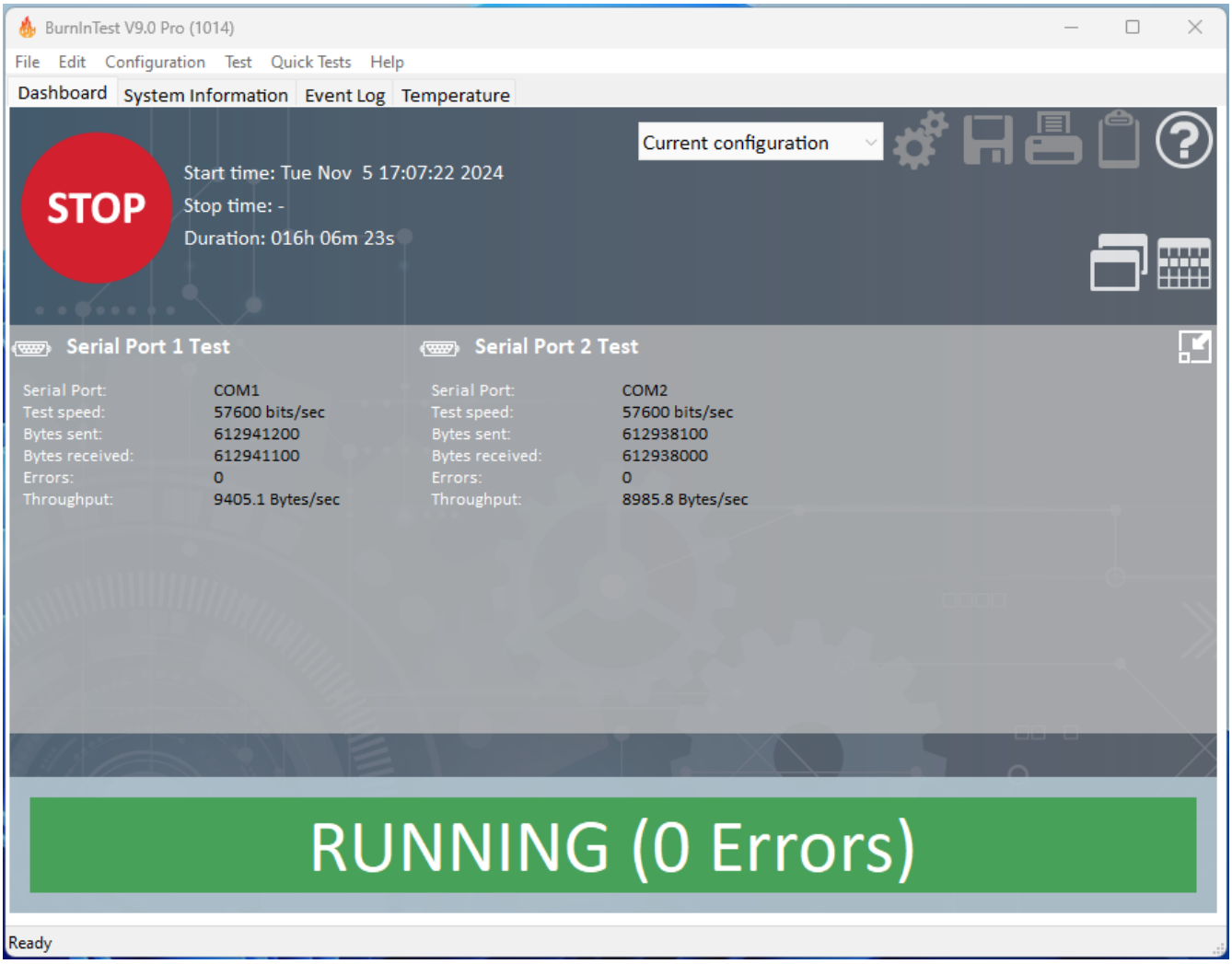
6-3. 10Gbps Ethernet





LAN Speed Test Result: Pass
LAN Datapacket Test Result: 0 Lost

6-4. Serial Port



6-5. Display Port