ET960

Intel[®] QM87 COM-Express Module

USER'S MANUAL

Version 1.0

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Introduction

Product Description

The ET960 COM-Express Module is based on the latest Intel[®] QM87 chipset and comes with Type 6 pin-outs, fully complying with the PICMG (PCI Industrial Computer Manufactures Group) COM.0 R2.0 specification. The platform supports 5th generation Intel[®] Core processor family with BGA packing and features an integrated dual-channel DDR3 memory controller as well as a graphics core.

QM87 utilizes the 22-nanometer technology that supports Intel's first processor architecture to unite the CPU and the graphics core on the transistor level. The ET960 COM-Express Module uses the dramatic increase in performance provided this Intel's latest cutting-edge technology. Measuring 125mm x 95mm, the ET960 offers fast 6Gbps SATA, USB3.0 and DisplayPort interfaces. ET960 also features Intel Active Management Technology 8.0.

ET960F FEATURES:

- Supports Intel[®] 5th Generation Core i7 QC/DC mobile processors
- Two DDR3 SO-DIMM, 1333/1600MHz, Max. 16GB memory
- Intel[®] PCI-Express Gigabit LAN
- Integrated graphics for VGA/DisplayPort/LVDS displays
- 2x SATA 2.0, 2x SATA 3.0, 8x USB 2.0, USB 3.0 (4 ports)
- 1x PEG (x16), 7x PCI-E(x1)

Checklist

Your ET960 package should include the items listed below.

- The ET960 COM-Express Module
- This User's Manual
- 1 CD containing chipset drivers and flash memory utility
- 1 heat sink (Optional)

Specifications

Product Name	ET960-Q26 (i7- 5700EQ CPU on board)
	ET960-Q27e (i7- 5850QE CPU on board)
	"ET960-Q27e" will be the model name printed on PCB surface
Form Factor	COM Express Type 6
CPU Type	Intel [®] 5th generation Core [™] H CPU
	BGA1364, 22nm, 37.5mm x 32mm x 1.6mm
Chipset	Intel® BD82QM87 PCH (C013QM87000024200P)
	- 20mm x 20mm, TDP = 2.7W
BIOS	AMI BIOS
Memory	DDR3L-1333/1600 SO-DIMM x 2, Max. 16GB (Non-ECC),
	Dual-channel, horizotal type
VGA	Intel [®] 5th generation Core [™] H CPU integrated HD graphic,
	Supports triple independent displays
	Thru interface on carrier board for 3 x DDI, VGA, PEG
LVDS	Thru NXP PTN3460 (C01Z3460BSFX12000P) for eDP to LVDS
LAN	Intel [®] I218LM PHY GbE x 1(C013218LM00029000P)
	Thru interface on carrier board
USB	Intel® BD82QM87 PCH built-in USB host controller, supports
	USB 3.0 x 4 ports & USB 2.0 x 8 ports
Serial ATA Ports	Intel® BD82QM87 PCH built-in controller,
	Supports 4 ports for SATA 3.0 (6Gb/sec.)
Audio	Intel® BD82QM87 PCH built-in HD audio controller with
	external HD codec on carrier board
RTC	Intel® BD82QM87 PCH built-in RTC, battery on carrier board
LPC I/O	Nuvoton NCT5523D ver. C (C0135523D00012100P)
	(64-pin LQFP [7 mmx7 mm]) ** Supports OVT**
Watchdog Timer	Yes (256 segments, 0, 1, 2255. sec/min)
Connector	Two 220-pin connectors (A-B & C-D)
to Carrier Board	[COM Express 2.1 standard]
Power	+12V, +5VSB
TPM 2.0	Infineon SLB9665 (C01Z9665TT2007000P)
Others	Heat spreader
	2 x 2-pin headers for PEG selectable to 2 x (8x) or 1x(8x) +
	2x(4x)
	Validate with iBASE IP409 carrier board
Certification	CE (EN55032: 2012)
	FCC Class B
	LVD
OS support	Windows 7 Pro (32b/64b)
	Windows 8.1(64b) / Embedded Industrial (64b)
	Linux Fedora (64b) / Ubuntu (64b)
Board Size	95mm x 125mm
RoHS	Yes

Board Dimensions





ET960 User's Manual

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Installations

This section provides information on how to use the jumpers and connectors on the ET960 in order to set up a workable system. The topics covered are:

Installing the Memory	.6
Setting the Jumpers	

Installing the Memory

The ET960 board supports two DDR3 memory socket for a maximum total memory of 16GB in DDR3 SO-DIMM memory type.

Installing and Removing Memory Modules

To install the DDR3 modules, locate the memory slot on the board and perform the following steps:

- 1. Hold the DDR3 module so that the key of the DDR3 module aligned with that on the memory slot.
- 2. Gently push the DDR3 module in an upright position until the clips of the slot close to hold the DDR3 module in place when the DDR3 module touches the bottom of the slot.
- 3. To remove the DDR3 module, press the clips with both hands.



Setting the Jumpers

Jumpers are used on ET960 to select various settings and features according to your needs and applications. Contact your supplier if you have doubts about the best configuration for your needs. The following lists the connectors on ET960 and their respective functions.

JP1: ME RST
JP2: RTC RST
J2, J3: PCI Express Bifurcation
J7: SPI Flash connector (Factory use only)
J6: Flash Descriptor Security Override (Factory use only)8



INSTALLATIONS

JP1: ME RST

JP1	Setting	Function
••• 1 2 3	Pin 1-2 Short/Closed	Normal (default)
123	Pin 2-3 Short/Closed	Clear ME

JP2: RTC RST

JP2	Setting	Function
••• 1 2 3	Pin 1-2 Short/Closed	Normal
123	Pin 2-3 Short/Closed	Clear CMOS

J2, J3: PCI Express Bifurcation

	J2	J3
X16 (Default)	Open	Open
X8, X8	Open	Close
X8, X4, X4	Close	Close

J6: Flash Descriptor Security Override (Factory use only)

J6	Flash Descriptor Security Override
Open	Disabled (Default)
Close	Enabled

J7: SPI Flash connector (Factory use only)

BIOS Setup

This chapter describes the different settings available in the AMI BIOS that comes with the board. The topics covered in this chapter are as follows:

BIOS Introduction	
BIOS Setup	
Advanced Settings	
Chipset Settings	
Boot Settings	
Security Settings	
Save & Exit Settings	

BIOS Introduction

The BIOS (Basic Input/Output System) installed in your computer system's ROM supports Intel processors. The BIOS provides critical low-level support for a standard device such as disk drives, serial ports and parallel ports. It also password protection as well as special support for detailed fine-tuning of the chipset controlling the entire system.

BIOS Setup

The BIOS provides a Setup utility program for specifying the system configurations and settings. The BIOS ROM of the system stores the Setup utility. When you turn on the computer, the BIOS is immediately activated. Pressing the key immediately allows you to enter the Setup utility. If you are a little bit late pressing the key, POST (Power On Self Test) will continue with its test routines, thus preventing you from invoking the Setup. If you still wish to enter Setup, restart the system by pressing the "Reset" button or simultaneously pressing the <Ctrl>, <Alt> and <Delete> keys. You can also restart by turning the system Off and back On again. The following message will appear on the screen:

Press to Enter Setup

In general, you press the arrow keys to highlight items, <Enter> to select, the <PgUp> and <PgDn> keys to change entries, <F1> for help and <Esc> to quit.

When you enter the Setup utility, the Main Menu screen will appear on the screen. The Main Menu allows you to select from various setup functions and exit choices.

Warning: It is strongly recommended that you avoid making any changes to the chipset defaults. These defaults have been carefully chosen by both AMI and your system manufacturer to provide the absolute maximum performance and reliability. Changing the defaults could cause the system to become unstable and crash in some cases.

Main Settings

A	ptio Setup	Utility – Co	pyright © 20	013 American N	legatrends, Inc.

Main	Advanced	Chipset	Boot	Securit	y Save & Exit
System	Language		[English]		Choose the system default language
					$\rightarrow \leftarrow$ Select Screen
System	Date		[Mon 06/22/2015]		↑↓ Select Item
System	Time		[18:21:30]		Enter: Select
					+- Change Field
Access	Level		Administrator		F1: General Help
					F2: Previous Values
					F3: Optimized Default
					F4: Save ESC: Exit

System Language

Choose the system default language.

System Date

Set the Date. Use Tab to switch between Data elements.

System Time

Set the Time. Use Tab to switch between Data elements.

Advanced Settings

This section allows you to configure and improve your system and allows you to set up some system features according to your preference.

Aptio Setup Utility					
Main	Advanced	Chipset	Boot	Security	Save & Exit
 Tru AC LV Shi AM NC Hai F8° SA CS 	U Configuration Isted Computing PI Settings DS (eDP/DP) Configu utdow n Temperature IT Configuration T5523D Super IO Co rdw are Monitor 1866/ F81846 Super TA Configuration M Configuration B Configuration	e Configuration		+- F1 F2 F3	 ← Select Screen ✓ Select Item ter: Select Change Field : General Help : Previous Values : Optimized Default : Save ESC: Exit

CPU Configuration

This section shows the CPU configuration parameters.

Aptio	Setup	Utility

Main Advanced Chipset	Boot	Security	Save & Exit
MainAdvancedChipsetCPU ConfigurationIntel(R) Core(TM) i7-5700EQ CPU @ 2.60CPU SignatureCPU SignatureMicrocode PatchProcessor CoresIntel HT TechnologyIntel VT-x TechnologyIntel SMX TechnologyIntel SMX Technology64-bitEIST TechnologyHyper-threadingActive Processor CoresOverclocking lockExecute Disable BitIntel Virtualization TechnologyEISTTurbo Mode			 → ← Select Screen ↑ ↓ Select Item Enter: Select +- Change Field F1: General Help F2: Previous Values F3: Optimized Default F4: Save ESC: Exit

Hyper-threading

Enabled for Windows XP and Linux (OS optimized for Hyper-Threading Technology) and Disabled for other OS (OS not optimized for Hyper-Threading Technology). When Disabled only one thread per enabled core is enabled.

Active Processor Cores

Number of cores to enable in each processor package.

Overclocking lock

FLEX_RATIO(194) MSR

Execute Disable Bit

XD can prevent certain classes of malicious buffer overflow attacks when combined with a supporting OS (Windows Server 2003 SP1, Windows XP SP2, SuSE Linux 9.2, RedHat Enterprise 3 Update 3.)

Intel Virtualization Technology

When enabled, a VMM can utilize the additional hardware capabilities provided by Vanderpool Technology.

EIST

Enabled/Disabled Intel Speedstep.

Turbo Mode

Turbo Mode.

Trusted Computing

Main	Advanced	Chipset	Boot	Security	Save & Exit
	guration				
Sec	urity Device Support		Disabled		
				\rightarrow	← Select Screen
	nt Status Information			1 1	Select Item
SUF	PORT TURNED OFF			Ent	ter: Select
				+-	Change Opt.
				F1:	: General Help
				F2:	: Previous Values
					: Optimized
				Dei	faults
				F4 :	: Save & Exit
				ESC	C: Exit

Aptio Setup Utility - Copyright © 2012 American Megatrends, Inc.

Security Device Support

Enables or disables BIOS support for security device. O.S. will not show Security Device. TCG EFI protocol and INT1A interface will not be available.

ACPI Settings

	Aptio Setup Utility					
Main	Advanced	Chipset	Boot	Securit	y Save & Exit	
ACPIS	Settings				$\rightarrow \leftarrow$ Select Screen	
ACPI S	Hibernation Sleep State		Enabled S3 (Suspend te	o R)	<pre>↓ Select Item Enter: Select</pre>	
	egacy Resources leo Repost		Disabled Disabled		+- Change Field F1: General Help	
					F2: Previous Values F3: Optimized Default	
					F4: Save ESC: Exit	

Enable Hibernation

Enables or Disables System ability to Hibernate (OS/S4 Sleep State). This option may be not effective with some OS.

ACPI Sleep State

Select ACPI sleep state the system will enter, when the *SUSPEND* button is pressed.

Lock Legacy Resources

Enabled or Disabled Lock of Legacy Resources.

S3 Video Repost

Enable or disable S3 Video Repost.

LVDS (eDP/DP) Configuration

Aptio Setup Utility

Main	Advanced	Chipset	Boot	Security Save & Exit
LVDS	(eDP/DP) Configura	tion		
LVDS	(eDP/DP) Support		Disable	 → ← Select Screen ↑ ↓ Select Item Enter: Select +- Change Field F1: General Help F2: Previous Values F3: Optimized Default F4: Save ESC: Exit

LVDS (eDP/DP) Support

LVDS (eDP/DP) ON/OFF

Shutdown Temperature Configuration

Aptio Setup Utility - Copyright © 2012 American Megatrends, Inc.

Main	Advanced	Chipset	Boot	Security Sav	ve & Exit
APCI	Shutdow n Temperat	ure	Disabled	↑↓Sei Enter: +- Cha F1: Gen F2: Pro F3: Op Defaul	Select Screen Lect Item Select ange Opt. heral Help evious Values timized ts ve ESC: Exit

ACPI Shutdown Temperature

The default setting is Disabled.

			Aptio Setup L	Jtility	
Main	Advanced	Chipset	Boot	Security	Save & Exit
MEBX Hide L Amt W Activa USB C PET P AMT C Watch OS	Hotkey Pressed Selection Screen Jn-Configure ME Cor Vait Timer ate Remote Assistan Configure rogress CIRA Timeout		Enabled Disabled Disabled Disabled O Disabled Enabled Disabled O Disabled O O	+- F1 F2 F3 F4	 ← Select Screen ↓ Select Item ter: Select Change Field : General Help : Previous Values : Optimized Default : Save : Exit

AMT Configuration

Intel AMT

Enable/Disable Intel (R) Active Management Technology BIOS Extension.

Note: iAMT H/W is always enabled. This option just controls the BIOS extension execution. If enabled, this requires additional firmware in the SPI device

BIOS Hotkey Pressed

OEMFLag Bit 1: Enable/Disable BIOS hotkey press.

MEBx Selection Screen

OEMFLag Bit 2: Enable/Disable MEBx selection screen.

Hide Un-Configure ME Configuration

OEMFlag Bit 6: Hide Un-Configure ME without password Confirmation Prompt

Amt Wait Timer

Set timer to wait before sending ASF_GET_BOOT_OPTIONS.

Activate Remote Assistance Process

Trigger CIRA boot.

USB Configure

Enable/Disable USB Configure function.

PET Progress

User can Enable/Disable PET Events progress to receive PET events or not.

Watchdog Timer

Enable/Disable Watchdog Timer.

NCT5523D Super IO Configuration

Aptio Setup Utility

Main	Advanced	Chipset	Boot	Security	Save & Exit
NCT5	523D Super IO Confi	guration			
► Se	ber IO Chip rial Port 1 Configurat rial Port 2 Configurat		NCT5523D	En +- F1 F2 F3 F4	← Select Screen ↓ Select Item ter: Select ← Change Field ∴ General Help ∴ Previous Values ∴ Optimized Default ∴ Save C: Exit

Serial Port Configuration

Set parameters of serial ports. User can Enable/Disable the serial port and Select an optimal settings for the Super IO Device.

Hardware Monitor

			Aprilo Setup	•unity	
Main	Advanced	Chipset	Boot	Securit	y Save & Exit
PC He	ealth Status				
####	Smart Fan Function #	<i>!###</i>			
CPU S	Smart Fan Control		Disabled		
					\rightarrow \leftarrow Select Screen
Syste	m temperature		+34.5 C		↑↓ Select Item
CPU to	emperature		+43.0 C		Enter: Select
CPU F	an Speed		4366 RPM		+- Change Field
Vcore	9		+1.794 V		F1: General Help
Memo	ry		+1.344 V		F2: Previous Values
					F3: Optimized Default
					F4: Save
					ESC: Exit

Aptio Setup Utility

CPU Smart Fan Control

The default setting is Disabled.

Temperatures/Voltages

These fields are the parameters of the hardware monitoring function feature of the board. The values are read-only values as monitored by the system and show the PC health status.

F81866 Super IO Configuration

			Aptio Setup Utilit	у	
Main A	Advanced	Chipset	Boot	Securit	y Save & Exit
F81866/ F	81846 Super IO C	onfiguration			→ ← Select Screen
Serial I	O Chip Port 1 Configuratio Port 2 Configuratio I Port Configuratio	n	F81866/ F81846		<pre>↑ ↓ Select Item Enter: Select +- Change Field F1: General Help</pre>
					F2: Previous Values F3: Optimized Default F4: Save ESC: Exit

Serial Port Configuration

Set parameters of serial ports. User can Enable/Disable the serial port and Select an optimal settings for the Super IO Device.

SATA Configuration

SATA Devices Configuration.

	Aptio Setup Utility						
Main	Advanced	Chipset	Boot	Securit	y Save & Exit		
SATA SATA Serial Sof Hot Serial Sof Hot Serial Sof Hot Serial	Advanced	Chipset	Boot Enabled AHCI Empty Unknow n Disabled Empty Unknow n Disabled Empty Unknow n Disabled Empty Unknow n Disabled Empty Unknow n Disabled Empty Unknow n	Securit	y Save & Exit → ← Select Screen ↑ ↓ Select Item Enter: Select +- Change Field F1: General Help F2: Previous Values F3: Optimized Default F4: Save		
Hot	Plug		Disabled		ESC: Exit		

SATA Controller(s)

Enable / Disable Serial ATA Controller.

SATA Mode Selection

(1) AHCI Mode.
 (2) RAID Mode.

Hot Plug

Designates this port as Hot Pluggable.

CSM Configuration

		Ар	tio Setup	Utility	
Main	Advanced	Chipset	Boot	Securit	y Save & Exit
Compa	tibility Support Mo	dule Configuration			
CSM St	upport		Enabled	i	
CSM16	Module Version		07.77		
GateA2	20 Active		Upon R	equest	
Option	ROM Messages		Force E	BIOS	
Boot op	otion filter		UEFI an	d Legacy	→ ← Select Screen ↑ ↓ Select Item Enter: Select
Option	ROM execution				+- Change Field F1: General Help
Netw or	rk		Do not l	aunch	F2: Previous Values
Storage	е		Legacy		F3: Optimized Default
Video			Legacy		F4: Save
Other F	PCI device		Legacy		ESC: Exit

.

CSM Support

Enable/Disable CSM Support.

Boot option filter

This option controls Legacy/UEFI ROMs priority.

Network

Controls the execution of UEFI and Legacy PXE OpROM.

Storage

Controls the execution of UEFI and Legacy Storage OpROM.

Video

Controls the execution of UEFI and Legacy Video OpROM.

Other PCI device

Determines OpROM execution policy for devices other than Network, Storage, or Video.

USB Configuration

Aptio Setup Utility

Main	Advanced	Chipset	Boot	Securit	y Save & Exit
USB C	onfiguration				
USB N	lodule Version		11		
USB C	ontrollers:				
2	EHCIs, 1 XHCI				
USB D	evices:				
1	Drive, 1 Keyboard,	1 Mouse, 2 Hub	os		$\rightarrow \leftarrow$ Select Screen
XHCI H	y USB Support land-off land-off		Enabled Enabled Enabled		↑ ↓ Select Item Enter: Select +- Change Field F1: General Help
USB N	lass Storage Driver \$	Support	Enabled		F2: Previous Values F3: Optimized Default
USB h	ardw are delays and	time-outs:			F4: Save
USB T	ransfer time-out		20 sec		ESC: Exit
Device	e reset tine-out		20 sec		
Device	e pow er-up delay		Auto		

Legacy USB Support

Enables Legacy USB support.

AUTO option disables legacy support if no USB devices are connected. DISABLE option keeps USB devices available only for EFI applications.

XHCI Hand-off

This is a workaround for OSes without XHCI hand-off support. The XHCI ownership change should be claimed by XHCI driver.

EHCI Hand-off

This is a workaround for OSes without EHCI hand-off support. The EHCI ownership change should be claimed by EHCI driver.

USB Mass Storage Driver Support

Enable/Disable USB Mass Storage Driver Support.

USB Transfer time-out

The time-out value for Control, Bulk, and Interrupt transfers.

Device reset time-out

USB mass Storage device start Unit command time-out.

Device power-up delay

Maximum time the device will take before it properly reports itself to the Host Controller. 'Auto' uses default value: for a Root port it is 100ms, for a Hub port the delay is taken from Hub descriptor.

Chipset Settings

This section allows you to configure and improve your system and allows you to set up some system features according to your preference.

	Aptio Setup Utility									
Main	Advanced	Chipset	Boot	Security	Save & Exit					
-	tem Agent (SA) Cor I-IO Configuration	nfiguration								

System Agent (SA) Configuration

Main	Advanced	Chipset	Boot	Security	Save & Exit
Syste	m Agent Bridge N	lame	Broadw ell		
Syste	m Agent RC Vers	ion	2.7.1.0	\rightarrow	← Select Screen
VT-d (Capability		Supported	•	Select Item
					ter: Select
VT-d			Enabled	+-	Change Field
				F1	: General Help
►Graph	ics Configuration			F2	: Previous Values
► Memo	ry Configuration			F3	: Optimized Default
				F4	: Save ESC: Exit

VT-d

Check to enable VT-d function on MCH.

Graphics Configuration

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Main	Advanced	Chipset	Boot	Security	/ Save & Exit
Graph	ics Configuration				
IGFX V	BIOS Version		1038		
lGfx F	requency		600 MHz		\rightarrow \leftarrow Select Screen
					↑ ↓ Select Item
Primar	y Display		Auto		Enter: Select
Prima	ary PEG		Auto		+- Change Opt.
Prima	ary PCIE		Auto		F1: General Help
Interna	al Graphics		Auto		F2: Previous Values
GTT S	lize		8MB		F3: Optimized
Apert	ure Size		256MB		Defaults
CD CI	<pre>K Frequency</pre>		Auto		F4: Save & Exit
DVMT	Pre-Allocated		32M		ESC: Exit
DVMT	Total Gfx Mem		256MB		

Primary Display

Select which of IGFX/PEG/PCI graphics device should be Primary Display or select SG for switchable Gfx.

Primary PEG

Select PEG0/PEG1/PEG2/PEG3 Graphics device should be Primary PEG.

Primary PCIE

Select PCIE0/PCIE1/PCIE2/PCIE3/PCIE4/PCIE5/PCIE6PCIE7 Graphics device should be Primary PCIE.

Internal Graphics

Keep IGD enabled based on the setup options.

GTT Size Select the GTT Size.

Aperture Size Select the Aperture Size.

CD Clk Frequency Select CD Clk Frequency.

DVMT Pre-Allocated

Select DVMT 5.0 Pre-Allocated (Fixed) Graphics Memory Size used by the Internal Graphics Device.

DVMT Total Gfx Mem

Select DVMT 5.0 Total Graphics Memory Size used by the Internal Graphics Device.

Memory Configuration

Aptio Setup Utility

Main Advanced	Chipset	Boot	Securit	y Save & Exit
Memory Information				
Memory Frequency Total Memory Memory Voltage DIMM#0 DIMM#2 CAS Latency (tCL) Minimum delay time CAS to RAS (tRC Row Precharge Active to Precha	tRPmin)	1600 MHz 4096 MB (DDR3) 1.35v 2048 MB (DDR3) 2048 MB (DDR3) 11 11 11 28		 → ← Select Screen ↑ ↓ Select Item Enter: Select +- Change Field F1: General Help F2: Previous Values F3: Optimized Default F4: Save ESC: Exit

PCH-IO Configuration

This section allows you to configure the North Bridge Chipset.

Aptio Setup Utility							
Main	Advanced	Chipset	Boot	Security	Save & E	xit	
Intel P	CH RC Version		2.7.1.0				
Intel P	CH SKU Name		QM87				
Intel P	CH Rev ID		05/C2				
					→ ← Sel	lect Screen	
► PCI	Express Configu	ration			†↓ Select	Item	
► USI	B Configuration			1	Inter: Sel	ect	
► PCł	HAzalia Configura	ation			- Change	Field	
				1	71: Genera	l Help	
PCH L	AN Controller		Enabled	1	2: Previo	us Values	
Wa	ake on LAN		Enabled	1	3: Optimi	zed Default	
Restor	re AC Pow er Los	s	Pow er Off	1	4: Save		
				1	SC: Exit		

PCH LAN Controller

Enable or disable onboard NIC.

Wake on LAN

Enable or disable integrated LAN to wake the system. (The Wake On LAN cannot be disabled if ME is on at Sx state.)

Restore AC Power Loss

Options are: Power Off (default) Power On Last State

PCI Express Configuration

Main	Advanced	Chipset	Boot	Security	Save & Exit
PCI Ex	press Configurat				
► PC	Express Root Po	rt 1			\rightarrow \leftarrow Select Screen
► PC	Express Root Po	ort 2			↑↓ Select Item
► PC	Express Root Po	rt 3		1	Enter: Select
► PC	Express Root Po	rt 4		-	+- Change Field
► PC	Express Root Po	rt 5		1	F1: General Help
PC	Port 6 is assigne	ed to LAN		1	F2: Previous Values
► PC	Express Root Po	rt 7		1	F3: Optimized Default
► PC	Express Root Po	rt 8		1	F4: Save
				1	ESC: Exit

PCI Express Configuration

PCI Express Root Port Settings.

USB Configuration

Main	Advanced	Chipset	Boot	Security	Save & Exit
USB (Configuration				
					\rightarrow \leftarrow Select Screen
USB F	Precondition		Disabled		↑↓ Select Item
xHCI I	Vlode		Auto	I	Inter: Select
				-	+- Change Field
USB F	Ports Per-Port Disa	able Control	Disabled	1	F1: General Help
				I	F2: Previous Values
				1	F3: Optimized Default
				I	74: Save
				I	ESC: Exit

USB Precondition

Precondition work on USB host controller and root ports for faster enumeration.

xHCI Mode

Mode of operation of xHCI controller.

USB Ports Per-Port Disable Control

Control each of the USB ports (0~13) disabling.

PCH Azalia Configuration

Main	Advanced	Chipset	Boot	Securit	y Save & Exit
PCH Az	zalia Configuration				$\rightarrow \leftarrow$ Select Screen
Azalia			Enabled		↑↓ Select Item Enter: Select +- Change Field F1: General Help
					F2: Previous Values F3: Optimized Default
					F4: Save
					ESC: Exit

Azalia

Control Detection of the Azalia device.

Disabled = Azalia will be unconditionally be disabled.

Enabled = Azalia will be unconditionally be enabled.

Auto = Azalia will be enabled if present, disabled otherwise.

Security Settings

	Aptio Setup Utility									
Main	Advanced	Chipset	Boot	Security	Save & Exit					
Passw	ord Description									
this or w hen If ONL pow e or ent Admin The pa in the Minimu	Y the Administrator ly limit access to Se entering Setup. Y the User's passw r on passw ord and er Setup. In Setup th istrator rights assw ord length mus follow ing range: im length um length	y ord is set, then must be entered ne User will have	sked for this is a to boot		→ ← Select Screen ↑ ↓ Select Item Enter: Select +- Change Field F1: General Help F2: Previous Values F3: Optimized Default					
Admin	istrator Password				F4: Save					
User F	Password				ESC: Exit					

Administrator Password

Set Setup Administrator Password.

User Password

Set User Password.

Boot Settings

This section allows you to configure the boot settings.

Aptio Setup Utility							
Main	Advanced	Chipset	Boot	Security	/ Save & Exit		
Boot C	onfiguration						
Setup	Prompt Timeout	1					
Bootup	NumLock State	0	n				
Quiet E	Boot	D	isabled				
Fast B	oot	D	isabled				
Boot n	node select	L	EGACY				
FIXED	BOOT ORDER Priori	ties			$\rightarrow \leftarrow$ Select Screen		
Boot O	ption #1	н	ard Disk		↑↓ Select Item Enter: Select		
Boot O	ption #2	С	D/DVD		+- Change Field		
Boot O	ption #3	U	SB Hard Disk		F1: General Help		
Boot O	ption #4	U	SB CD / DV D		F2: Previous Values		
Boot O	ption #5	U	SB Key		F3: Optimized Default		
Boot O	ption #6	U	SB Floppy		F4: Save		
Boot O	ption #7	U	SB LAN		ESC: Exit		
Boot O	ption #8	N	etw ork		ESC. EALC		

Setup Prompt Timeout

Number of seconds to wait for setup activation key. 65535(0xFFFF) means indefinite waiting.

Bootup NumLock State

Select the keyboard NumLock state.

Quiet Boot

Enables/Disables Quiet Boot option.

Fast Boot

Enables/Disables boot with initialization of a minimal set of devices required to launch active boot option. Has no effect for BBS boot options.

Boot mode select

Select boot mode LEGACY/UEFI

FIXED BOOT ORDER Priorities

Sets the system boot order.

Save & Exit Settings

Aptio Setup Utility

Main Advanced	Chipset	Boot	Security	Save & Exit				
Save Changes and Exit	Save Changes and Exit							
Discard Changes and Exi	t							
Save Changes and Reset								
Discard Changes and Res	set							
Save Options Save Changes Discard Changes			+-	onango 1101a				
Restore Defaults Save as User Defaults Restore User Defaults			F2 F3 F4	L: General Help 2: Previous Values 3: Optimized Default 4: Save 5C: Exit				

Save Changes and Exit

Exit system setup after saving the changes.

Discard Changes and Exit

Exit system setup without saving any changes.

Save Changes and Reset

Reset the system after saving the changes.

Discard Changes and Reset

Reset system setup without saving any changes.

Save Changes

Save Changes done so far to any of the setup options.

Discard Changes

Discard Changes done so far to any of the setup options.

Restore Defaults Restore/Load Defaults values for all the setup options.

Save as User Defaults Save the changes done so far as User Defaults.

Restore User Defaults Restore the User Defaults to all the setup options.

Drivers Installation

This section describes the installation procedures for software and drivers. The software and drivers are included with the motherboard. If you find the items missing, please contact the vendor where you made the purchase. The contents of this section include the following:

Intel Chipset Software Installation Utility	33
VGA Drivers Installation	
Realtek HD Audio Driver Installation	
LAN Drivers Installation	41
Intel® USB 3.0 Drivers	

IMPORTANT NOTE:

After installing your Windows operating system, you must install first the Intel Chipset Software Installation Utility before proceeding with the drivers installation.
Intel Chipset Software Installation Utility

The Intel Chipset Drivers should be installed first before the software drivers to enable Plug & Play INF support for Intel chipset components. Follow the instructions below to complete the installation.

1. Insert the DVD that comes with the board. Click *Intel* and then *Intel(R) Broadwell Chipset Drivers*.



2. Click Intel(R) Chipset Software Installation Utility.



3. When the Welcome screen to the Intel® Chipset Device Software appears, click *Next* to continue.



4. Click *Yes* to accept the software license agreement and proceed with the installation process.



5. On the Readme File Information screen, click *Next* to continue the installation.



6. The Setup process is now complete. Click *Finish* to restart the computer and for changes to take effect.



VGA Drivers Installation

1. Insert the DVD that comes with the board. Click *Intel* and then *Intel(R) Broadwell Chipset Drivers*.



2. Click Intel(R) HD Graphics Driver.



3. When the Welcome screen appears, click Next to continue.



4. Click *Yes* to to agree with the license agreement and continue the installation.



5. On the screen shown below, click *Install* to continue.



6. Setup complete. Click *Finish* to restart the computer and for changes to take effect.



Realtek HD Audio Driver Installation

1. Insert the DVD that comes with the board. Click *Intel* and then *Intel(R) Broadwell Chipset Drivers*.



2. Click Realtek High Definition Audio Driver.

Inside T	his CD Version : I-5_Gen-1.1 @2
Intel LAN Card Tools	Intel(R) Chipset Software Installation Utility Intel(R) HD Graphics Driver Realtek High Definition Audio Driver Intel(R) PRO LAN Network Drivers Intel(R) ME 9.x Drivers Intel(R) USB 3.0 Drivers
8	Realtek High Definition Audio Driver

3. On the Welcome to the InstallShield Wizard screen, click *Yes* to proceed with and complete the installation process.



4. The InstallShield Wizard Complete. Click *Finish* to restart the computer and for changes to take effect.



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LAN Drivers Installation

1. Insert the DVD that comes with the board. Click *Intel* and then *Intel(R) Broadwell Chipset Drivers*.



2. Click Intel(R) PRO LAN Network Driver.

Inside T	his CD Version : 9.0.3i @1
Intel LAN Card Tools	Intel(R) Chipset Software Installation Utility Intel(R) HD Graphics Driver Realtek High Definition Audio Driver Intel(R) PRO LAN Network Drivers Intel(R) ME 9.0 Drivers Intel(R) USB 3.0 Drivers
8	Intel(R) PRO LAN Network Drivers

3. Click Install Drivers and Software.



4. When the Welcome screen appears, click Next.

Welcome to the install wizard for Intel(R) Network Connections	(intel)
Installs drivers, Intel(R) Network Connections, and Advanced Networking Services.	
WARNING: This program is protected by copyright law and international treaties.	

5. Click *Next* to to agree with the license agreement.

HINTEL INTERIOR INTERIORIA INTERIORI	×
License Agreement Please read the following license agreement carefully.	(intel)
INTEL SOFTWARE LICENSE AG	GREEMENT
IMPORTANT - READ BEFORE COPYING, IN	ISTALLING OR USING.
Do not copy, install, or use this software and any a (collectively, the "Software") provided under this I ("Agreement") until you have carefully read the fo	icense agreement
By copying, installing, or otherwise using the Soft the terms of this Agreement. If you do not agree to do not copy, install, or use the Software.	
the terms of this Agreement. If you do not agree to	

6. Click the checkbox for **Drivers** in the Setup Options screen to select it and click **Next** to continue.

Intel(R) Network Connections	×
Setup Options Select the program features you want installed.	(intel)
Install: Drivers JIntel(R) PROSet for Windows* Device Manager	
Intel(R) Network Connections SNMP Agent	
Feature Description Drivers for all wired Intel Network Connections	
< Back Nex	xt > Cancel

7. The wizard is ready to begin installation. Click *Install* to begin the installation.



8. When InstallShield Wizard is complete, click Finish.

BIntel(R) Network Connections Instal	ll Wizard		X
Install wizard Completed			(intel)
To access new feature: properties of the netwo		ager, and view the	
	< Back	Finish	Cancel

Intel® Management Engine Interface

T \	
•	
	!

The following application requires Microsoft .NET Framework 3.5 or later: Intel® Management Engine Components. Please install the latest version of Microsoft .NET Framework from Microsoft Download Center to run this application correctly.

Follow the steps below to install the Intel Management Engine.

1. Insert the DVD that comes with the board. Click *Intel* and then *Intel(R) Broadwell Chipset Drivers* and then *Intel(R) AMT 9.x Drivers*.



2. When the Welcome screen to the InstallShield Wizard for Intel® Management Engine Components, click the checkbox for **Install Intel® Control Center** & click *Next*.



3. Click Yes to to agree with the license agreement.

Intel® Installation Framework		
Intel® Management Engine License Agreement	Components	(intel)
You must accept all of the terms of the licer program. Do you accept the terms?	ise agreement in order to	continue the setup
INTEL SOFTWARE LICENSE AGREEMENT (C IMPORTANT - READ BEFORE COPYING, IN: Do not use or load this software and any a until you have carefully read the following ' Software, you agree to the terms of this A install or use the Software. Please Also Note: * If you are an Original Equipment Manufar (IHV), or Independent Software Vendor (IS * If you are an End-User, then only Exhibit	STALLING OR USING. ssociated materials (collecterms and conditions. By ligreement. If you do not to the state of the state	tively, the "Software") oading or using the wish to so agree, do not at Hardware Vendor E AGREEMENT applies;
	< Back	Yes No

4. When the Setup Progress screen appears, click *Next*. Then, click *Finish* when the setup progress has been successfully installed.



Intel® USB 3.0 Drivers

1. Insert the DVD that comes with the board. Click *Intel* and then *Intel(R) Broadwell Chipset Drivers*.



2. Click Intel(R) USB 3.0 Drivers.



3. When the Welcome screen to the InstallShield Wizard for Intel® USB 3.0 eXtensible Host Controller Driver, click *Next*.



4. Click *Yes* to to agree with the license agreement and continue the installation.

tel® Installation Framework ntel® USB 3.0 eXtensible Ho	st Controller	Driver	
icense Agreement		Q	intel)
You must accept all of the terms of the license a program. Do you accept the terms?	agreement in order to	continue the s	etup
INTEL SOFTWARE LICENSE AGREEMENT (Alpha	a / Beta, Organization	ial Use)	*
IMPORTANT - READ BEFORE COPYING, INSTA	LLING OR USING.		Ξ
Do not use or load this software and any assoc until you have carefully read the following term Software, you agree to the terms of this Agree install or use the Software.	is and conditions. By l	loading or using	g the
The Software contains pre-release "alpha" or " and which Intel Corporation ("Intel") may subsi of the Software. Intel can provide no assuran	tantially modify in pro	ducing any "fin	al" version
	< Back	Yes	No
		- Intel® Insta	lation Framewo

5. On the Readme File Information screen, click *Next* to continue the installation of the Intel® USB 3.0 eXtensible Host Controller Driver.

6. Setup complete. Click *Finish* to restart the computer and for changes to take effect.



Appendix

A. I/O Port Address Map

Each peripheral device in the system is assigned a set of I/O port addresses which also becomes the identity of the device. The following table lists the I/O port addresses used.

Address	Device Description		
0000h-001Fh	Direct memory access controller		
0000h-001Fh	PCI bus		
0040h-0043h	System timer		
0050h-0053h	System timer		
0060h-0060h	PS/2 Keyboard		
0064h-0064h	PS/2 Keyboard		
0070h-0077h	System CMOS/real time clock		
0081h-0091h	Direct memory access controller		
0093h-009Fh	Direct memory access controller		
00C0h-00DFh	Direct memory access controller		
00F0h-00F0h	Numeric data processor		
0240h-0247h	Communications Port (COM3)		
0250h-0257h	Communications Port (COM4)		
02E8h-02EFh	Communications Port (COM1)		
02F8h-02FFh	Communications Port (COM2)		
0378h-037Fh	Printer Port (LPT1)		
03B0h-03BBh	Intel(R) HD Graphics 5600		
03C0h-03DFh	Intel(R) HD Graphics 5600		
0D00h-FFFFh	PCI bus		
3000h-303Fh	Intel(R) HD Graphics 5600		
3040h-305Fh	Intel(R) 8 Series/C220 Series SMBus Controller - 8C22		
3060h-307Fh	Intel(R) 8 Series/C220 Series SATA AHCI Controller - 8C03		
30A0h-30A3h	Intel(R) 8 Series/C220 Series SATA AHCI Controller - 8C03		
30B0h-30B7h	Intel(R) 8 Series/C220 Series SATA AHCI Controller - 8C03		
30C0h-30C3h	Intel(R) 8 Series/C220 Series SATA AHCI Controller - 8C03		
30D0h-30D7h	Intel(R) 8 Series/C220 Series SATA AHCI Controller - 8C03		
30E0h-30E7h	Intel(R) Active Management Technology - SOL (COM5)		

B. Interrupt Request Lines (IRQ)

Peripheral devices use interrupt request lines to notify CPU for the service required. The following table shows the IRQ used by the devices on board.

Level	Function	
IRQ0	System Timer Output	
IRQ1	PS/2 Keyboard	
IRQ3	Serial Port #2	
IRQ4	Serial Port #1	
IRQ6	Serial Port #4	
IRQ7	Serial Port #3	
IRQ8	Real Time Clock	
IRQ11	Intel(R) 8 Series/C220 Series SMBus Controller - 8C22	
IRQ12	PS/2 Mouse	
IRQ13	Numeric data processor	
IRQ 16	PCI standard PCI-to-PCI bridge	
IRQ 16	Intel(R) 8 Series/C220 Series USB EHCI #2 - 8C2D	
IRQ 16	Intel(R) Management Engine Interface	
IRQ 17	Intel(R) Active Management Technology - SOL	
	(COM5)	
IRQ 19	Intel(R) 8 Series SATA AHCI Controller - 8C03	
IRQ 22	High Definition Audio Controller	
IRQ 23	Intel(R) 8 Series/C220 Series USB EHCI #1 - 8C26	

C Watchdog Timer Configuration

The WDT is used to generate a variety of output signals after a user programmable count. The WDT is suitable for use in the prevention of system lock-up, such as when software becomes trapped in a deadlock. Under these sorts of circumstances, the timer will count to zero and the selected outputs will be driven. Under normal circumstance, the user will restart the WDT at regular intervals before the timer counts to zero.

SAMPLE CODE:

	e NCT5523D.H			
//				
,,	ODE AND INFORMATION IS	PROV	IDED "AS I	S" WITHOUT WARRANTY OF ANY
// KIND, 1	EITHER EXPRESSED OR IMPL	JED, I	NCLUDING	BUT NOT LIMITED TO THE
		ANTA	BILITYAN	D/OR FITNESS FOR A PARTICULAR
// PURPO	SE.			
//				
,,	NCT5523D Н			
	NCT5523D_H NCT5523D_H	1		
	_NC15525D_H			
,,	NCT5523D_INDEX_PORT			D BASE)
	NCT5523D_DATA_PORT			
				_ ,
	NCT5523D_REG_LD			
,,				
	ICT5523D_UNLOCK		0x87	
	NCT5523D_LOCK			
	int Init NOT5522D(id).			
0	int Init_NCT5523D(void);			
	NCT5523D_LD(unsigned char			
	NCT5523D_Reg(unsigned cha			
0	char Get_NCT5523D_Reg(uns	0		
<i>,,</i>	// NCT5522D H			

#endif //__NCT5523D_H

```
APPENDIX
```

File of the MAIN.CPP.

```
//-----
//
// THIS CODE AND INFORMATION IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY
// KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE
// IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR
// PURPOSE.
//
//_.
#include <dos.h>
#include <conio.h>
#include <stdio.h>
#include <stdlib.h>
#include "NCT5523D.H"
//-----
int main (void);
void WDTInitial(void);
void WDTEnable(unsigned char);
void WDTDisable(void);
//-----
int main (void)
{
    char SIO;
     SIO = Init_NCT5523D();
     if (SIO == 0)
     {
          printf("Can not detect Nuvoton NCT5523D, program abort.\n");
         return(1);
     }
     WDTInitial();
     WDTEnable(10);
     WDTDisable();
    return 0;
}
//-
                             _____
void WDTInitial(void)
{
    unsigned char bBuf;
     Set_NCT5523D_LD(0x08);
                                                       //switch to logic device 8
     bBuf = Get_NCT5523D_Reg(0x30);
    bBuf \&= (\sim 0x01);
    Set_NCT5523D_Reg(0x30, bBuf);
                                                 //Enable WDTO
}
```

```
void WDTEnable(unsigned char NewInterval)
{
     unsigned char bBuf;
     Set_NCT5523D_LD(0x08);
                                                           //switch to logic device 8
     Set_NCT5523D_Reg(0x30, 0x01);
                                                     //enable timer
     bBuf = Get_NCT5523D_Reg(0xF0);
     bBuf \&= (\sim 0x08);
     Set_NCT5523D_Reg(0xF0, bBuf);
                                                     //count mode is second
     Set_NCT5523D_Reg(0xF1, NewInterval); //set timer
}
//-----
void WDTDisable(void)
{
     Set_NCT5523D_LD(0x08);
                                                           //switch to logic device 8
     Set_NCT5523D_Reg(0xF1, 0x00);
                                                    //clear watchdog timer
     Set_NCT5523D_Reg(0x30, 0x00);
                                                     //watchdog disabled
}
//----
```

File of the NCT5523D.CPP //-----// // THIS CODE AND INFORMATION IS PROVIDED "AS IS" WITHOUT WARRANTY OF ANY // KIND, EITHER EXPRESSED OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE // IMPLIED WARRANTIES OF MERCHANTABILITY AND/OR FITNESS FOR A PARTICULAR // PURPOSE. // //_. #include "NCT5523D.H" #include <dos.h> //-----_____ unsigned int NCT5523D_BASE; void Unlock_NCT5523D (void); void Lock_NCT5523D (void); //-----_____ unsigned int Init_NCT5523D(void) { unsigned int result; unsigned char ucDid; NCT5523D_BASE = 0x4E; result = NCT5523D_BASE; ucDid = Get_NCT5523D_Reg(0x20); if (ucDid == 0xC4)//NCT5523D?? { goto Init_Finish; } NCT5523D BASE = 0x2E; result = NCT5523D_BASE; ucDid = Get_NCT5523D_Reg(0x20); if (ucDid == 0xC4)//NCT5523D?? goto Init_Finish; } { $NCT5523D_BASE = 0x00;$ result = NCT5523D BASE; Init_Finish: return (result); } //--_____ void Unlock NCT5523D (void) { outportb(NCT5523D_INDEX_PORT, NCT5523D_UNLOCK); outportb(NCT5523D_INDEX_PORT, NCT5523D_UNLOCK); } //-----_____ void Lock_NCT5523D (void) { outportb(NCT5523D_INDEX_PORT, NCT5523D_LOCK); } //-----

```
void Set_NCT5523D_LD( unsigned char LD)
{
     Unlock_NCT5523D();
     outportb(NCT5523D_INDEX_PORT, NCT5523D_REG_LD);
     outportb(NCT5523D_DATA_PORT, LD);
     Lock_NCT5523D();
}
//----
void Set_NCT5523D_Reg( unsigned char REG, unsigned char DATA)
{
     Unlock_NCT5523D();
     outportb(NCT5523D_INDEX_PORT, REG);
     outportb(NCT5523D_DATA_PORT, DATA);
     Lock_NCT5523D();
}
//--
               -----
unsigned char Get_NCT5523D_Reg(unsigned char REG)
{
     unsigned char Result;
     Unlock_NCT5523D();
     outportb(NCT5523D_INDEX_PORT, REG);
     Result = inportb(NCT5523D_DATA_PORT);
     Lock_NCT5523D();
     return Result;
}
```