Report NO: 14IP010007

EMB-Q87A

Intel® Q87 Express Chipset

P5 Verification Test Report

Summary	☒ Pass ☐ Fail ☐ Pass with Deviation (Comment: _____)			
Test Results Category				
	Critical	Major	Minor	Enhancement
Defect Found	0	0	0	0
Defect Unsolved	0	0	0	0

Issue date	Approval	Test Engineer
2014/06/11	Tom Lin	Leo Liu

Version Released Records

Date	Version	Change History	Note
2010/04/21	P3-1001	1. Re-composing test Items	
2010/06/01	P2P3-1001	1. New Test Report	
2010/06/21	P2P3-1002	1. Add BIOS -> SPI ROM Setting (South Bridge - GPIO)	
2010/12/02	P2P2-1003	1. New Test Report	
2011/02/23	P2P3-1101	1. Re-composing test Items	
2011/03/04	P2P3-1102	1. Add Specification Validation	
2012/0529	P2P3-1201	1. Add Summary Table of DTS	

Note :

For all test items in this report, 3 results have been defined and described as following:

Pass: Functionality work perfectly
Fail: Functionality failed and must be resolved in the next version
N/A: Functionality Not Applicable or Not Available

This test report will be updated when re-test completed in product next change version.

Specification Validation
Main Specification

Item	Specification	Result Pass	Result Fail	Result N/A	Note
Form Factor	ATX	☒	☐	☐	
Processor	IntelR Haswell 22nm LGA 1150 socket Processor, Max. 65W TDPs	☒	☐	☐	
System Memory	Dual channel pure DIMM configuration DIMM_A1, DIMM_B1 DDR3 Speed and Type DDR3-1333, DDR3-1600 Type 204 pin, Non-ECC,Unbuffered Max:16GB	☒	☐	☐	
Chipset	Intel® Q87 Express Chipset	☒	☐	☐	
Super I/O	NUVOTON NCT6791D	☒	☐	☐	
	1XCPU FAN connector(s)(4-pin) 1XChassis FAN connector(s)(4-pin)	☒	☐	☐	
Network	IntelR PHY I217LM Giga LAN (support vPro)	☒	☐	☐	
	IntelR I210AT Giga LAN	☒	☐	☐	
Storage	South Bridge: Intel Q87 built-in SATA GEN3(6G/s)x 4 port(s)	☒	☐	☐	
	RAID 0/1/5/10	☒	☐	☐	
TPM	Infineon SLB9655	☒	☐	☐	
USB	USB 2.0 Ports: 6 mid-board: (3 headers) 6 ports	☒	☐	☐	
	USB 3.0 Ports: 4 back panel: 4 ports	☒	☐	☐	
Audio	Realtek ALC887 (Colay with ALC886)	☒	☐	☐	
Expansion Slots	Slots: PCIEX4 slot: 1	☒	☐	☐	
PC Health Monitoring	Voltage: Vcore 5V,12V,3V Fan Speed,CPU fan,Chassis fan Temperature:CPU,Motherboard	☒	☐	☐	
Graphics	Integrated Gfx in North bridge Max. resolution LVDS: Up to 1920 x 1200 @ 60 Hz, Dual Channel 18/24 bit. Backlight Control:Voltage/PWM. VGA: up to 1920 x 1200 @60 Hz HDMI: up to 1920 x 1080 @60, with Digital Audio	☒	☐	☐	
Back I/O Connector	AUDI Audio Jack x: 2 (Line-out, Line-In/Mic-In) port Lan (RJ45) x:2 USB3.0 x: 2 layers x2（共 4 個 port) HDMI Display Port	☒	☐	☐	

		Pass	Fail	N/A	
Onboard Connector	BATTERY AAFP (BLACK) CLRTC Speaker (4 pin internal speaker) F_Panel (2x5 pin (K10), (IDE LED, Power LED,Power Switch, Reset) DIO connector x: 1 Invertor control connector x: 1 LVDS Panel connector x: 1 COM port (Box header) connector x: 2(其中 Com1 support RS232/422/485) USB2.0(2x5 pin , k9) x: 3 header (6 ports), pin pitch 2.0mm Full size Mini PCIE socket x: 1(colay half size) Half size Mini PCIE socket x: 1 SATA Gen3(6G/s) x: 4	☒	☐	☐	
Jumpers, LED & BUZZER	A. Jumper: CLRTC* (3 pin, Normal/Clear RTC,with tab)	☒	☐	☐	
	B. LED: SB_PWR* (Green, stand-by power LED)	☒	☐	☐	
	C. BUZZER/Speaker Header Buzzer	☒	☐	☐	
Wake-up Functions	WOR by Ring* (Wake On Ring by external Modem from S3, S4, S5)	☒	☐	☐	
	WOL/WOR by PME* (Wake On LAN/Ring by PME from S3, S4, S5)	☒	☐	☐	
POWER MANAGEMENT	S3,S4,S5 ERP(default)/ DSW	☒	☐	☐	

O.S. Support

Item	Specification	Result			Note
		Pass	**Fail**	**N/A**	
Microsoft Windows	Windows 7, 32bit / 64bit	☒	☐	☐	
	Windows 8 32bit/64bit	☒	☐	☐	
Linux	Linux-Fedora	☒	☐	☐	

Environmental Specifications

Item	Specification
Operating temperature	0~60°C
Operating humidity	0%～90%RH, non-condensing
EMC	CE & FCC Class A

Note: Please refer to Environment Test Report for detail information

Platform Information

Item	Device Information	Test Item
PCB Model / Version	EMB-Q87A 1.01	1,2,3,4,5,6,7,8,9
BIOS / Version	R1.2(EQ87AM12) (04/16/2014)	1,2,3,4,5,6,7,8,9
CPU Type	Intel® Core™ i7-4770K Processor (8M Cache, up to 3.90 GHz)	1,2,3,4,5,6,7,8,9
Memory Type	DSL DDR3-1600 8GB(hynix H5TQ4G83MFR) x2	1,2,3,4,5,6,7,8,9
SATA HDD	Seagate ST500DM002 SATAIII 3.5" 500GB/7200rpm	1,2,3,4,5,6,7,8,9
SATA DVD-ROM	Pioneer DVR-217	1,2,3,4,5,6,7,8,9
USB DVD-ROM	ASUS-SDRW-08D2S-U	1,2,3,4,5,6,7,8,9
LCD Monitor	Dell U2410 1920*1200 LG E2260 1920*1080 ViewSonic VA703b 1280*1024	1,2,3,4,5,6,7,8,9
Operating System	☒ Linux English Fedora17 Kernel 3.3.4-5.fc17.i686.PAE	7-1
	☒ Windows 7 Ultimate SP1 English Version 32/64 Bit	7-2
	☒ Windows 8 Pro English Version 32/64Bit	7-3
Power Supply	ATX Power Supply : Zippy HG2-6400P 400W	1,2,3,4,5,6,7,8,9
	Chipset Information with 7 Ultimate SP1 English Version 32 Bit Driver Version	
Chipset Software	Intel Chipset Device Software 9.4.0.1016(01/11/2013)	
PCH Bridge	Intel Q87 (C2 version)	
Super IO Chipset	NuvoTon NCT6791D	
VGA Chipset	Intel HD Graphics 4600 9.18.10.3107 (4/11/2013)	
Audio Chipset	Realtek High Definition Audio 6.0.1.6899 (5/7/2013)	
	Intel Display Audio 6.16.0.3106 (1/11/2013)	
Ethernet Chipset	Intel Ethernet Connection I217-LM 12.6.47.0 (2/26/2013)	
	Intel I210 Gigabit Network Connection 12.7.28.0 (4/5/2013)	

Summary Table of contents:

1. Hardware Test

1.1. CPU Compatibility Test

CPU Information	Result			Note
	Pass	**Fail**	**N/A**	
Intel® Core™ i7-4770K Processor(8M Cache,3.5GHz, up to 3.90 GHz) 84W(ES)	☒	☐	☐	
Intel® Core™ i7-4770S Processor(8M Cache, 3.1GHz, up to 3.90 GHz)65W(ES)	☒	☐	☐	
Intel® Core™ i7-4770T Processor(8M Cache, 2.5GHz, up to 3.70 GHz)45W(ES)	☒	☐	☐	
Intel® Core™ i5-4570S Processor(6M Cache, up to 3.60 GHz) 65W(ES)	☒	☐	☐	
Intel® Core™ i3-4330 Processor (4M Cache, 3.50 GHz) 65W(ES)	☒	☐	☐	

1.2. Memory Compatibility Test

Memory Information	MEM V4.20			Note
	Pass	**Fail**	**N/A**	
InnoDisk DDR3-1600 8GB(hynix H5TQ4G83MFR)	☒	☐	☐	
DSL DDR3-1066 4GB(SEC 134 HCH9 K4B2G0846D)	☒	☐	☐	
DSL DDR3-1066 4GB(SEC 134 HCH9 K4B2G0846D)	☒	☐	☐	
InnoDisk DDR3-1066 4GB(hynix H5TQ2G83CFR H9C)	☒	☐	☐	
Transcend DDR3-1333 1GB(SEC 325 BCH9 K4B1G0846G)	☒	☐	☐	
Transcend DDR3-1333 4GB(AP-DR14D6A04G00)	☒	☐	☐	
DSL DDR3-1333 8GB(ELPIDA J4208BBBG-GN-F)	☒	☐	☐	
Transcend DDR3-1600 4GB(SEC 316 XYKO K4B4G0846B)	☒	☐	☐	
Transcend DDR3-1600 8GB(SEC 325 XYKO K4B4G0846B)	☒	☐	☐	
InnoDisk DDR3-1333 4GB(Micro 2AD22 D9MGZ)	☒	☐	☐	

1.3. SATA Compatibility Test

1.3.1 SATA-IDE Mode Test

SATA IDE Mode		Result			Note
		Pass	**Fail**	**N/A**	
HDD	Seagate ST500DM002 SATAIII 3.5" 500GB/7200rpm	☒	☐	☐	
HDD	Seagate ST30000DM001-2Y/P SATAIII 3.5" 3TB/7200rpm	☒	☐	☐	
HDD	Hitchi HDS721050CLA362 3.5" 500GB/7200rpm	☒	☐	☐	

1.3.2 Onboard SATA-AHCI Mode Test

SATA AHCI Test	Result			Note
	Pass	**Fail**	**N/A**	
Seagate ST500DM002 SATAIII 3.5" 500GB/7200rpm	☒	☐	☐	
WD WD500AKX SATAIII 3.5" 500GB/7200rpm	☒	☐	☐	
ADATA SSD SX900 128GB	☒	☐	☐	
Seagate ST3160815AS 3.5" 160GB/7200 rpm	☒	☐	☐	
Toshiba HDKPC05A0A02 S SATAIII 3.5" 500GB/7200rpm	☒	☐	☐	

1.3.3 Onboard SATA-RAID Mode Test

SATA RAID Test		Result			Note
		Pass	Fail	N/A	
RAID-0 (HDDx2) Striping/Span Test	WD WD20EZRX 3.5" 2TB	☒	☐	☐	Win7_32
	WD WD20EZRX 3.5" 2TB	☒	☐	☐	
RAID-1 (HDDx2) Mirror Test	Toshiba HDKPC03A2A02J 3.5" 1TB	☒	☐	☐	Win7_64
	Toshiba HDKPC03A2A02J 3.5" 1TB	☒	☐	☐	
RAID-5 (HDDx3) Striping/Span Test Rotation Parity	TOSHIBA MK167GSX 160GB 2.5"	☒	☐	☐	Win8_64
	TOSHIBA MK167GSX 160GB 2.5"	☒	☐	☐	
	TOSHIBA MK167GSX 160GB 2.5"	☒	☐	☐	
RAID-10 (HDDx4) Striping/Span Test Mirroring	TOSHIBA MK167GSX 160GB 2.5"	☒	☐	☐	Win7_32
	TOSHIBA MK167GSX 160GB 2.5"	☒	☐	☐	
	TOSHIBA MK3276GSX 320GB 2.5"	☒	☐	☐	
	TOSHIBA MK3276GSX 320GB 2.5"	☒	☐	☐	

2. Basic Function Test

2.1. Video Function Test

2.1.1. Single Output Function Test

	Hardware Information with Windows 7 Ultimate English Version 32 Bit Driver Version
CPU	Intel® Core™ i7-4770S Processor(8M Cache, up to 3.90 GHz) 65W
Memory	DSL DDR3-1600 8GB(hynix H5TQ4G83MFR) x2
SATA HDD	Seagate ST30000DM001-2Y/P SATAIII 3.5" 3TB/7200rpm
VGA	DELL U2713HM 27" 1920*1200
LVDS	1920x1080 21.5"(M215HW03 V.1)
HDMI	DELL U2410 24" 1920*1200
Display port	DELL U2713HM 2560*1440
Color Quality	☒16bit ☐24bit ☒32bit

Resolution	VGA			LVDS			HDMI			DP			Note
	Pass	Fail	N/A	Pass	Fail	N/A	Pass	Fail	N/A	Pass	Fail	N/A	
640X480	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	
800X600	☒	☐	☐	☒	☐	☐	☒	☐	☐	☐	☐	☒	
1024X768	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	
1152X864	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	
1280X600	☒	☐	☐	☒	☐	☐	☒	☐	☐	☐	☐	☒	
1280X720	☒	☐	☐	☒	☐	☐	☒	☐	☐	☐	☐	☒	
1280X768	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	
1280X800	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	
1280X960	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	
1280X1024	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	
1360X768	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	
1366X768	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	
1400X1050	☒	☐	☐	☒	☐	☐	☒	☐	☐	☐	☐	☒	
1600X900	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	
1600X1200	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	
1680X1050	☒	☐	☐	☒	☐	☐	☒	☐	☐	☒	☐	☐	
1792X1344	☐	☐	☒	☐	☐	☒	☐	☐	☒	☒	☐	☐	
1856X1392	☐	☐	☒	☐	☐	☒	☐	☐	☒	☒	☐	☐	
1920X1080	☐	☐	☒	☐	☐	☒	☒	☐	☐	☒	☐	☐	
1920X1200	☒	☐	☐	☐	☐	☒	☒	☐	☐	☒	☐	☐	
1920X1440	☐	☐	☒	☐	☐	☒	☐	☐	☒	☒	☐	☐	
2048X1152	☐	☐	☒	☐	☐	☒	☐	☐	☒	☒	☐	☐	Test with Dell U2713HM
2560X1440	☐	☐	☒	☐	☐	☒	☐	☐	☒	☒	☐	☐	
Rotation	☒	☐	☐	☐	☐	☒	☒	☐	☐	☒	☐	☐	Rotation (0 / 90 /180 /270)

Note: Pay attention to Full Screen under POST screen and Text Mode.

2.1.2. Multi-Display Test

Selection	Output	Result			Note
		Pass	Fail	N/A	
Dual Display Clone	VGA + HDMI	☒	☐	☐	
Extended Desktop		☒	☐	☐	
Dual Display Clone	VGA+DP	☒	☐	☐	
Extended Desktop		☒	☐	☐	
Dual Display Clone	VGA+LVDS	☒	☐	☐	
Extended Desktop		☒	☐	☐	
Dual Display Clone	HDMI+DP	☒	☐	☐	
Extended Desktop		☒	☐	☐	
Dual Display Clone	HDMI+LVDS	☒	☐	☐	
Extended Desktop		☒	☐	☐	
Dual Display Clone	DP+LVDS	☒	☐	☐	
Extended Desktop		☒	☐	☐	
Triple Display Clone	VGA + HDMI +DP	☒	☐	☐	
Extended Desktop		☒	☐	☐	
Triple Display Clone	VGA + HDMI +LVDS	☒	☐	☐	
Extended Desktop		☒	☐	☐	
Triple Display Clone	HDMI+DP+LVDS	☒	☐	☐	
Extended Desktop		☒	☐	☐	
Triple Display Clone	VGA+DP+LVDS	☒	☐	☐	
Extended Desktop		☒	☐	☐	

2.1.3. Video Resolution Test

Test points:

    1. Power on without inserting any VGA connector until system reaches Windows desktop

    2. Plug VGA connector into test machine while system reaches Windows; then check VGA driver and display

    3. Check VGA output Brightness to if it is normal, no "Ghost Image" / "Flicker"

	Result			Note
	Pass	Fail	N/A	
In Windows Desktop	☒	☐	☐	

2.1.4. Video Resolution Test

LVDS Model		Result			Note
		Pass	Fail	N/A	
LVDS	1_AUO G065VN01 V.0 / 6.5" / 640x480 / 18bit (4:3)	☐	☐	☒	
	2_AUO G065VN01 V.0 / 6.5" / 640x480 / 24bit (4:3)	☐	☐	☒	
	3_Data Image 7" / 800*480 / 18bit (16:9)	☐	☐	☒	
	4_AU G084SN05 V.3 / 8.4" / 800*600 / 18bit (4:3)	☐	☐	☒	
	5_AU B104SN02 V.0 / 10.4" / 800*600 / 18bit (4:3)	☐	☐	☒	
	6_AUO G084SN05 v7 / 8.4" / 800*600 / 24bit (4:3)	☐	☐	☒	
	7_AU G150XG01 V.0 / 15" / 1024*768 / 18bit (4:3)	☐	☐	☒	
	8_AU M150XN07 V.2 / 15" / 1024x768 / 24bit (4:3)	☐	☐	☒	
	9_AUO G121XN01 V.0 / 12" 1024*768 / 18bit (4:3)	☐	☐	☒	
	10_AU M170EG01 V.D/ 17"/ 1280*1024 / 48bit (4:3)	☐	☐	☒	
	11_AU M170XW01 V.1 / 17" / 1280x768 / 24bit (16:9)	☐	☐	☒	
	12_AUO T260XW02 / 26" / 1366x768 / 24bit	☐	☐	☒	
	13_AU M201UN02 V.5 / 20.1" / 1600x1200x48bit	☐	☐	☒	
	14_AUO T370HW01 / 37" / 1920x1080 / 48bit	☐	☐	☒	
	15_AUO 1920x1080 21.5"(M215HW03 V.1)	☒	☐	☐	

2.2. Audio Function Test

〔 〕No Support

Function Test	Result			Note
	Pass	Fail	N/A	
L (Left) Channel	☒	☐	☐	
R (Right) Channel	☒	☐	☐	
Line In	☒	☐	☐	
Line Out	☒	☐	☐	
MICROPHONE	☒	☐	☐	

2.3. LAN Function Test

〔　〕No Support

Connect two computers via different speed LAN HUB by using "Ping" instruction (1000 times)									
1000MBps LAN HUB		D-Link DGS-1008D							
100MBps LAN HUB		HP J4095A 24 Ports							
10MBps LAN HUB		SVEC FD916H							
OnBoard LAN1		IntelR PHY I217LM Gigabit LAN					MAC Address		00-07-32-64-12-87
OnBoard LAN2		IntelR I210AT Gigabit LAN					MAC Address		00-07-32-64-12-88

LAN Speed	Link / Speed LED	Active LED	LAN 1			LAN 2			Note
			Pass	Fail	N/A	Pass	Fail	N/A	
1000MBps			☒	☐	☐	☒	☐	☐	
100MBps			☒	☐	☐	☒	☐	☐	
10MBps			☒	☐	☐	☒	☐	☐	
Wake On LAN			☒	☐	☐	☒	☐	☐	S1/S3/S4/S5/DOS off
LAN Boot (PXE)			☒	☐	☐	☒	☐	☐	
Internet Browser (DHCP Server)			☒	☐	☐	☒	☐	☐	

2.3.2. Throughput Test

DUT Platform Information:

☐	Fedora Core 14 – Kernel	
☒	Cent OS5.6	
☐	Ubuntu 10.10 Kernel 2.6.35-22-generic #33	
☐	Red Hat	

Note : Connection-Level Performance (Interaction Constants Duration Time Set to <u>60</u> Sec.)

Graphics Media	Cent OS5.6 Default setting
LAN	LAN1→Intel PHY I217LM Gigabit LAN <Intel Pro/1000 Network Driver e1000e-2.3.2.tar.gz
	LAN2→Intel I210AT Gigabit LAN<Intel Pro/1000 Network Driver igb-4.3.0.tar.gz
Audio Driver	Cent OS5.6 Default setting

SMB Platform Information:

Chassis	SPIRENT Smartbits 600B
Chassis Version	2.80.003 (Cur) 2.50.000
Chassis Serial #	06014047
Library	6.00-29
API	5.50.42.01
File	0550042
Module	2 * LAN-3324A SmartMetrics XD 4-Port 10/100/1000Base-T Gigabit Ethernet
Test Software	SmartFlow5.50.42.1

Test Result:

1. Half Direction (LAN1: Intel PHY I217LM Gigabit LAN → LAN2: Intel I210AT Gigabit LAN)
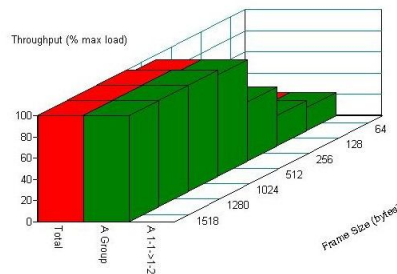
Throughput vs Frame Size

Name/Framesize	64	128	256	512	1024	1280	1518
Total	21.109375	28.0703125	55.140625	95.359375	100	100	100
A Group	21.109375	28.0703125	55.140625	95.359375	100	100	100
A 1-1->1-2	N/A	N/A	N/A	N/A	N/A	N/A	N/A

2. Binary Direction (LAN1: Intel PHY I217LM Gigabit LAN → LAN2: Intel I210AT Gigabit LAN)
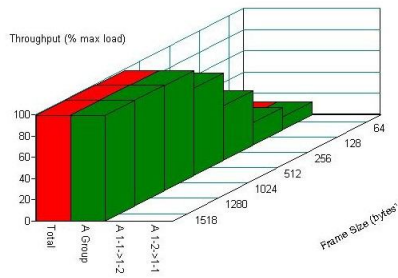
Throughput vs Frame Size

Name/Framesize	64	128	256	512	1024	1280	1518
Total	11.828125	20.3359375	50.5	81.4375	98.453125	99.2265625	99.2265625
A Group	11.828125	20.3359375	50.5	81.4375	98.453125	99.2265625	99.2265625
A 1-1->1-2	N/A	N/A	N/A	N/A	N/A	N/A	N/A
A 1-2->1-1	N/A	N/A	N/A	N/A	N/A	N/A	N/A

3. Integration Test

	Hardware Information with Windows 7 Ultimate English Version 32 Bit Driver Version
CPU	Intel® Core™ i7-4770S Processor(8M Cache, up to 3.90 GHz) 65W
Memory	DSL DDR3-1600 8GB(hynix H5TQ4G83MFR) x2
SATA HDD	Toshiba HDKPC05A0A02 S SATAIII 3.5" 500GB/7200rpm
	Chipset Information with 7 Professional English SP1 32 Bit Driver Version
Chipset Software	Intel Chipset Device Software 9.4.0.1016(01/11/2013)
PCH Bridge	Intel Q87 (C2 version)
Super IO Chipset	NuvoTon NCT6791D+FINTEK F81216HD-I
VGA Chipset	Intel HD Graphics 4600 9.18.10.3107 (4/11/2013)
Audio Chipset	Realtek High Definition Audio 6.0.1.6899 (5/7/2013)
	Intel Display Audio 6.16.0.3106 (1/11/2013)
Ethernet Chipset	Intel Ethernet Connection I217-LM 12.6.47.0 (2/26/2013)
	Intel I210 Gigabit Network Connection 12.7.28.0 (4/5/2013)

3.1. USB Port Integration Test

Item / USB Port	Boot			Function(Win 7)			Note
	Pass	Fail	N/A	Pass	Fail	N/A	
USB HDD	☒	☐	☐	☒	☐	☐	
USB FDD Mitsumi D353GUE	☒	☐	☐	☒	☐	☐	
ASUS SDRW-08D2S-U	☒	☐	☐	☒	☐	☐	
USB Hub Test (Connect USB Device) HUB Port1: USB Keyboard / HUB Port2: USB Mouse / HUB Port3: USB HDD							
USB 2.0 HUB PowerSync / USB 2.0 4 Port HU-155				☒	☐	☐	

3.2. Digital I/O Port Test

DIO Address ( )	Result			Note
	Pass	Fail	N/A	
DIO VCC +5.0V	☒	☐	☐	Test under DOS

3.3. COM Port Integration Test

Test Item		Result			Note
		Pass	Fail	N/A	
Serial Modem Dial Out		☒	☐	☐	
Serial Modem	Ring In	☒	☐	☐	Test by Modem S3/S4/S5/DOS off
	+12V	☒	☐	☐	Test by Multimeter
	+5V	☒	☐	☐	Test by Multimeter

3.4. RS-422 / RS-485 Test

Test Item	Result			Note
	Pass	**Fail**	**N/A**	
RS-422 for COM2	☒	☐	☐	Use loopback and WINSSD.exe to test RS-422 in Windows
	☒	☐	☐	The communication between the RS-422 port of two boards is linked by one 1.2km cable on Windows Terminal
RS-485 for COM2	☒	☐	☐	Use ICP CON I-7044D D/IO Module in Windows(Support Auto flow control)
	☒	☐	☐	The communication between the RS-485 port of two boards is linked by one 1.2km cable on Windows Terminal

3.5. Burn In Test

Under Room Temperature: 26 ºC

Test Item	Result			Note
	Pass	**Fail**	**N/A**	
Burn In Test V7.1 Pro	☒	☐	☐	Windows 7 Ultimate SP1 English Version 64 Bit

Note: COM PORT Speed is set to 115200 bauds.

4. Application Test

4.1. PCI-Express Function Test

PCI-Express x4		Function Test			Note
		Pass	**Fail**	**N/A**	
Adaptec AAR-1430SA SATAII HostRAID Controllers	4x slot	☒	☐	☐	
Mini PCI Express Card		**Function Test**			**Note**
		Pass	**Fail**	**N/A**	
InnoDisk 32GB(D150Q)		☒	☐	☐	

4.2. SSD Modules Compatibility Test

SSD HDD Compatibility Test:

Cable Type: 〔　〕 IDE　〔　〕 SATA2　〔 X 〕 MLC　〔　〕 SLC

Test Item	Result			Note
	Pass	**Fail**	**N/A**	
ADATA SX900 128GB SATA 6GB SSD	☒	☐	☐	

5. Power Consumption Test

Hardware Information with Windows 7 Ultimate English Version 32 Bit Driver Version	
CPU	Intel® Core™ i7-4770K Processor(8M Cache, up to 3.90 GHz)
Memory	DSL DDR3-1600 8GB(hynix H5TQ4G83MFR) x2
SATA HDD	Seagate ST500DM002 SATAIII 3.5" 500GB/7200rpm

5.1. AT/ATX Power Consumption

Test Equipment				
Equipment	AC/DC Digital Clamp meter			
Manufacturer	KYORITSU			
Model name	2010			
Test Environment				
ATX Power Model	Seventeam ST-400EAG-05F 400W			
Note	Power consumption does not include HDD consumption.			
Power Supply		**ATX Power**		**Note**
(Full Loading Mode) Windows 7 with Prime 95 Full Loading Test	(+12V)	7.85	94.2	Prime95 Version 259
	(+5V)	0.61	3.05	
	(+3.3V)	2.40 A	7.92 W	
	(-12V)	0.03	0.36	
	(5VSB)	0.23	1.15	
Full Loading Total Watt	106.68 (W)			
S3 mode: Measure the current value when system in S3 mode of windows and without running any	(+12V)	0	0	
	(+5V)	0	0	
	(+3.3V)	0 A	0 W	
	(-12V)	0	0	
	(5VSB)	0.24	1.2	
Suspend Total Watt	1.2 (W)			
Win. Idle mode: Measure the current value when system in windows mode and without running any program	(+12V)	1.73	20.76	
	(+5V)	0.50	2.5	
	(+3.3V)	2.40 A	7.92 W	
	(-12V)	0.02	0.24	
	(5VSB)	0.23	1.15	
Idle Total Watt	32.57 (W)			
Power on - Boot sequence: Measure the maximum current value of between system power on and boot-up to O.S.	(+12V)	4.85	58.2	
	(+5V)	0.57	2.85	
	(+3.3V)	2.40 A	7.92 W	
	(-12V)	0.04	0.48	
	(5VSB)	0.27	1.35	
Power On Total Watt	70.8 (W)			
S5 mode: Measure the current value when system in S5 mode of windows and without running any	(+12V)	0	0	Erp disable
	(+5V)	0	0	
	(+3.3V)	0 A	0 W	
	(-12V)	0	0	
	(5VSB)	0.10	0.50	
Suspend Total Watt	0.50(W)			
S5 mode: Measure the current value when system in S5 mode of windows and without running any	(+12V)	0	0	Erp Enable
	(+5V)	0	0	
	(+3.3V)	0 A	0 W	
	(-12V)	0	0	
	(5VSB)	0.01	0.05	
Suspend Total Watt	0.05 (W)			

5.2. PC Health Status

Test Point: The value between Actual Voltage and Voltage Monitor must be + /- 5%

Voltage Monitoring Test	Result			BIOS (V)		Actual (V)		Note
	Pass	**Fail**	**N/A**					
CPU Temperature	☒	☐	☐	38℃		33℃		
System Temperature	☒	☐	☐	27℃		26℃		
CPU Fan Speed	☒	☐	☐	4385	RPM	4437	RPM	
System Fan1 Speed	☒	☐	☐	4385	RPM	4437	RPM	
System FAN2 Speed	☒	☐	☐	4385	RPM	4437	RPM	
+12V	☒	☐	☐	12.192V		12.09V		
+5V	☒	☐	☐	5.100V		5.06V		
CPU Vcore	☒	☐	☐	1.792V		1.78V		

6. Time Accuracy Test

6.1. System Clock & RTC Clock Test

Under Room Temperature: 26 ºC

Item / Function	Time Interval	Criteria	Actual		Result			Note
					Pass	Fail	N/A	
RTC Clock in Power On Mode	24 hrs	+/-2 sec	-1	Sec	☒	☐	☐	
RTC Clock in Power Off Mode	24 hrs	+/-2 sec	-1	Sec	☒	☐	☐	

6.2. Booting Timer Test

Installation	Actual		Note
System Booting Time	4.0	Sec	Press the Power Button till "Beep" Sound appears

6.3. Watchdog Timer Test

Use Function as below:

〔　〕No Support. Test with Hi-Safe0729

Time-Out Interval	Margin for error	Actual		Result			Note
				Pass	Fail	N/A	
10 sec	+ / - 10 %	11	Sec	☒	☐	☐	
60 sec	+ / - 10 %	65	Sec	☒	☐	☐	
255 sec	+ / - 10 %	270	Sec	☒	☐	☐	

Note : Under Room Temperature: 26℃ / DOS Mode

7. O.S. Compatibility Test

7.1. English Fedora 17 Kernel 3.3.4-5.fc17.i686.PAE

〔 〕No Support

Driver Information:

Chipset Software	System default
Graphics Media	System default
Audio Driver	System default
LAN Driver <I217>	Intel PRO/1000 Network Driver 2.3.2-NAPI <modinfo e1000e>
LAN Driver <I210>	Intel Gigabit Ethernet Network Driver igb-4.3.0 <modinfo igb>

Install OS to SATA HDD:

Installation	Result			Note
	Pass	**Fail**	**N/A**	
English Fedora17 Kernel 3.3.4-5.fc17.i686.PAE	☒	☐	☐	Type uname –a AHCI

Test Result:

Test Item	Result			Note
	Pass	**Fail**	**N/A**	
Display Function Test				
VGA -- Full Screen	☒	☐	☐	1920*1200
LVDS	☒	☐	☐	1920*1200
HDMI	☒	☐	☐	1920*1200
DP	☒	☐	☐	1920*1200
Network Function Test				
Connect to Internet – LAN 1	☒	☐	☐	I217
Connect to Internet – LAN 2	☒	☐	☐	I210
Audio Function Test				
Play Audio Function Test	☒	☐	☐	Play Audio Test
Base Function Test				
Mouse Test	☒	☐	☐	PS/2 USB
Keyboard Test	☒	☐	☐	PS/2 USB
USB 2.0 Removable Devices	☒	☐	☐	
X Windows Application				
Start Button Office	☒	☐	☐	Office function
X-Window	☒	☐	☐	Startx – Desktop in Linux
Command Test On Text Mode: Attention Delay Phenomenon				
uname –a	☒	☐	☐	Show information
Shutdown	☒	☐	☐	Init 0 or shutdown –h now
Restart the Computer	☒	☐	☐	Init 6 or shutdown –r now
ls / clear ……; cd /dev /ls –l	☒	☐	☐	Command instruction

7.2. Windows 7 Ultimate English Version 32/64Bit

〔 X 〕x32/64 Driver Information:

Chipset Software	Intel Chipset Device Software 9.4.0.1016(01/11/2013)
Graphics Media	Intel HD Graphics 4600 9.18.10.3107 (4/11/2013)
Audio Driver	Realtek High Definition Audio 6.0.1.6899 (5/7/2013)
	Intel Display Audio 6.16.0.3106 (1/11/2013)
LAN Driver	Intel Ethernet Connection I217-LM 12.6.47.0 (2/26/2013)
	Intel I210 Gigabit Network Connection 12.7.28.0 (4/5/2013)
ME Driver	Intel Management Engine Interface 9.0.0.1287 (12/17/2012)

Install OS to SATA HDD:

Installation	Result			Note
	Pass	Fail	N/A	
English Windows 7 Ultimate ACPI Mode	☒	☐	☐	32bit IDE mode; 64bit AHCI mode

Test Results:

Test Item	Result			Note
	Pass	Fail	N/A	
Single Display				
VGA -- Full Screen	☒	☐	☐	2048*1152
LVDS -- Full Screen	☒	☐	☐	1920*1080
HDMI -- Full Screen	☒	☐	☐	1920*1080
Display port—Full Screen	☒	☐	☐	2048*1440
Boot - Windows 7 Ultimate Advanced Options Menu				
Safe Mode	☒	☐	☐	
Basic Function Test				
PS/2 Mouse	☒	☐	☐	
PS/2 keyboard	☒	☐	☐	
USB Mouse and Keyboard	☒	☐	☐	
COM Port Mouse detect	☒	☐	☐	
TPM	☒	☐	☐	
USB 2.0/3.0 Removable Devices	☒	☐	☐	
LAN Function Test				
LAN1 --- Auto	☒	☐	☐	I217-LM
LAN2 --- Auto	☒	☐	☐	I210
Audio Function Test				
Line Out Test	☒	☐	☐	
Line In Test	☒	☐	☐	
Microphone Test	☒	☐	☐	
HDMI Audio Test	☒	☐	☐	
Start Menu				
Log off User	☒	☐	☐	
Shut down (S5)	☒	☐	☐	
Standby(S3)	☒	☐	☐	
Standby(S1)	☒	☐	☐	
Restart	☒	☐	☐	
Hibernate (S4)	☒	☐	☐	

7.3. Windows 8 Pro English Version 32/64Bit

〔 X 〕x32/64 Driver Information:

Chipset Software	Intel Chipset Device Software 9.4.0.1016(01/11/2013)
Graphics Media	Intel HD Graphics 4600 9.18.10.3107 (4/11/2013)
Audio Driver	Realtek High Definition Audio 6.0.1.6899 (5/7/2013)
	Intel Display Audio 6.16.0.3106 (1/11/2013)
LAN Driver	Intel Ethernet Connection I217-LM 12.6.47.0 (2/26/2013)
	Intel I210 Gigabit Network Connection 12.7.28.0 (4/5/2013)
ME Driver	Intel Management Engine Interface 9.0.0.1287 (12/17/2012)

Install OS to SATA HDD:

Installation	Result			Note
	Pass	Fail	N/A	
English Windows 8 Pro ACPI Mode	☒	☐	☐	32bit AHCI mode 64bit RAID1+0

Test Results:

Test Item	Result			Note
	Pass	Fail	N/A	
Single Display				
VGA -- Full Screen	☒	☐	☐	
LVDS -- Full Screen	☒	☐	☐	
HDMI -- Full Screen	☒	☐	☐	
Display port—Full screen	☒	☐	☐	
Boot - Windows 7 Ultimate Advanced Options Menu				
Safe Mode	☒	☐	☐	
Basic Function Test				
PS/2 Mouse	☒	☐	☐	
PS/2 Keyboard	☒	☐	☐	
USB Mouse and Keyboard	☒	☐	☐	
COM Port Mouse detect	☒	☐	☐	
USB 2.0/3.0 Removable Devices	☒	☐	☐	
LAN Function Test				
LAN1 --- Auto	☒	☐	☐	I217-LM
LAN2 --- Auto	☒	☐	☐	I210
Audio Function Test				
Line Out Test	☒	☐	☐	
Line In Test	☒	☐	☐	
Microphone Test	☒	☐	☐	
HDMI Audio Test	☒	☐	☐	
Start Menu				
Log off User	☒	☐	☐	
Shut down (S5)	☒	☐	☐	
Standby(S3)	☒	☐	☐	
Standby(S1)	☒	☐	☐	
Restart	☒	☐	☐	
Hibernate (S4)	☒	☐	☐	

8. BIOS Function Test

	Hardware Information with Windows 7 Ultimate English Version 32Bit Driver Version
CPU	Intel® Core™ i7-4770S Processor(8M Cache, up to 3.90 GHz) 65W
Memory	DSL DDR3-1600 8GB(hynix H5TQ4G83MFR) x2
SATA HDD	Toshiba HDKPC05A0A02 S SATAIII 3.5" 500GB/7200rpm

8.1. Advanced Test

Test Item		Result			Note
		Pass	Fail	N/A	
ACPI settings	Suspend Disable	☒	☐	☐	Enable/Disable
	Sleeps state (S3)	☒	☐	☐	
Dynamic Digital IO	DIO0~7	☒	☐	☐	Test under Dos and OS
S5 RTC Wake up	Wake system with Dynamic time	☒	☐	☐	
	Wake system with fixed time	☒	☐	☐	
Trusted Computing	TPM SUPPORT	☒	☐	☐	
	Clear TPM	☒	☐	☐	
CPU configuration	Hyper-threading	☒	☐	☐	Enable/Disable
	Virtualization Technology	☒	☐	☐	Enable/Disable
SATA configuration	SATA controller	☒	☐	☐	Enable/Disable
	AHCI mode	☒	☐	☐	
	IDE mode	☒	☐	☐	
	RAID mode	☒	☐	☐	
AMT Configuration	Intel AMT	☒	☐	☐	Enable/disable
	Un-configure ME	☒	☐	☐	
USB configuration	Legacy USB Support	☒	☐	☐	
NCT6791D Super IO configuration	Serial port 1	☒	☐	☐	Enable/Disable
	RS232	☒	☐	☐	
	RS422	☒	☐	☐	
	RS485	☒	☐	☐	
	Serial port 2	☒	☐	☐	
NCT6791D Smart FAN	CPU_FAN1 Disable	☒	☐	☐	4300rpm
	CPU_FAN1 Manual	☒	☐	☐	0~255 255: 4300rpm;127:1920rpm; 0:1073rpm
	CPU_FAN1 Thermal Cruise mode	☒	☐	☐	
	CPU_FAN1 Smart FAN IV mode	☒	☐	☐	
	CHA_FAN1 Disable	☒	☐	☐	
	CHA_FAN1 Manual	☒	☐	☐	0~255 255: 4272rpm;127:2450rpm; 0:0rpm
	CHA_FAN1 Thermal Cruise mode	☒	☐	☐	Refer System temperature
	CHA_FAN1 Smart FAN IV mode	☒	☐	☐	Refer System temperature
	CHA_FAN2 Disable	☒	☐	☐	
	CHA_FAN2 Manual	☒	☐	☐	0~255 255: 4272rpm;127:2450rpm; 0:0rpm
	CHA_FAN2 Thermal Cruise mode	☒	☐	☐	Refer System temperature
	CHA_FAN2 Smart FAN IV mode	☒	☐	☐	Refer System temperature

8.2. Chipset Test

Test Item			Result			Note
			Pass	Fail	N/A	
System Agent (SA) Configuration	Primary Display	Auto	☒	☐	☐	
		IGFX	☒	☐	☐	
		PEG	☒	☐	☐	
	Boot display	CRT	☒	☐	☐	
		HDMI	☒	☐	☐	
		DVI	☒	☐	☐	
		HDMI2	☒	☐	☐	
		DP	☒	☐	☐	optional
	Memory Configuration		☒	☐	☐	
	PCIE 16x GEN speed		☒	☐	☐	Test with bear card
PCH-IO Configuration	Power Mode	ATX	☒	☐	☐	
		AT	☒	☐	☐	FP_PWR LED is not support.
	Restore AC Power Loss	Power on	☒	☐	☐	
		Power Off	☒	☐	☐	
		Last State	☒	☐	☐	
	PCIe x4 port Speed		☒	☐	☐	Test with PCIe SATA1414 Test with bear card
	Resume on Ring		☒	☐	☐	Enable /disable
	ERP/EUP mode		☒	☐	☐	Enable /disable

8.3. Boot Test

Test Item	Result			Note
	Pass	Fail	N/A	
Quiet Boot	☒	☐	☐	
Launch Intel I217 PXE OpROM	☒	☐	☐	
Launch Intel I210 PXE OpROM	☒	☐	☐	
Boot From Hard Disk	☒	☐	☐	
Boot From CDROM	☒	☐	☐	
Boot From USB HDD	☒	☐	☐	
Boot From USB Floppy	☒	☐	☐	
Boot From USB CD-ROM	☒	☐	☐	
Boot from LAN	☒	☐	☐	
Disable	☒	☐	☐	

8.4. CMOS Backup / Clear CMOS Test

Test Item	Result			Note
	Pass	Fail	N/A	
CMOS Backup	☒	☐	☐	Clear Date and time
Clear CMOS Test	☒	☐	☐	Clear Date

8.5. AAEON Tag Check Utility

Test Item	Result			Note
	Pass	**Fail**	**N/A**	
Check AAEON BIOS OK	☒	☐	☐	AONCHECK.EXE

8.6. Supervisor / User Password Test

Test Item	Result			Note
	Pass	**Fail**	**N/A**	
Administrator Password	☒	☐	☐	
User Password	☒	☐	☐	

8.7. Hi-safe Test

Test Item		Result			Note
		Pass	**Fail**	**N/A**	
Version(20130823)		☒	☐	☐	
System Information	CPU Information	☒	☐	☐	
	Model Name	☒	☐	☐	
	Display Information	☒	☐	☐	
	RAM Information	☒	☐	☐	Support single DIMM
H/W Monitor	Info	☒	☐	☐	
	Fan Speed	☒	☐	☐	
	Temperature	☒	☐	☐	
	Voltage	☒	☐	☐	
DIO	DIO1~4 High	☒	☐	☐	
	DIO1~4 Low	☒	☐	☐	
	DIO5~8 High	☒	☐	☐	
	DIO5~8 Low	☒	☐	☐	
WatchDog	10sec	☒	☐	☐	Actual 11 sec
	1min	☒	☐	☐	Actual 65sec
	255sec	☒	☐	☐	Actual 270sec
	Auto Reload	☒	☐	☐	
SMBus	SMBus IO	☒	☐	☐	SMBus Address 0xF040
	Read Byte	☒	☐	☐	Slave Address A0h,A2h,A4h
	Read Word	☒	☐	☐	
	Result / Read	☒	☐	☐	
Smart FAN	Chipset	☒	☐	☐	
	Fan Speed	☒	☐	☐	CPU, SYS, SYS2
	Temperature	☒	☐	☐	
	Speed control	☒	☐	☐	
	Off Speed TMP	☒	☐	☐	
	Full Speed TMP	☒	☐	☐	

8.8. Hi-Manager Test

Test Item		Result			Note
		Pass	**Fail**	**N/A**	
Version(20130819)		⊠	☐	☐	
Power control	Power on	⊠	☐	☐	
	Power off	⊠	☐	☐	
	Reset	⊠	☐	☐	
	Power on from G3 state	⊠	☐	☐	
Group Management		⊠	☐	☐	
Event log		⊠	☐	☐	
Alarm Clock	Set Alarm Time	⊠	☐	☐	
	Recurring Alarm	⊠	☐	☐	
Remote Recovery		⊠	☐	☐	Remote Reboot/ Reboot from CD ROM/Reboot from ISO (Reboot to BIOS no support)
KVM		⊠	☐	☐	Test with i7-4770T
Schedule		⊠	☐	☐	

9. Performance Test

	Hardware Information with Windows 7 Ultimate English Version 32 Bit Driver Version
CPU	Intel® Core™ i7-4770K Processor(8M Cache, up to 3.90 GHz)
Memory	DSL DDR3-1600 8GB(hynix H5TQ4G83MFR) x2
SATA HDD	Seagate ST500DM002 SATAIII 3.5" 500GB/7200rpm

9-1. Performance Test

Test Result: (Display set 1920*1080 test)

Testing Software	Scope		Note
	AAEON	Ref.	
PCMark2005			
PCMark	12683	-	PCMarks
CPU	15007	-	
Memory	15213	-	
Graphics	10073	-	
HDD	7324	-	
Benchmark (B)	-		
Average Efficiency	-		
PCMark Vantage			
PCMarks	10878	-	PCMarks
Memories	6108	-	
TV and Movies	7069	-	
Gaming	7889	-	
Music	8802	-	
Communications	13243	-	
Productivity	8421	-	
HDD	4979	-	
Benchmark (B)	-		
Average Efficiency	-		

Testing Software	Scope		Note
	AAEON	Ref.	
3Dmark2006 v120			Windows 7
3Dmark Score	6754	-	
SM2.0 Score	2314	-	
HDR/SM3.0 Score	2539	-	
CPU Score	7559	-	
Benchmark (B)	-		
Average Efficiency	-		

3Dmark Vantage			Windows 7
GPU Score	3213	-	
CPU Score	27264	-	
3Dmark11 Professional Edition			Windows 7
Extreme 1920*1080			
3Dmark 11Score	X388	-	
Graphics Score	344	-	
Physics Score	8116	-	

Combined Score	428	-	
Performance 1280*720			
3Dmark 11Score	P1444	-	
Graphics Score	1242	-	
Physics Score	8012	-	
Combined Score	1433	-	
Entry 1024*600			
3Dmark 11Score	E2356	-	
Graphics Score	2045	-	
Physics Score	7933	-	
Combined Score	1760	-	

SATA Performance				
SATA HDD	Seagate ST30000DM001-2Y/P SATAIII 3.5" 3TB/7200rpm (AHCI mode)			
CPU	Intel® Core™ i5-4570S Processor(6M Cache, up to 3.60 GHz)			
Memory	DSL DDR3-1600 8GB(hynix H5TQ4G83MFR) x2			
OS	Windows8 Pro 32bit			
Item	Comment / (unit)	Software	Score	Note
Single HDD (SATA port 1) SATA3.0	Long bench(32mb zones)-Random access / (ms) (smaller is better)	HD Tach version 3.0.4.0 free	13.6ms	
	Long bench(32mb zones)-CPU utilization / (%,+/-2%) (smaller is better)	HD Tach version 3.0.4.0 free	3%	
	Long bench(32mb zones)-Average read / (MB/s)	HD Tach version 3.0.4.0 free	186.1MB/s	
	Long bench(32mb zones)-Burst Speed / (MB/s)	HD Tach version 3.0.4.0 free	351.4MB/s	
Single HDD (SATA port 2) SATA3.0	Long bench(32mb zones)-Random access / (ms) (smaller is better)	HD Tach version 3.0.4.0 free	14.7ms	
	Long bench(32mb zones)-CPU utilization / (%,+/-2%) (smaller is better)	HD Tach version 3.0.4.0 free	4%	
	Long bench(32mb zones)-Average read / (MB/s)	HD Tach version 3.0.4.0 free	177.4MB/s	
	Long bench(32mb zones)-Burst Speed / (MB/s)	HD Tach version 3.0.4.0 free	381.8MB/s	
Single HDD (SATA port 3) SATA 3.0	Long bench(32mb zones)-Random access / (ms) (smaller is better)	HD Tach version 3.0.4.0 free	14.2ms	
	Long bench(32mb zones)-CPU utilization / (%,+/-2%) (smaller is better)	HD Tach version 3.0.4.0 free	3%	
	Long bench(32mb zones)-Average read / (MB/s)	HD Tach version 3.0.4.0 free	176.7MB/s	
	Long bench(32mb zones)-Burst Speed / (MB/s)	HD Tach version 3.0.4.0 free	379.8MB/s	
Single HDD (SATA port 4) SATA 3.0	Long bench(32mb zones)-Random access / (ms) (smaller is better)	HD Tach version 3.0.4.0 free	20.4ms	
	Long bench(32mb zones)-CPU utilization / (%,+/-2%) (smaller is better)	HD Tach version 3.0.4.0 free	5%	
	Long bench(32mb zones)-Average read / (MB/s)	HD Tach version 3.0.4.0 free	180.5MB/s	
	Long bench(32mb zones)-Burst Speed / (MB/s)	HD Tach version 3.0.4.0 free	346.1MB/s	
Single HDD (SATA port 5) SATA 3.0	Long bench(32mb zones)-Random access / (ms) (smaller is better)	HD Tach version 3.0.4.0 free	14.4ms	
	Long bench(32mb zones)-CPU utilization / (%,+/-2%) (smaller is better)	HD Tach version 3.0.4.0 free	3%	
	Long bench(32mb zones)-Average read / (MB/s)	HD Tach version 3.0.4.0 free	178.1MB/s	

	Long bench(32mb zones)-Burst Speed / (MB/s)	HD Tach version 3.0.4.0 free	382.2MB/s	
Single HDD (SATA port 6) SATA 3.0	Long bench(32mb zones)-Random access / (ms) (smaller is better)	HD Tach version 3.0.4.0 free	13.7ms	
	Long bench(32mb zones)-CPU utilization / (%,+/-2%) (smaller is better)	HD Tach version 3.0.4.0 free	4%	
	Long bench(32mb zones)-Average read / (MB/s)	HD Tach version 3.0.4.0 free	185.8MB/s	
	Long bench(32mb zones)-Burst Speed / (MB/s)	HD Tach version 3.0.4.0 free	341.0MB/s	

USB3.0 Performance				
USB Flash	Kingston DT Ultimate G2 32GB			
Item	Comment / (unit)	Software	Score	Note
Single HDD (USB port 1) USB3.0	Long bench(32mb zones)-Random access / (ms) (smaller is better)	HD Tach version 3.0.4.0 free	0.6ms	
	Long bench(32mb zones)-CPU utilization / (%,+/-2%) (smaller is better)	HD Tach version 3.0.4.0 free	2%	
	Long bench(32mb zones)-Average read / (MB/s)	HD Tach version 3.0.4.0 free	129.3MB/s	
	Long bench(32mb zones)-Burst Speed / (MB/s)	HD Tach version 3.0.4.0 free	138.7MB/s	
Single HDD (USB port 2) USB3.0	Long bench(32mb zones)-Random access / (ms) (smaller is better)	HD Tach version 3.0.4.0 free	0.6ms	
	Long bench(32mb zones)-CPU utilization / (%,+/-2%) (smaller is better)	HD Tach version 3.0.4.0 free	3%	
	Long bench(32mb zones)-Average read / (MB/s)	HD Tach version 3.0.4.0 free	129.4MB/s	
	Long bench(32mb zones)-Burst Speed / (MB/s)	HD Tach version 3.0.4.0 free	138.0MB/s	
Single HDD (USB port 3) USB3.0	Long bench(32mb zones)-Random access / (ms) (smaller is better)	HD Tach version 3.0.4.0 free	0.6ms	
	Long bench(32mb zones)-CPU utilization / (%,+/-2%) (smaller is better)	HD Tach version 3.0.4.0 free	4%	
	Long bench(32mb zones)-Average read / (MB/s)	HD Tach version 3.0.4.0 free	129.4MB/s	
	Long bench(32mb zones)-Burst Speed / (MB/s)	HD Tach version 3.0.4.0 free	136.0MB/s	
Single HDD (USB port 4) USB3.0	Long bench(32mb zones)-Random access / (ms) (smaller is better)	HD Tach version 3.0.4.0 free	0.6ms	
	Long bench(32mb zones)-CPU utilization / (%,+/-2%) (smaller is better)	HD Tach version 3.0.4.0 free	4%	
	Long bench(32mb zones)-Average read / (MB/s)	HD Tach version 3.0.4.0 free	129.4MB/s	
	Long bench(32mb zones)-Burst Speed / (MB/s)	HD Tach version 3.0.4.0 free	136.3MB/s	