## **ET950**

Intel® QM87 COM-Express Module

# **USER'S MANUAL**

Version 1.0

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# Introduction

## **Product Description**

The ET950 COM-Express Module is based on the latest Intel<sup>®</sup> QM87 chipset with pin-out Type 6 that fully complies with the PICMG (PCI Industrial Computer Manufactures Group) COM.0 R2.0 specification.. The platform supports 3<sup>rd</sup> generation Intel<sup>®</sup> Core processor family with BGA packing and feature an integrated dual-channel DDR3 memory controller as well as a graphics core.

The QM87 platform is made with 22-nanometer technology that supports Intel's first processor architecture to unite the CPU and the graphics core on the transistor level. The ET950 COM-Express Module utilizes the dramatic increase in performance provided this Intel's latest cutting-edge technology. Measuring 125mm x 95mm, the ET950 offers fast 6Gbps SATA, USB3.0 and DisplayPort. ET950 features Intel Active Management Technology 8.0.

## ET950F FEATURES:

- Supports Intel<sup>®</sup> 3<sup>rd</sup> Generation Core i7/i5/i3 QC/DC mobile processors
- Two DDR3 SoDIMM, 1066/1333/1600MHz, Max. 16GB memory
- Intel<sup>®</sup> 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-EX1

## Checklist

Your ET950 package should include the items listed below.

- The ET950 COM-Express Module
- This User's Manual
- 1 CD containing chipset drivers and flash memory utility
- 1 heat sink

## **Board Dimensions**



ET950 User's Manual

# Installations

This section provides information on how to use the jumpers and connectors on the ET950 in order to set up a workable system. The topics covered are:

Installing the Memory	4
Setting the Jumpers	5

## **Installing the Memory**

The ET950 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.
- 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 ET950 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 ET930 and their respective functions.

Jumper Locations on ET950	.9
J7: SPI Flash connector (Factory use only)	
J6: Flash Descriptor Security Override (Factory use only)	



J7: SPI Flash connector (Factory use only)

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

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# **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	10
BIOS Setup	10
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 <Del> key immediately allows you to enter the Setup utility. If you are a little bit late pressing the <Del> 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 <DEL> 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**

	y – Copyright © 2011 American Megatrends	
s pao ootap o ang	j copjingin o zeri runon can mogan en ac	,

Main	Advanced	Chipset	Boot	Security	/ Save & Exit
BIOS In	formation				Choose the system default language
System	Language		[English]		$\rightarrow$ $\leftarrow$ Select Screen
System	Date		[Tue 01/20/2009]		↑↓ Select Item
System	Time		[00.00.00]		Enter: Select
Access	Level		Administrator		+- Change Field 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
<ul> <li>AC</li> <li>Wa</li> <li>Trr</li> <li>CP</li> <li>SA</li> <li>Sh</li> <li>AW</li> <li>US</li> <li>Su</li> <li>HA</li> </ul>	I Subsystem Setting IPI Settings ake up event setting usted Computing PU Configuration TA Configuration utdown Temperature IT Configuration B Configuration per IO Configuration N Monitor cond Super IO Conf	e Configuration		1 - 1 1 1	<ul> <li>→ ←Select Screen</li> <li>↑ ↓ Select Item</li> <li>Enter: Select</li> <li>+- Change Field</li> <li>F1: General Help</li> <li>F2: Previous Values</li> <li>F3: Optimized Default</li> <li>F4: Save ESC: Exit</li> </ul>

### **PCI Subsystem Settings**

Aptio Setup Utility

Main Advanced	Chipset	Boot	Security	/ Save & Exit
PCI Bus Driver Version		V 2.0502		
PCI Common setting PCI Latency Timer VGA Palette Snoop PERR# Generation SERR# Generation ► PCI Express Settings		32 PCI Bus C Disabled Disabled Disabled	locks	<pre>→ ←Select Screen ↑↓ Select Item Enter: Select +- Change Field F1: General Help F2: Previous Values F3: Optimized Default F4: Save ESC: Exit</pre>

## **PCI Express Settings**

Change PCI Express devices settings.

## **PCI Express Settings**

Main Advanced Chipset	Boot	Securit	y Save & Exit
PCI Express Device Register Settings			
Relaxed Ordering	Disabled		
Extended Tag	Disabled		
No Snoop	Enabled		
Maximum Payload	Auto		
Maximum Read Request	Auto		
PCI Express Link Register Settings ASPM Support WARNING: Enabling ASPM may cause some PCI-E devices to fail	Disabled		→ ←Select Screen
Extended Synch	Disabled		↑↓ Select Item Enter: Select
Link Training Retry Link Training Timeout (uS) Unpopulated Links Restore PCIE Registers	5 100 Keep Link ON Disabled		<pre>+- Change Field +- Change Field F1: General Help F2: Previous Values F3: Optimized Default F4: Save ESC: Exit</pre>

Aptio Setup Utility

#### **Relaxed Ordering**

Enables or disables PCI Express Device Relaxed Ordering.

#### Extended Tag

If ENABLED allows device to use 8-bit Tag field as a requester.

#### No Snoop

Enables or disables PCI Express Device No Snoop option.

#### **Maximum Payload**

Set Maximum Payload of PCI Express Device or allow System BIOS to select the value.

#### Maximum Read Request

Set Maximum Read Request Size of PCI Express Device or allow System BIOS to select the value.

## ASPM Support

Set the ASPM Level: Force L0s – Force all links to L0s State: AUTO – BIOS auto configure : DISABLE – Disables ASPM.

#### Extended Synch

If ENABLED allows generation of Extended Synchronization patterns.

### Link Training Retry

Defines number of Retry Attempts software will take to retrain the link if previous training attempt was unsuccessful.

## Link Training Timeout (uS)

Defines number of Microseconds software will wait before polling 'Link Training' bit in Link Status register. Value range from 10 to 1000 uS.

#### **Unpopulated Links**

In order to save power, software will disable unpopulated PCI Express links, if this option set to 'Disable Link'.

## **ACPI Settings**

Aptio Setup Utility

Main	Advanced	Chipset	Boot	Security	/ Save & Exit
Enab ACPI Lock	Settings le Hibernation Sleep State Legacy Resources deo Repost		Enabled S3 (Suspend to Disabled Enabled	) R)	→ ←Select Screen ↑↓ Select Item Enter: Select +- 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.

#### Wake up event settings

Main	Advanced	Chipset	Boot	Security	y Save & Exit
	on Ring on PCIE Wake Event		Disabled Disabled		<pre>→ ←Select Screen ↑↓ Select Item Enter: Select +- Change Field F1: General Help F2: Previous Values F3: Optimized Default F4: Save ESC: Exit</pre>

#### Aptio Setup Utility

## Wake on PCIE PME Wake Event

The options are Disabled and Enabled.

### **Trusted Computing**

	Aptio Setup Utility							
Main	Advanced	Chipset	Boot	Security	Save & Exit			
	Configuration I Support		Disabled		→ ←Select Screen			
Curre	nt TPM Status Infor	nation			<pre>↓ Select Item Enter: Select +- Change Field F1: General Help F2: Previous Values</pre>			
					F3: Optimized Default F4: Save ESC: Exit			

#### **TPM Support**

This configuration is supported only with MB970VF. Enables or Disables TPM support. O.S. will not show TPM. Reset of platform is required.

#### **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.

## **CPU Configuration**

This section shows the CPU configuration parameters.

		Aptio Setup	Utility	
Main Advanced	Chipset	Boot	Securit	y Save & Exit
CPU Configuration				
Intel® Core ™ i7-4770EC	CPU @ 2.400	Hz		
CPU Signature		306C3		
Processor Family		6		
Microcode Patch		16		
FSB Speed		100 MHz		
Max CPU Speed		2400 MHz		
Min CPU Speed		800 MHz		
CPU Speed		2500 MHz		
Processor Cores		4		
Intel HT Technology		Supported		
Intel VT-x Technology		Supported		
Intel SMX Technology		Supported		
64-bit		Supported		
EIST Technology		Supported		
CPU C3 State		Supported		$\rightarrow$ $\leftarrow$ Select Screen
CPU C6 State		Supported		↑↓ Select Item
CPU C7 State		Supported		Enter: Select
				+- Change Field
Active Processor Cores		All		F1: General Help
Intel Virtualization Techno	logy	Disabled		F2: Previous Values
EIST		Enabled		F3: Optimized Default
Turbo Mode		Enabled		F4: Save ESC: Exit

#### Active Processor Cores

Number of cores to enable in each processor package.

## Intel Virtualization Technology

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

#### EIST

Enabled / Disabled Intel Speedstep.

#### Turbo Mode

Enabled / Disabled Turbo Mode.

## **SATA Configuration**

SATA Devices Configuration.

Main Advanced C SATA Controller(s) SATA Mode Selection SATA Controller Speed SATA Port0	hipset Boot Enabled AHCI Default	Security	Save & Exit
SATA Mode Selection SATA Controller Speed	AHCI		
SATA Port0			
Software Preserve Hot Plug SATA Port1 Software Preserve Hot Plug SATA Port2 Software Preserve Hot Plug SATA Port3 Software Preserve Hot Plug SATA Port4 Software Preserve Hot Plug SATA Port5 Software Preserve	Empty Unknown Disabled Empty Unknown Disabled Empty Unknown Disabled Empty Unknown Disabled Empty Unknown	] - ] ] ]	<ul> <li>→ ← Select Screen</li> <li>↑ ↓ Select Item</li> <li>Enter: Select</li> <li>+- Change Field</li> <li>F1: General Help</li> <li>F2: Previous Values</li> <li>F3: Optimized Default</li> <li>F4: Save ESC: Exit</li> </ul>

Aptio Setup Utility

## SATA Controller(s)

Enable / Disable Serial ATA Controller.

#### **SATA Mode Selection**

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

# Shutdown Temperature Configuration Aptio Setup Utility

Main	Advanced	Chipset	Boot	Security	/ Save & Exit
APCI	Shutdown Temperat	ture	Disabled		
					→ ← Select Screen
					↑↓ Select Item Enter: Select
					+- Change Field F1: General Help
					F2: Previous Values F3: Optimized Default
					F4: Save ESC: Exit

## **ACPI Shutdown Temperature**

The default setting is Disabled

#### Aptio Setup Utility Main Advanced Chipset Boot Security Save & Exit Intel AMT Enabled **BIOS Hotkey Pressed** Disabled MEBx Selection Screen Disabled Hide Un-Configure ME Confirmation Disabled Disabled MEBx Debug Message Output Un-Configure ME Disabled Amt Wait Timer n Disabled Activate Remote Assistance Process **USB** Configure Enabled → ← Select Screen PET Progress Enabled ↑↓ Select Item AMT CIRA Timeout Λ Enter: Select +- Change Field Disabled Watchdog F1: General Help OS Timer 0 F2: Previous Values **BIOS Timer** 0 F3: Optimized Default F4: Save ESC: Exit

## **AMT Configuration**

### **AMT Configuration**

This configuration is supported only with MB980VF (with iAMT function). Options are Enabled and Disabled.

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.

#### **Unconfigure ME**

This configuration is supported only with MB980VF (with iAMT function). Perform AMT/ME unconfigure without password operation.

#### Amt Wait Timer

Set timer to wait before sending ASF\_GET\_BOOT\_OPTIONS.

#### Activate Remote Assistance Process

Trigger CIRA boot.

#### **PET Progress**

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

#### Watchdog Timer

This configuration is supported only with MB980VF (with iAMT function). Enable/Disable Watchdog Timer.

## **USB** Configuration

Aptio Setup Utility

Main Advanced	Chipset	Boot	Security	y Save & Exit
USB Configuration				
USB Module Version		8.10.28		
USB Devices:				
1Driver,1 Keyboard	,2 Hubs			
Legacy USB Support		Enabled		
USB3.0 Support		Enabled		
XHCI Hand-off		Enabled		
EHCI Hand-off		Enabled		
USB Mass Storage Drive	r Support	Enabled		
				$\rightarrow$ $\leftarrow$ Select Screen
USB hardware delays and	d time-outs:			↑↓ Select Item
USB Transfer time-out		20 sec		Enter: Select
Device reset tine-out		20 sec		+- Change Field
Device power-up delay		Auto		F1: General Help
				F2: Previous Values
Mass Storage Devices:				F3: Optimized Default
USB FLASH DRIVE PMA	<b>∖</b> P	Auto		F4: Save ESC: Exit

## Legacy USB Support

Enables Legacy USB support.

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

#### **USB3.0 Support**

Enable/Disable USB3.0 (XHCI) Controller support.

## 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

Enabled/Disabled. 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 tine-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.

## **Super IO Configuration**

-					
Main	Advanced	Chipset	Boot	Security	Save & Exit
Super	IO Configuration				
					$\rightarrow$ $\leftarrow$ Select Screen
Super	IO Chip		NCT5523D		↑↓ Select Item
					Enter: Select
Sei	rial Port 1 Configura	tion			+- Change Field
Sei	rial Port 2 Configura	tion			F1: General Help
					F2: Previous Values
					F3: Optimized Default
					F4: Save ESC: Exit

Aptio Setup Utility

### **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.

#### **H/W Monitor**

			Aptio Setup	Utility	
Main	Advanced	Chipset	Boot	Security	/ Save & Exit
PC He	alth Status				
Smart	Fan Function		Disabled		→ ←Select Screen
CPU te	emperature		+36.0 C		↑↓ Select Item
SYS te	mperature		+56.5 C		Enter: Select
CPU F	AN Speed		N/A		+- Change Field
Vcore			+1.768 V		F1: General Help
Memor	У		+1.344 V		F2: Previous Values F3: Optimized Default
					F4: Save ESC: Exit

#### **Temperatures/Voltages**

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

#### **Smart Fan Function**

This field enables or disables the smart fan feature. At a certain temperature, the fan starts turning. Once the temperature drops to a certain level, it stops turning again.

## **Second Super IO Configuration**

System Second Super IO Chip Parameters.

Main	Advanced	Chipset	Boot	Security	/ Save & Exit
Secor	nd Super IO Configu	ration			
Secor	nd Super IO Chip		F81846		→ ←Select Screen ↑↓ Select Item Enter: Select
	rial Port 0 Configura rial Port 1 Configura				+- Change Field F1: General Help
► Pa	rallel Port Configura	tion			F2: Previous Values F3: Optimized Default
					F4: Save ESC: Exit

#### Aptio Setup Utility

### **Serial Port 0 Configuration**

Set Parameters of Serial Port 0(COMA).

#### **Serial Port 1 Configuration**

Set Parameters of Serial Port 1(COMB)

### **Parallel Port Configuration**

Set Parameters of Parallel Port (LPT/LPTE)

## **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				
	H-IO Configuration stern Agent (SA) Cor	nfiguration			<pre>→ ←Select Screen ↑ ↓ Select Item Enter: Select +- Change Field F1: General Help F2: Previous Values F3: Optimized Default F4: Save ESC: Exit</pre>				

## **PCH-IO Configuration**

This section allows you to configure the North Bridge Chipset.

	Aptio Setup Utility								
Main	Advanced	Chipset	Boot	Security	/ Save & Exit				
Intel F	PCH RC Version PCH SKU Name PCH Rev ID		1.6.2.0 QM87 O5/C2						
► US	CI Express Configu CB Configuration CH Azalia Configur				→ ←Select Screen ↑↓ Select Item Enter: Select +- Change Field F1: General Help				
Wa	LAN Controller ake on LAN ore AC Power Loss	5	Enabled Disabled Power Off		F2: Previous Values F3: Optimized Default F4: Save ESC: 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**

Select AC power state when power is re-applied after a power failure.

Main	Advanced	Chipset	Boot	Security	Save & Exit
PCI Express Configuration					
DMI L DMI L PCle-I PCIE	xpress Clock Ga ink ASPM Contr ink Extended Sy USB Glitch W/A Root Port Functi active Decode	ol nch Control	Enabled Enabled Disabled Disabled Disabled Disabled		
<ul> <li>PC</li> <li>PC</li> <li>PC</li> <li>PC</li> <li>PC</li> <li>PC</li> </ul>	I Express Root F I Express Root F I Express Root F I Express Root F I-E Port 6 is ass I Express Root F I Express Root F	Port 2 Port 3 Port 4 Port 5 igned to LAN Port 7			→ ← Select Screen ↑ ↓ Select Item Enter: Select +- Change Field F1: General Help F2: Previous Values F3: Optimized Default F4: Save ESC: Exit

## **PCI Express Configuration**

### **PCI Express Clock Gating**

Enable or disable PCI Express Clock Gating for each root port.

#### **DMI Link ASPM Control**

The control of Active State Power Management on both NB side and SB side of the DMI link.

#### PCIe-USB Glitch W/A

PCIe-USB Glitch W/A for bad USB device(s) connected behind PCIE/PEG port.

#### **USB** Configuration

Main	Advanced	Chipset	Boot	Security	Save & Exit
USB	Configuration				
XHCI Pre-Boot Driver xHCI Mode USB Ports Per-Port Disable Control		Disabled Auto Disabled		→ ←Select Screen ↑↓ Select Item Enter: Select +- Change Field F1: General Help	
				F2: Previous Values F3: Optimized Default F4: Save 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 Advance	d Chipset	Boot	Security Save & Exit
PCH Azalia Confi	guration		$\rightarrow \leftarrow \text{Select Screen}$ $\uparrow \downarrow \text{Select Item}$
Azalia Azalia Docking Su Azalia PME	ipport	Auto Enabled Enabled	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 unconditionally be disabled.

Enabled Azalia will be unconditionally be enabled.

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

## **Azalia Docking Support**

Enable or Disable Azalia Docking Support of Audio Controller.

### Azalia PME

Enable or Disable power Management capability of Audio Controller.

#### System Agent (SA) Configuration Aptio Setup Utility

Main	Advanced	Chipset	Boot	Security	/ Save & Exit
Syste Syste VT-d VT-d CHAF Thern Enabl	P Device (B0:D7: nal Device (B0:D7: nal Device (B0:D e NB CRID	Name sion F0) 4:F0)	Haswell 1.6.2.0 Supported Enabled Disabled Disabled Disabled	Jecuny	→ ←Select Screen ↑ ↓ Select Item Enter: Select +- Change Field F1: General Help
	aphics Configura				F2: Previous Values F3: Optimized Default F4: Save ESC: Exit

### VT-d

Check to enable VT-d function on MCH.

#### **Enable NB CRID**

Enable or disable NB CRID WorkAround.

#### **BDAT ACPI Tabled Support**

Enables Support for the BDAT ACPI table.

## **Graphics Configuration**

Main Advanced	Chipset	Boot	Security	y Save & Exit
Graphics Configuration				
IGFX VBIOS Version		2179		
IGfx Frequency		800 MHz		
Primary Display		Auto		
Primary PEG		Auto		
Primary PCIE		Auto		
Internal Graphics		Auto		→ ← Select Screen
Aperture Size		256MB		↑↓ Select Item
DVMT Pre-Allocated		32M		Enter: Select
DVMT Total Gfx Mem		256MB		+- Change Field
Primary IGFX Boot Disp	olay	VBIOS Default		F1: General Help
LVDS / EDP Control		Disabled		F2: Previous Values
Gfx Low power mode		Enabled		F3: Optimized Default
Panel Power Enabled		Disabled		F4: Save ESC: Exit

Aptio Setup Utility

#### Primary Display

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

#### Primary PEG

Select PEGO/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.

#### **DVMT Total Gfx Mem**

Select DVMT 5.0 total graphics memory size used by the internal graphics device.

## Primary IGFX Boot Display (LCD Control)

Select the Video Device that will be activated during POST. This has no effect if external graphics present. Secondary booty display selection will appear based on your selection. VGA modes will be supported only on primary display.

#### **Gfx Low Power Mode**

This option is applicable for SFF only.

#### Panel Power Enabled

Enabled / Disabled forcing of Panel Power in the BIOS.

## **Memory Configuration**

#### Aptio Setup Utility

Main Advanced	Chipset	Boot	Security	/ Save & Exit
Memory Information	l			
Memory Frequency Total Memory Memory Voltage DIMM#0 DIMM#2 CAS Latency (tCL) Minimum delay time CAS to RAS (tF Row Precharge Active to Prech	e RCDmin)	1600 MHz 2048 MB (DDR3) 1.35V Not Present 2048 MB (DDR3) 11 11 28		→ ←Select Screen ↑↓ Select Item Enter: Select +- Change Field F1: General Help F2: Previous Values F3: Optimized Default F4: Save ESC: Exit

## **Boot Settings**

This section allows you to configure the boot settings.

Aptio Setup Utility						
Main Advanced	Chipset	Boot	Security	y Save & Exit		
Boot Configuration Setup Prompt Timeout Bootup NumLock State Quiet Boot Fast Boot Boot Mode select		1 On Disabled Disabled LEGACY				
Boot Option Priorities Boot Option #1 Boot Option #2 Boot Option #3 Boot Option #4 Boot Option #5 Boot Option #6 Boot Option Priorities ► CSM16 parameters CSM parameters		Hard Disk CD/DVD USB Hard USB CD/I USB Key USB Flop Network	Disk DVD	→ ←Select Screen ↑↓ Select Item Enter: Select +- Change Field F1: General Help F2: Previous Values F3: Optimized Default F4: Save ESC: Exit		

Aptio Setup Utility

#### 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 Option Priorities**

Sets the system boot order.

## **CSM** parameters

This section allows you to configure the boot settings.

	Aptio Setup Utility							
Main	Advanced	Chipset	Boot	Security	y Save & Exit			
Boot o Launcl Launcl Launcl	h CSM ption filter h PXE OpROM po h Storage OpROM h Video OpROM p PCI device ROM p	l policy policy	Always UEFI and Do not lau Legacy on Legacy Op	nch Ily Ily	<pre>→ ← Select Screen ↑ ↓ Select Item Enter: Select +- Change Field F1: General Help F2: Previous Values F3: Optimized Default F4: Save ESC: Exit</pre>			

### **Boot option filter**

This option controls what devices system can boot to.

### Launch PXE OpROM policy

Controls the execution of UEFI and Legacy PXE OpROM.

### Launch Storatge OpROM policy

Controls the execution of UEFI and Legacy Storage OpROM.

#### Launch Video OpROM policy

Controls the execution of UEFI and Legacy Video OpROM.

## Other PCI device ROM priority

For PCI devices other than Network, Mass storage or Video defines which OpROM to launch.

## **Security 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			
Passw	ord Description							
this on when e If ONL power enter S	If ONLY the Administrator's password is set, then this only limit access to Setup and is only asked for when entering Setup. If ONLY the User's password is set, then this is a power on password and must be entered to boot or enter Setup. In Setup the User will have Administrator rights → ← Select Screen ↑ ↓ Select Item							
	ollowing range:				Enter: Select +- Change Field			
Minimu	um length		3		F1: General Help			
Maxim	um length		20		F2: Previous Values F3: Optimized Default			
Admini	istrator Password		F4: Save ESC: Exit					
User P	assword							

## Administrator Password

Set Setup Administrator Password.

## **User Password**

Set User Password.
### Save & Exit Settings

Main A	Advanced	Chipset	Boot	Security	v Save & Exit
Discard C Save Cha	anges and Exit Changes and Exit anges and Reset Changes and Rese	t			
Save Opt Save Cha Discard C	anges				→ ←Select Screen ↑↓ Select Item Enter: Select +- Change Field
	Defaults User Defaults Jser Defaults				F1: General Help F2: Previous Values F3: Optimized Default F4: Save ESC: Exit

Aptio Setup Utility

#### 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	35
VGA Drivers Installation	38
Realtek HD Audio Driver Installation	41
LAN Drivers Installation	43
Intel® USB 3.0 Drivers	50

#### **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*) 8 *Series 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*) 8 *Series Chipset Drivers*.



#### 2. Click Intel(R) Core(TM) i3/i5/i7 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*) 8 *Series Chipset Drivers*.



2. Click 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.



ET950 User's Manual

## LAN Drivers Installation

1. Insert the DVD that comes with the board. Click *Intel* and then *Intel*(*R*) 8 *Series Chipset Drivers*.



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



#### 3. Click Install Drivers and Software.



#### 4. When the Welcome screen appears, click Next.

Installs drivers, I Networking Servi	ntel(R) Network Connections, a ces.	nd Advanced	
WARNING: This international treat	program is protected by copyrig tites.	ht law and	

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

Intel(R) Network Connections Install Wizard	
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 fol	license agreement llowing terms and conditions.
By copying, installing, or otherwise using the Softw 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			X
Setup Options Select the program features you want in	istalled.		(intel)
Install:			
Intel(R) PROSet for Windows* Devi     Advanced Network Services     Intel(R) Network Connections SNMF	a.e., 10-		
Feature Description Drivers for all wired Intel Network Connec	tions		
	< Back	Next >	Cancel

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



#### 8. When InstallShield Wizard is complete, click Finish.

Install wizard Completed		(intel)
To access new feature properties of the netw	s, open Device Manager, and v ork adapters.	view the

### Intel® Management Engine Interface

	1
4	• )

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) 8 Series Chipset Drivers* and then *Intel(R) AMT 9.0 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.

ntel® Installation Framework		
Intel® Management Engine Co License Agreement	mponents	(intel)
You must accept all of the terms of the license ag program. Do you accept the terms?	reement in order to co	ntinue the setup
INTEL SOFTWARE LICENSE AGREEMENT (OEM / IMPORTANT - READ BEFORE COPYING, INSTALL Do not use or load this software and any associa until you have carefully read the following terms Software, you agree to the terms of this Agreen install or use the Software. Please Also Note: * If you are an Original Equipment Manufacturer (IHY), or Independent Software Vendor (ISV), th	ING OR USING. ted materials (collectiv and conditions. By load ent. If you do not wish (OEM), Independent H is complete LICENSE A	ely, the "Software") ding or using the n to so agree, do not Hardware Vendor GREEMENT applies;
* If you are an End-User, then only Exhibit A, th	< 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*) 8 *Series 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	Host Controller	Driver	
icense Agreement			(intel)
You must accept all of the terms of the lice program. Do you accept the terms?	nse agreement in order t	o continue t	he setup
INTEL SOFTWARE LICENSE AGREEMENT (	Alpha / Beta, Organizatio	onal Use)	*
IMPORTANT - READ BEFORE COPYING, IN	ISTALLING OR USING.		E
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.	terms and conditions. By	loading or u	using the
The Software contains pre-release "alpha" and which Intel Corporation ("Intel") may i of the Software. Intel can provide no ass	substantially modify in pr	oducing any	"final" version
	< Back	Yes	No
		— Intel® In	stallation 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
000h - 01Fh	DMA Controller #1
020h - 03Fh	Interrupt Controller #1
040h - 05Fh	Timer
060h - 06Fh	Keyboard Controller
070h - 07Fh	Real Time Clock, NMI
080h - 09Fh	DMA Page Register
0A0h - 0BFh	Interrupt Controller #2
0C0h - 0DFh	DMA Controller #2
0F0h	Clear Math Coprocessor Busy Signal
0F1h	Reset Math Coprocessor
1F0h - 1F7h	IDE Interface
278h - 27Fh	Parallel Port #2(LPT2)
2E8h - 2EFh	Serial Port #4(COM4)
2F8h - 2FFh	Serial Port #2(COM2)
2B0h-2DFh	Graphics adapter Controller
360h - 36Fh	Network Ports
3B0h - 3BFh	Monochrome & Printer adapter
3C0h - 3CFh	EGA adapter
3D0h - 3DFh	CGA adapter
3E8h - 3EFh	Serial Port #3(COM3)
3F8h - 3FFh	Serial Port #1(COM1)

### **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	Keyboard
IRQ2	Interrupt Cascade
IRQ3	Serial Port #2
IRQ4	Serial Port #1
IRQ5	Reserved
IRQ6	Reserved
IRQ7	Reserved
IRQ8	Real Time Clock
IRQ9	Reserved
IRQ10	Serial Port #3
IRQ11	Serial Port #4
IRQ12	PS/2 Mouse
IRQ13	80287
IRQ14	Primary IDE
IRQ15	Secondary IDE

### C. Digital I/O Sample Code

File of the NCT5523D.H

//-----\_\_\_\_\_ // 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. //-----#ifndef \_\_NCT5523D\_H #define \_\_\_NCT5523D\_H 1 //-----NCT5523D\_INDEX\_PORT #define (NCT5523D\_BASE) #define NCT5523D\_DATA\_PORT (NCT5523D\_BASE+1) //-----#define NCT5523D\_REG\_LD 0x07 //-----#define NCT5523D\_UNLOCK 0x87 #define NCT5523D\_LOCK 0xAA //----unsigned int Init\_NCT5523D(void); void Set\_NCT5523D\_LD( unsigned char); void Set\_NCT5523D\_Reg( unsigned char, unsigned char); unsigned char Get\_NCT5523D\_Reg( unsigned char); //-----// NCT5523D H #endif

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 Dio5Initial(void);
void Dio5SetOutput(unsigned char);
unsigned char Dio5GetInput(void);
void Dio5SetDirection(unsigned char);
unsigned char Dio5GetDirection(void);
//-----
int main (void)
{
     char SIO;
     SIO = Init_NCT5523D();
     if (SIO == 0)
     {
          printf("Can not detect Nuvoton NCT5523D, program abort.\n");
          return(1);
     }
    Dio5Initial();
    //for GPIO20..27
     Dio5SetDirection(0x0F); //GP20..23 = input, GP24..27=output
     printf("Current DIO direction = 0x%X\n", Dio5GetDirection());
     printf("Current DIO status = 0x%X\n", Dio5GetInput());
     printf("Set DIO output to high\n");
     Dio5SetOutput(0x0F);
     printf("Set DIO output to low\n");
     Dio5SetOutput(0x00);
    return 0;
}
//-----
```

```
void Dio5Initial(void)
     unsigned char ucBuf;
  ucBuf = Get_NCT5523D_Reg(0x1C);
  ucBuf &= ~0x02;
  Set_NCT5523D_Reg(0x1C, ucBuf);
     Set_NCT5523D_LD(0x07);
                                                                     //switch to logic device 7
     //enable the GP2 group
     ucBuf = Get_NCT5523D_Reg(0x30);
     ucBuf \models 0x04;
     Set_NCT5523D_Reg(0x30, ucBuf);
}
//--
void Dio5SetOutput(unsigned char NewData)
{
     Set_NCT5523D_LD(0x07);
                                                               //switch to logic device 7
     Set_NCT5523D_Reg(0xE1, NewData);
}
//---
unsigned char Dio5GetInput(void)
{
     unsigned char result;
     Set NCT5523D LD(0x07);
                                                               //switch to logic device 7
     result = Get_NCT5523D_Reg(0xE1);
     return (result);
}
//--
                                           -----
void Dio5SetDirection(unsigned char NewData)
{
     //NewData: 1 for input, 0 for output
     Set_NCT5523D_LD(0x07);
                                                               //switch to logic device 7
     Set_NCT5523D_Reg(0xE8, NewData);
}
//-----
                                     _____
unsigned char Dio5GetDirection(void)
{
     unsigned char result;
     Set_NCT5523D_LD(0x07);
                                                               //switch to logic device 7
     result = Get_NCT5523D_Reg(0xE8);
     return (result);
//_--
```

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;
}
//-
                 _____
```

## **D.** 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:

File of the NCT5523D.H //-----// // 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. 11 //---#ifndef \_\_NCT5523D\_H #define \_\_NCT5523D\_H 1 //-----#define NCT5523D\_INDEX\_PORT #define NCT5523D\_DATA\_PORT (NCT5523D\_BASE) (NCT5523D BASE+1) //\_\_\_\_\_ #define NCT5523D\_REG\_LD 0x07 //-----\_\_\_\_\_ 0x87 #define NCT5523D\_UNLOCK #define NCT5523D\_LOCK 0xAA //----unsigned int Init\_NCT5523D(void); void Set\_NCT5523D\_LD( unsigned char); void Set\_NCT5523D\_Reg( unsigned char, unsigned char); unsigned char Get\_NCT5523D\_Reg( unsigned char); //-----

#endif //\_\_NCT5523D\_H

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
}
```

//-----

#### APPENDIX

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

#### APPENDIX

```
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;
}
```