

## **SOM-4481 ETX Module**

Intel® Pentium® M SOM-ETX  
Module with CPU, VGA/LVDS,  
Audio & LAN

### **Users' Manual**

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This manual is for the SOM-4481

Part No. 2006448100

1st Edition, Printed Nov 2004

## **Packing List**

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Before you begin installing your card, please make sure that the following materials have been shipped:

- 1 SOM-4481 System On Module CPU module
- CD-ROM or Disks for utility, drivers, and manual (in PDF format).
- Heatsink

If any of these items are missing or damaged, contact your distributor or sales representative immediately.

### **Additional Information and Assistance**

1. Visit the Advantech web site at **WWW.advantech.com** where you can find the latest information about the product.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance.

Please have the following information ready before you call:

- . Product name and serial number
- . Description of your peripheral attachments
- . Description of your software (operating system, version, application software, etc.)
- . A complete description of the problem
- . The exact wording of any error messages

### **Version History**

November, 2004 (manual no. 2006448100) SOM-4481

*This device complies with the requirements in part 15 of the FCC rules: Operation is subject to the following two conditions:*

## **FCC**

- 1. This device may not cause harmful interference, and*
- 2. This device must accept any interference received, including interference that may cause undesired operation*

*This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this device in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense. The user is advised that any equipment changes or modifications not expressly approved by the party responsible for compliance would void the compliance to FCC regulations and therefore, the user's authority to operate the equipment.*

### **Caution!**



!

*There is a danger of a new battery exploding if it is incorrectly installed. Do not attempt to recharge, force open, or heat the battery. Replace the battery only with the same or equivalent type recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.*

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## General Information

This chapter gives background information on the SOM-4481 CPU System On Module.

Sections include:

- Introduction
- Specifications
- Board Dimensions

# Chapter 1 Introduction

## 1.1 Introduction

---

The SOM-4481 is an Intel Low Voltage Intel® Pentium® M processor System On Module (SOM) with audio controller, a 4X AGP SVGA controller, a PCI 10/100Base-T Ethernet interface. Using an Intel Pentium® M processor, the SOM-4481 achieves quite good performance on the SOM-ETX CPU module. On-board features include two serial ports, one multi-mode parallel (ECP/EPP/SPP) port, four USB (Universal Serial Bus) ports, a floppy drive controller, and a keyboard/PS/2 mouse interface. The built-in high-speed PCI IDE controller supports both PIO and UDMA/66 bus master modes. Up to two IDE devices can be connected, including large hard disks, CD-ROM drives, and tape backup drives. The SOM-4481 features power management to minimize power consumption. It complies with the "Green Function" standard and supports Doze, Standby and Suspend modes. In addition, the board's watchdog timer can automatically reset the system or generate an interrupt if the system stops due to a program bug or EMI. The small size (95 mm x 114 mm) and use of four high capacity connectors based on the proven SOM-ETX form factor, allow the SOM-ETX modules to be easily and securely mounted onto a customized solution board or our standard SOM-DB4400 development board.

The SOM-4481 is a highly integrated multimedia SOM that combines audio, video, and network functions. It provides 16-bit half-duplex, 8-bit full-duplex, integrated 3D audio, and up to 1024 x 768 resolution @ 16.8 M colors with 8/16/32 MB system memory. Major on-board devices adopt PCI technology, to achieve outstanding computing performance when used with Intel® Pentium® M processors.



## 1.2 Specifications

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### 1.2.1 Standard System On Module functions

- **CPU:**
  - Intel® Pentium® M processor w/64KB primary cache memory
  - Intel® Celeron® M processor w/64KB primary cache memory
- **BIOS:** Award 4 Mbit Flash BIOS
- **Chipset:** Intel® 855GME GMCH/ICH4 Chipset 400 MHz PSB
- **Cache memory:** 1MB on the Pentium M processor or 512KB on the Celeron M processor
- **System memory:** 1x200 pin SO-DIMM sockets, support ECC Double DataRate (DDR) 128 MB to 512 MB, accept 128/256/512 MB DR200/266/333 DRAM
- **Power management:** Supports power saving modes including Normal/Standby/Suspend modes. APM1.2/ACPI 1.0 compliant
- **Enhanced IDE interface:** 2 EIDE channels support up to 4 IDE devices. BIOS auto-detect, PIO Mode3 or Mode4, UDMA/66 transfer
- **FDD interface/Parallel port:** Both of two interface can't co-exist, Parallel port is default use for designer, FDD interface hardware design is required to be modified, for detailed information, please refer to our website: <http://service.advantech.com.tw/>
- **Infrared:** One 115 Kbps infrared port, IrDA compliant
- **Serial port:** two serial ports, COM 1: RS-232 and COM 2 : RS-232 (TTL Output)
- **Watchdog timer:** 255 timer intervals, from 1 to 255 in seconds or minutes, setup by software, jumperless selection, generates system reset
- **Keyboard/mouse:** Supports standard PC/AT keyboard and PS/2 mouse interface
- **USB interface:** Four USB connectors compliant with USB Spec. Rev. 2.0

## 1.2.2 VGA/flat panel Interface

- **Chipset:** Intel 855 GME, supports a single 1.5V accelerated graphics port interface
- **Frame buffer:** Supports 8/16/32 MB frame buffer with system memory
- **Display type:** Simultaneously supports CRT and flat panel displays. Also supports channel LVDS interface (SOM-4481FL-00A1, SOM-4481FL-M0A1 & SOM-4481FL-S0A1)
- **Display mode:** CRT Mode: 1280 x 1024 @ 32bpp (60Hz), 1024 x 768 @ 32bpp(85Hz); LCD/Simultaneous Modes: 1280 x 1024 @16bpp(60Hz), 1024 x 768 @16bpp(60Hz)

## 1.2.3 Audio function

- **Chipset:** REALTEK ALC202
- **Audio controller:** AC97 Ver. 2.0 compliant interface,
- Multistream Direct Sound and Direct Sound 3D acceleration
- **Stereo sound:** 8-bit full-duplex
- **Audio interface:** Microphone in, Line in, Line out

## 1.2.4 LCI

- **Chipset:** Intel 82562EZ
- Ethernet interface: IEEE 802.3U compatible 100/10Base-T interface includes software drivers and boot ROM

## 1.2.5 Mechanical and environmental

- **Dimensions:** (L x W): SOM-ETX form factor, 95 mm x 114 mm (3.7" x 4.5")
- **Power supply voltage:** +5 V power only
- **Power requirements:**
- **Max:**+5.0 V@4 A +5V@2.8 A (Pentium M 1.1G, 256 MB DDR 333)
- **Operating temperature:** 0 ~ 60° C (32 ~ 140° F)
- **Operating humidity:** 0% ~ 90% Relative Humidity, Noncondensing
- **Weight:** 0.074 Kg (weight of total package)

## 1.3 Board Dimensions

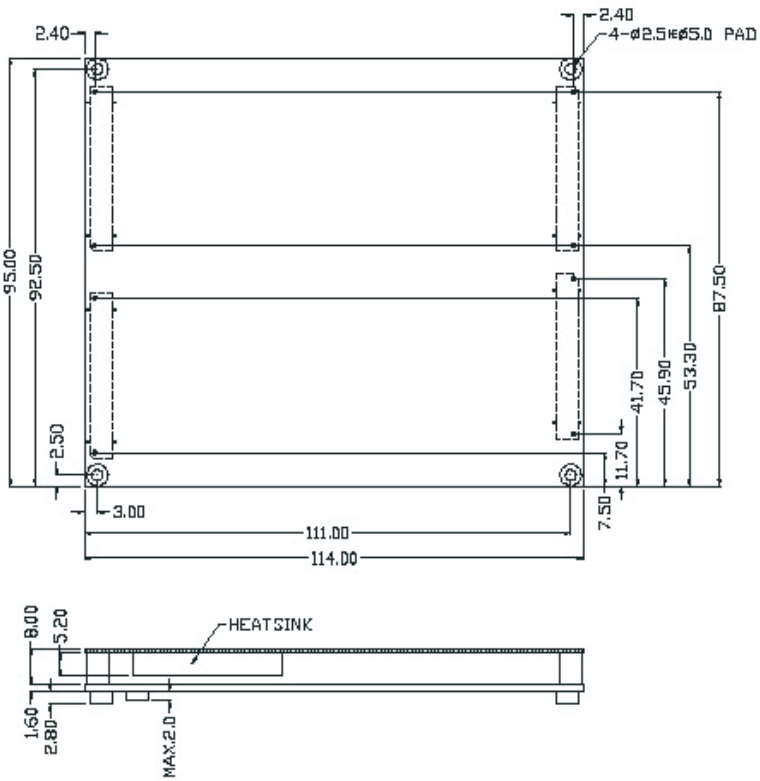
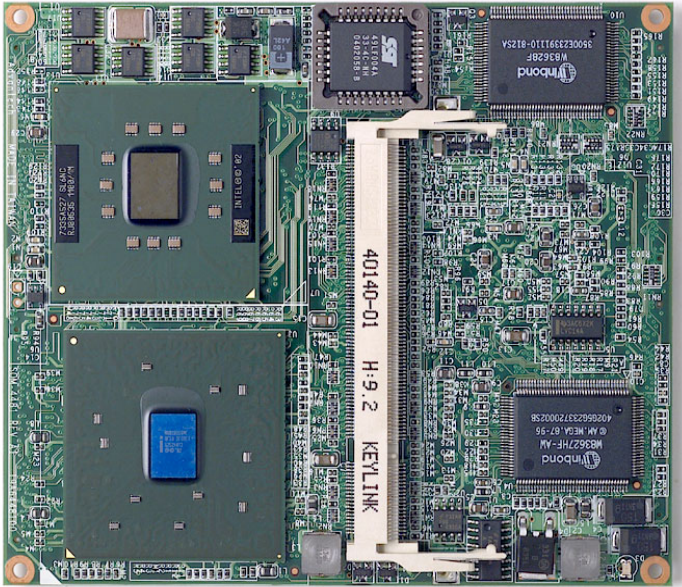


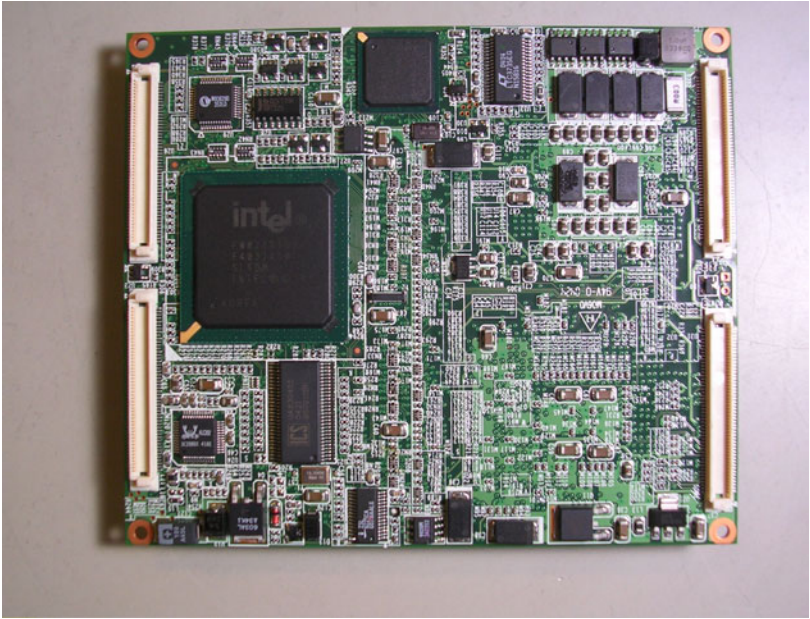
Figure 1.1: SOM-4481 dimensions

## 1.4 Board layout: dimensions

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*Figure 1.2: SOM-4481 Top view*



*Figure 1.3: SOM-4481 Solder view*

## **Connector Assignments and Descriptions**

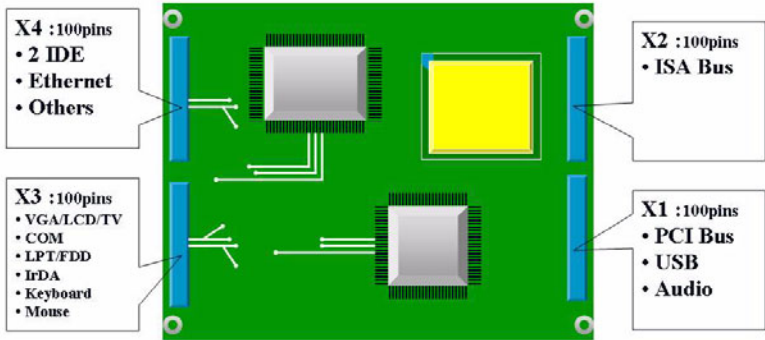
This chapter tells how to set up the SOM-4481 hardware. It includes instructions on connecting peripherals, switches and indicators. Make sure you read all the safety precautions before you begin the installation procedure

# Chapter 2 Connector Assignments

## 2.1 Connector Locations

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The board has a number of connectors that allow you to configure your system to suit your application.



*Figure 2.1: SOM-4481 Locating Connectors*

## 2.2 Pin Assignments for X1/2/3/4 connectors

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Please refer to SOM-ETX Design and Specification Guide, Chapter 2



## 2.3 Safety precautions

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**Warning!** *Always completely disconnect the power cord from your board whenever you are working on it. Do not make connections while the power is on, because sensitive electronic components can be damaged by a sudden rush of power.*

**Caution!** *Always ground yourself to remove any static charge before touching the board. Modern electronic devices are very sensitive to static electric charges. Use a grounding wrist strap at all times. Place all electronic components on a static-dissipative surface or in a static-shielded bag when they are not in use.*



CHAPTER  
**3**

# Software Configuration

# Chapter 3 Software Configuration

## 3.1 Introduction

---

The SOM-4481 system BIOS and custom drivers are located in a 512 KB, 32-pin Flash ROM. A single Flash chip holds the system BIOS and VGA BIOS. The display type can be configured via software. This method minimizes the number of chips and eases configuration. You can change the display BIOS simply by reprogramming the Flash chip

## 3.2 Utility CD disk

---

The SOM-4481 is supplied with a software utility on CDROM. This disk contains the necessary file for setting up the VGA display. Directories and files on the disk are as follows.



### **AWDFLASH.EXE**

This program allows you to update the BIOS Flash ROM.

4481Vxxx

This binary file contains the system BIOS.

## 3.3 VGA display software configuration

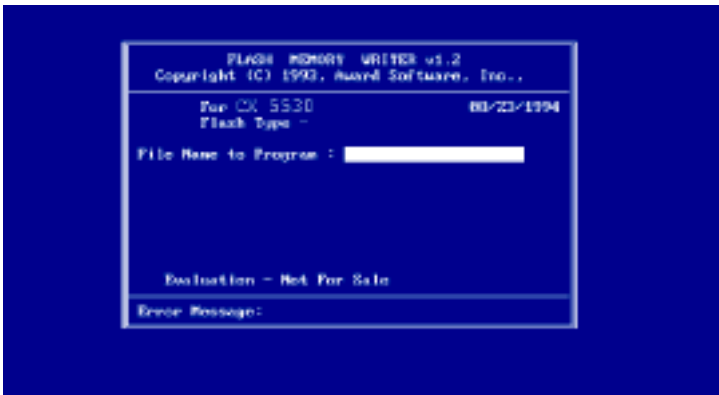
---

The SOM-4481 on-board VGA/LCD interface supports an 18bit TFT LCD, flat panel displays and traditional analog CRT monitors. The interface can drive CRT displays with resolutions up to 1280 x 1024@32 bpp. It is also capable of driving color panel displays with resolutions of 1280 x 1024 @ 16bpp. The LCD type is configured completely via the software utility, so you do not have to set any jumpers. Configure the LCD type as follows:

1. Apply power to the SOM-4481 application with a color TFT display attached. This is the default setting for the SOM-4481 series. Make sure that the AWDFLASH.EXE and \*.BIN files are located in the working drive.

**Note:**        *Make sure that you do not run AWDFLASH.EXE while your system is operating in EMM386 mode.*

2. At the prompt, type AWDFLASH.EXE and press <Enter>. The VGA configuration program will then display the following:



***Figure 3.1: BIOS VGA setup screen***

3. At the prompt, type in the BIN file which supports your display. When you are sure that you have entered the file name correctly press <Enter>. The screen will ask “Do you want to save?” If you wish to continue press Y. If you change your mind or have made a mistake press N.
4. If you decide to continue, the screen will issue a prompt which will then ask “Are you sure to program (Y/N)?” If you wish to continue, press Y. Press N to exit the program.

The new VGA configuration will then write to the ROM BIOS chip. This configuration will remain the same until you run the AWDFLASH.EXE program and change the settings.

## 3.4 Connections for two channel LVDS

---

### 3.4.1 SOM-4481 X3

*Table 3.1: LVDS Pin assignments*

Pin	Name
37	TxoutA0-
35	TxoutA0+
38	TxoutA1-
36	TxoutA1+
29	TxoutA2-
31	TxoutA2+
32	TxclkA-
30	TxclkA+
23	TxclkA3-
25	TxclkA3+
26	TxoutB0-
24	TxoutB0+
19	TxoutB1-
17	TxoutB1+
20	TxoutB2-
18	TxoutB2+
11	TxclkB-
13	TxclkB+
12	TxclkB3-
14	TxclkB3+

## **PCI Graphic Setup**

Introduction

Installation of PCI Graphic drivers

-for Windows 98/2000/XP

Further information

# Chapter 4 PCI Graphic Setup

## 4.1 Introduction

---

The SOM-4481 has an onboard PCI/AGP flat panel/VGA interface. The specifications and features are described as follows:

### 4.1.1 Chipset

The SOM-4481 uses an Intel 855GME for its graphic controller. It supports LVDS LCD displays, and CRT monitors.

### 4.1.2 Display memory

The 855GME chip can support up to 8MB dynamic frame buffer shared with system memory; the VGA controller can drive CRT displays up to 1600 x 1200 at 85-Hz and 2048 x 1536 at 75-Hz, color panel displays in LVDS model with resolutions up to UGXA panel resolution with frequency range from 25 MHz to 112 MHz.

### 4.1.3 Display types

CRT and panel displays can be used simultaneously. The SOM-4481 can be set in one of three configurations: CRT only, LVDS only, both CRT and LFP (LVDS). The system is initially set to simultaneous display mode - CRT and LFP (LDVS). If you want to enable other display mode, please set up manually. Set up example is shown as in the following chapters.

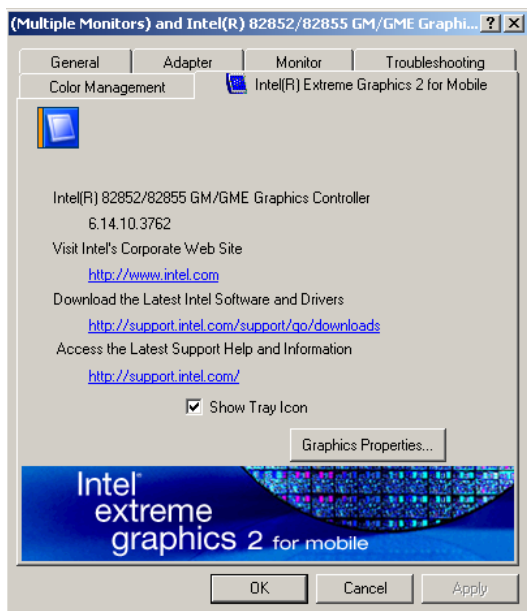
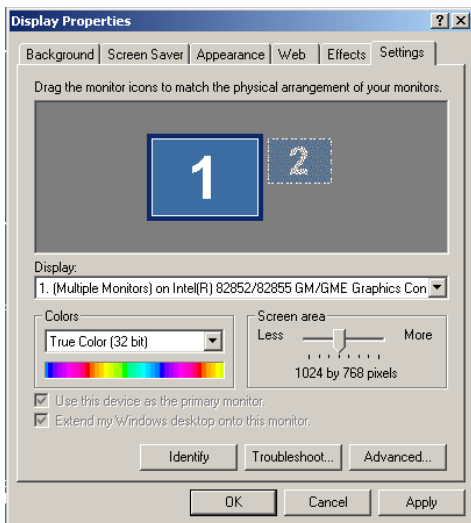
### 4.1.4 Dual/Simultaneous Display

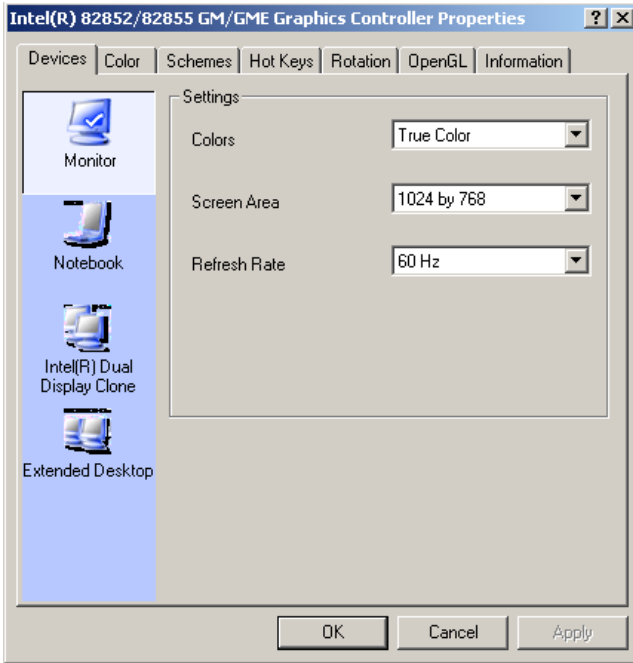
The SOM-4481 uses an Intel 855GME controller that is capable of providing simultaneous dual view display of the same content on a flat panel and CRT.

To set up dual view (simultaneous mode) under Windows 9x, Windows ME, Windows NT/2000/XP, follow these steps:

- Step 1. Open the Control panel, and select "Display", "Settings".
- Step 2. Select "Advanced."
- Step 3. Select "Graphic Properties."
- Step 4. Select "Devices" mode and click "OK".







*Figure 4.1: Selecting Display Settings*

## 4.2 Installation of the PCI Graphic driver

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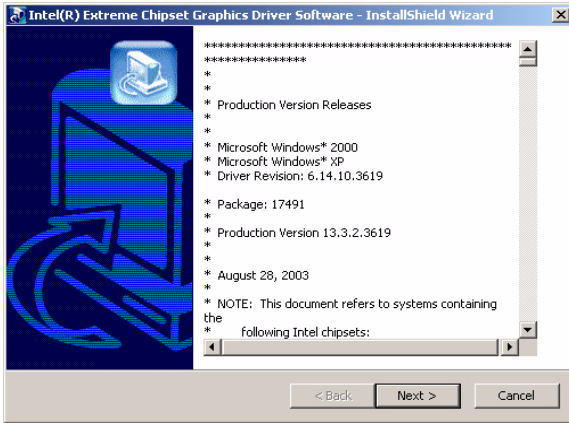
Complete the following steps to install the PCI graphic driver. Follow the procedures in the flow chart that apply to the operating system that you are using within your SOM-4481.

- Notes:*
- 1. The windows illustrations in this chapter are intended as examples only. Please follow the listed steps, and pay attention to the instructions which appear on your screen.*
  - 2. For convenience, the CD-ROM drive is designated as "D" throughout this chapter.*

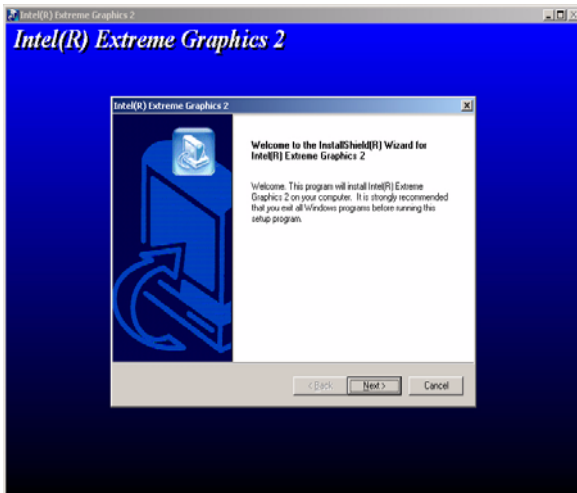
### 4.2.1 Installation for Windows 98/ME/2000/XP

To install PCI Graphic driver for Windows 98/2000/XP, please run the set up wizard "Intel Extreme Graphic 2" in CD-ROM. Example of installation steps is shown as below:

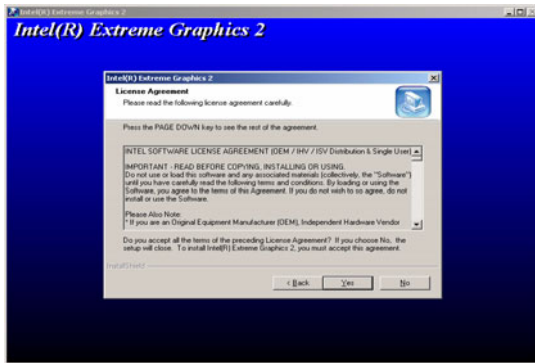
1. Follow Driver Setup Wizard instructions, then click "Next."



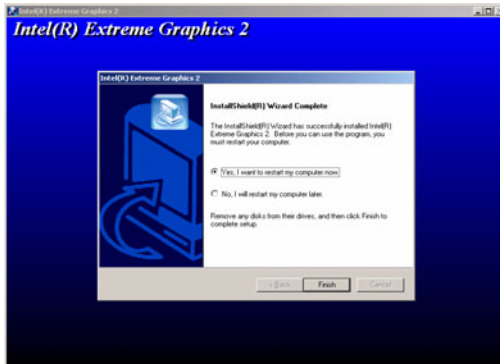
2. Click "Next."



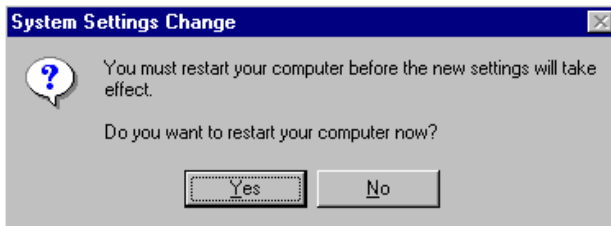
3. Click "Yes" to go next step.



4. Click "Finish" to exit.



5. Click "Yes" to reboot.



## 4.3 Further Information

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For further information about the AGP/VGA installation in your SOM-4481, including driver updates, troubleshooting guides and FAQ lists, visit the following web resources:

Advantech websites: [www.advantech.com](http://www.advantech.com)  
[www.advantech.com.tw](http://www.advantech.com.tw)



## **Audio Setup**

The SOM-4481 is equipped with an audio interface that records and plays back CD-quality audio. This chapter provides instructions for installing the software drivers included on the audio driver diskettes.

# Chapter 5 Audio Setup

## 5.1 Introduction

---

The SOM-4481's on-board audio interface provides high-quality stereo sound and FM music synthesis (ESFM) by using the Intel ICH4 audio controller. The audio interface can record, compress, and play back voice, sound, and music with built-in mixer control.

## 5.2 Driver installation

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### 5.2.1 Before you begin

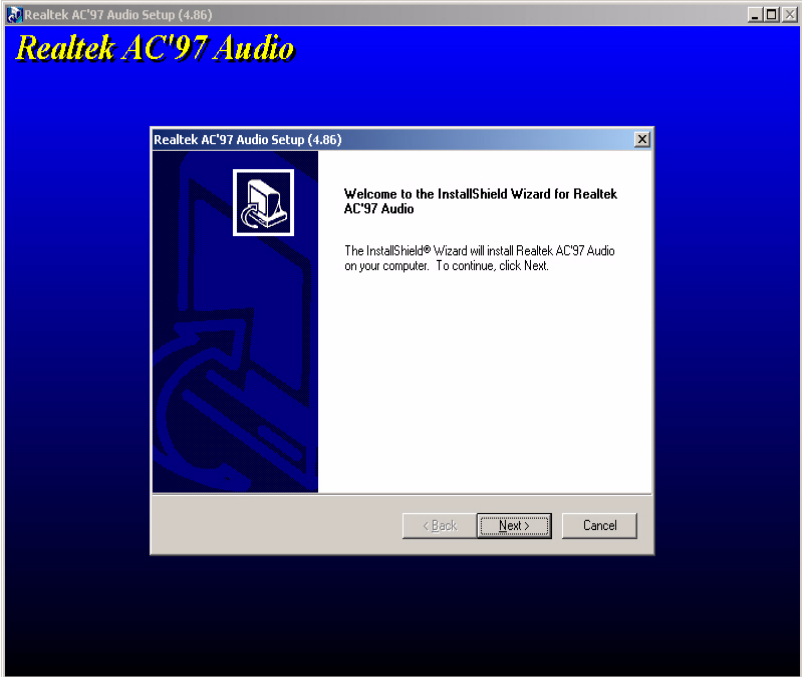
Please read the instructions in this chapter carefully before you attempt installation. The audio drivers for the SOM-4481 board are located on the audio driver CD. Run the supplied SETUP program to install the drivers; don't copy the files manually.

- Note:*
- 1. Note 1: Before trying to install the driver, go to Chapter 3 to use the "Chipset Software Installation Utility" first.*
  - 2. The files on the software installation diskette are compressed. Do not attempt to install the drivers by copying the files manually. You must use the supplied SETUP program to install the drivers.*



## 5.2.2 Windows 9x/2000/Me/XP drivers

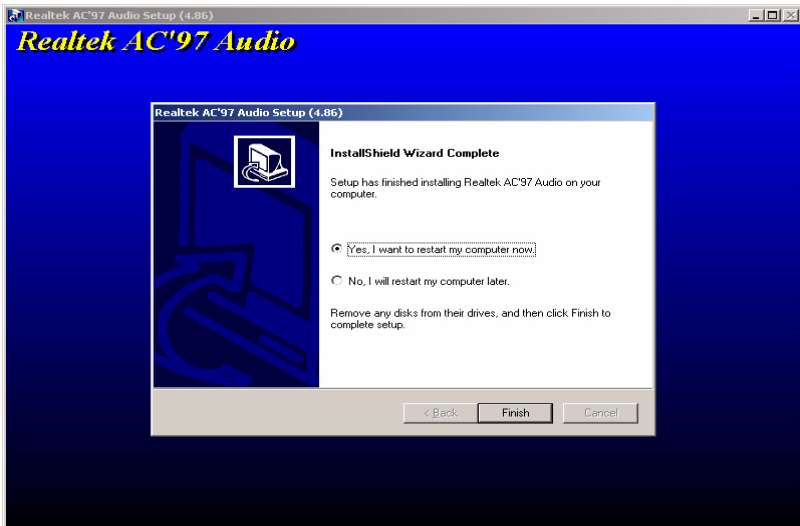
Step 1. To install Audio driver for Windows 98/2000/XP, please run the set up wizard "Install Shield Wizard for Realtek AC'97 Audio" in CD-ROM. Example of installation steps is shown as bellow.



Step 2. In the Hardware Update Wizard window, click "Next".



Step 3. In the following Hardware Update Wizard window, click "Finish" for Windows to complete audio driver installation.



## **LAN Configuration**

- Introduction
- Features
- Installation of Ethernet Driver for
  - Windows 2000 Drivers Setup Steps
  - Windows NT Drivers Setup Steps
  - Windows Wake-on-LAN Setup

# Chapter 6 LCI Bus Ethernet Interface

## 6.1 Introduction

---

The SOM-4481 is equipped with a high-performance 32-bit Ethernet chipset which is fully compliant with IEEE 802.3 100 Mbps CSMA/CD standards. It is supported by major network operating systems. It is also both 100Base-T and 10Base-T compatible.

## 6.2 Features

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- Intel 82562EZ 10/100Base-T Ethernet LAN controller
- Optional Intel 82540 10/100/1000 Base-T Ethernet LAN controller
- Supports Wake-on-LAN remote control function.
- PCI Bus Master complies with PCI Rev. 2.2
- Complies with 100Base-TX, and 10Base-T applications.
- Single RJ-45 connector gives auto-detection of 10 Mbps or 100 Mbps network data transfer rates and connected cable types.
- Enhancements on ACPI & APM.
- Complies with PCI Bus Power Management Interface Rev. 1.1,
- ACPI Rev. 2.0, and Device Class Power Management Rev. 1.0.

## 6.3 Installation of Ethernet Driver

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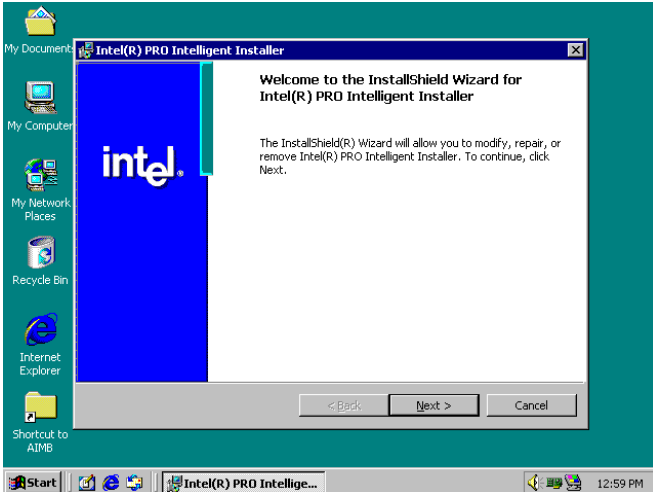
Before installing the Ethernet driver, note the procedures below. You must know which operating system you are using in your SOM-4481, and then refer to the corresponding installation procedure. Then just follow the steps described. You will quickly and successfully complete the installation, even if you are not familiar with instructions for Windows.

**Note:** *The windows illustrations in this chapter are examples only. You must follow the flow chart instructions and pay attention to the instructions which then appear on your screen.*

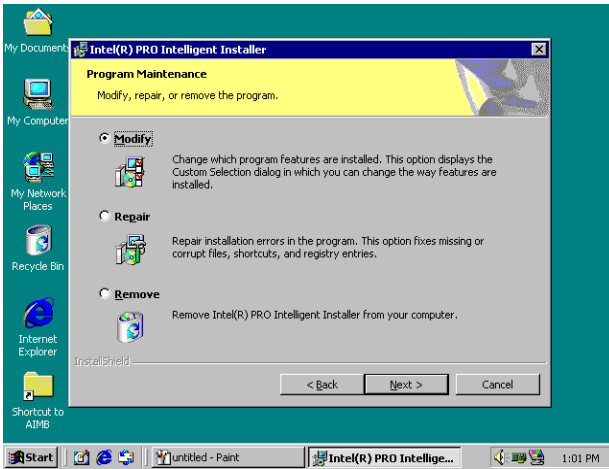
### 6.3.1 Installation for Windows 2000

**Note:** The CD-ROM drive is designated as "D" throughout this section.

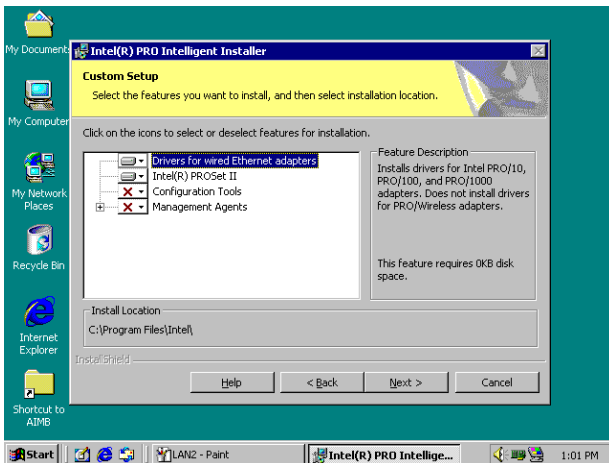
1. Click "Setup" icon in path "D:\SOM\SOM-ETX\4481\LAN"



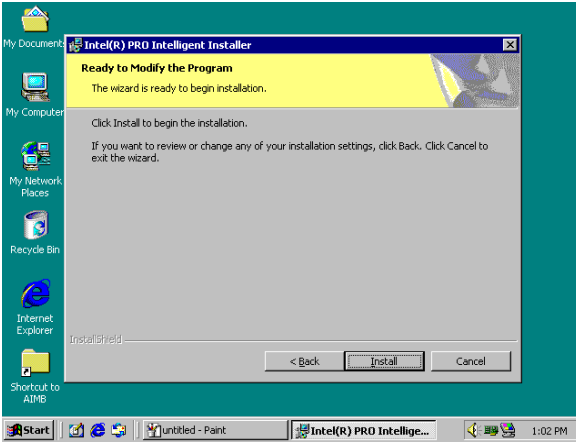
2. Choose "Modify" item and click "Next" to go next step.



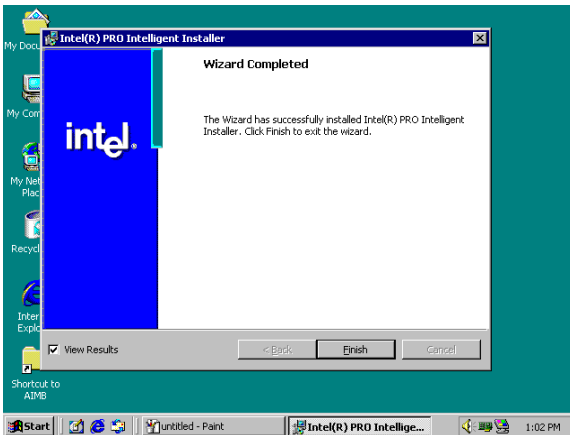
3. Highlight "Drivers for wired Ethernet adapters" and click "Next".



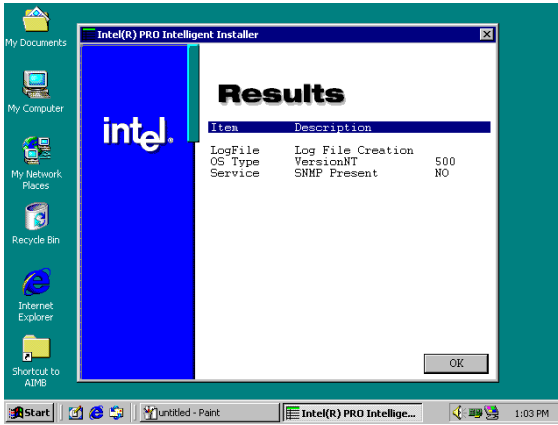
4. Click "Install" to begin the installation.



5. Click "Finish" to exit the wizard.

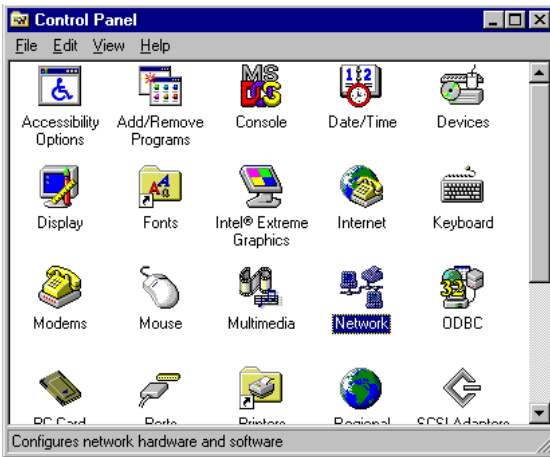


6. Then the Installer will show the result after driver installed.



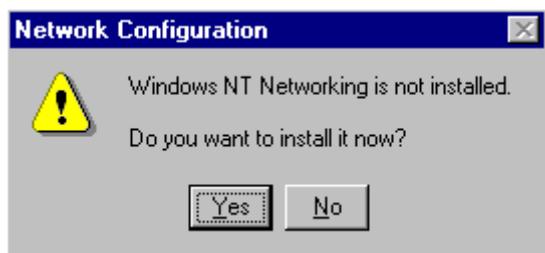
### 6.3.2 Installation for Windows NT

1. Select "Start", "Settings", "Control Panel" and double click "Network" icon.

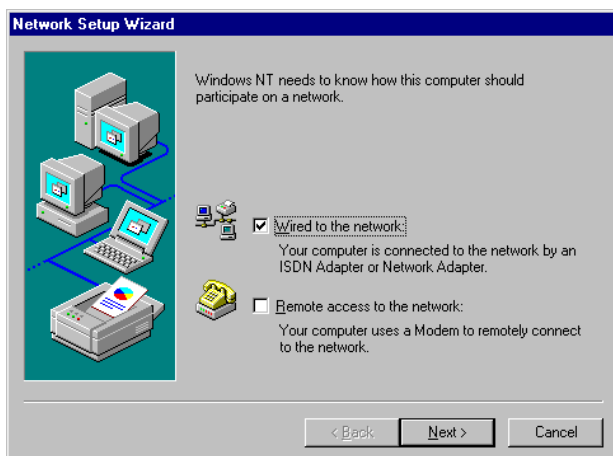




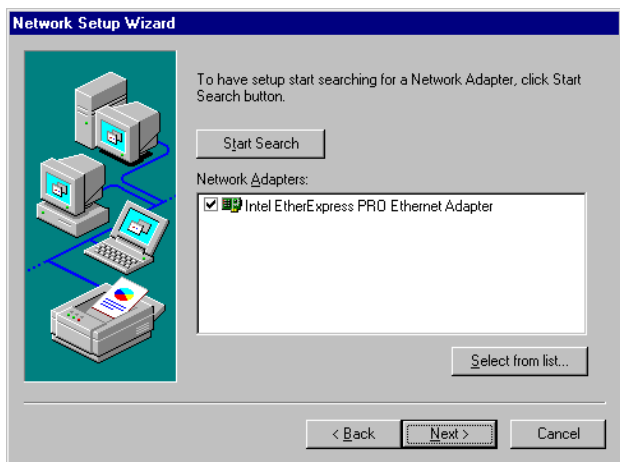
2. Then this menu will show on the screen. And click "Yes" to install network driver.



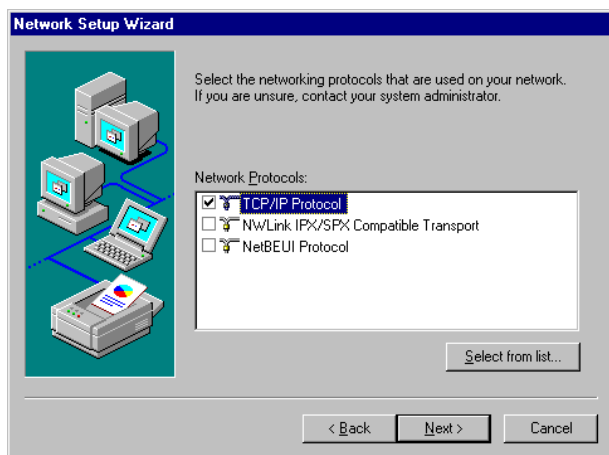
3. Select "Wired to the network" and click "Next"

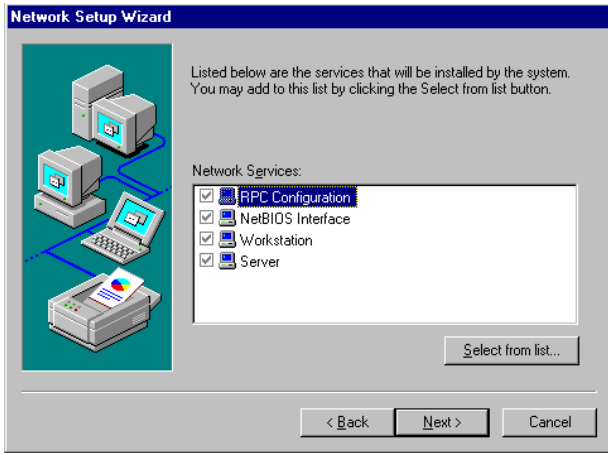


4. Click "Start Search" to search a Network Adapter. Then click "Next" to go next step

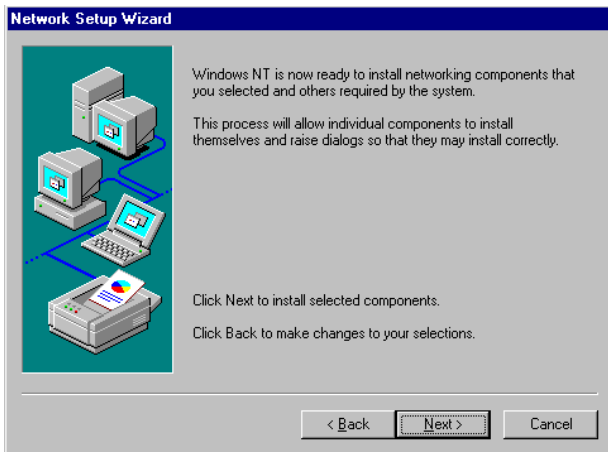


5. Base on current network environment to modify the Network Protocol then Click "Next"

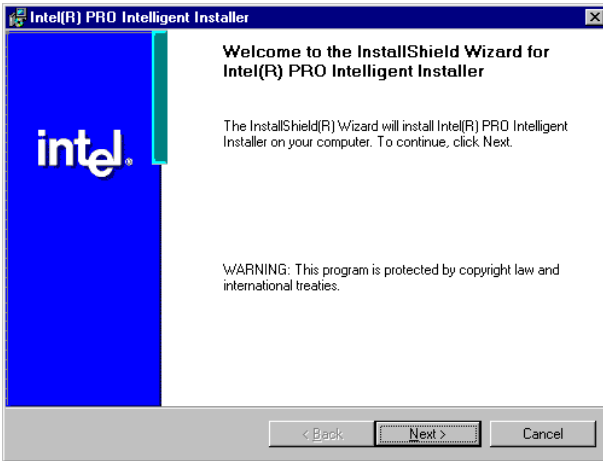




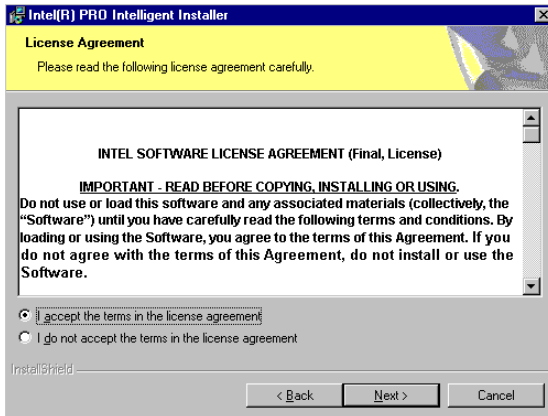
6. Click "Next" to go to next step



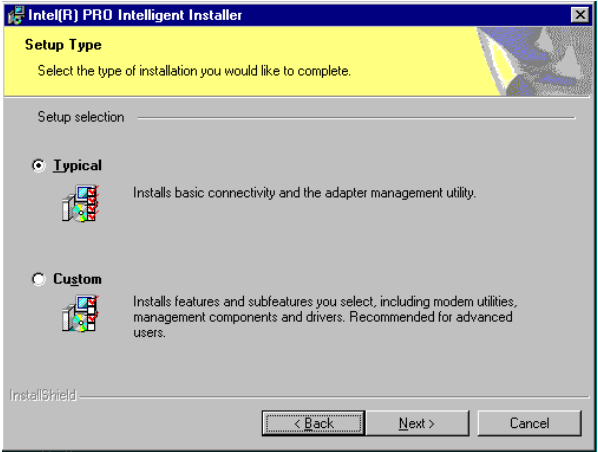
7. Click "Next" to install Network Adapter driver.



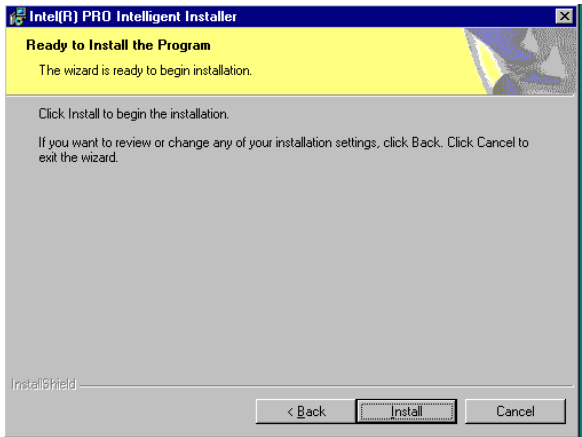
8. Check the License Agreement first then select "I accept the terms in the license agreement" and click "Next".



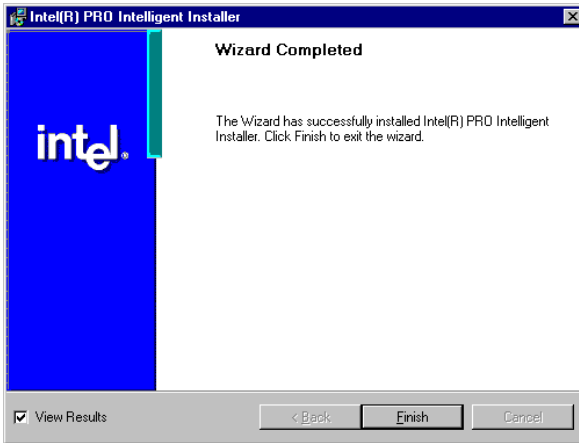
9. Select "Typical" and Click "Next".



10. Click "Install" to start to install driver.



11. Click "Finish" to finish install driver.



### 6.3.3 Further information

Intel website: [www.intel.com](http://www.intel.com)

Advantech websites: [www.advantech.com](http://www.advantech.com)

[www.advantech.com.tw](http://www.advantech.com.tw)

## **Programming the Watchdog Timer**

The SOM-4481 is equipped with a watchdog timer that resets the CPU or generates an interrupt if processing comes to a standstill for any reason. This feature ensures system reliability in industrial standalone or unmanned environments.

# Appendix A Prog. Watchdog Timer

## A.1 Watchdog programming

---

Bellow is a sample of programming code for controlling the Watchdog Timer function.

-----  
Enter the extended function mode, interruptible double-write

```
MOV DX,2EH
MOV AL,87H
OUT DX,AL
OUT DX,AL
```

-----  
Configured logical device 8, configuration register CRF6

```
MOV DX,2EH
MOV AL,2BH
OUT DX,AL
MOV DX,2FH
IN AL,DX
AND AL.OEFH;Setbit 4=0 Pin 89=WDTO
OUT DX,AL
MOV DX,2EH
MOV AL,07H; point to Logical Device Number Reg.
OUT DX,AL
MOV DX,2FH
MOV AL,08H; select logical device 8
OUT DX,AL;
MOV DX,2EH
MOV AL,30H;Set watch dog activate or inactivate
OUT DX,AL
```



```

MOV DX,2FH
MOV AL,01H; 01:activate 00:inactivate
OUT DX,AL;
MOV DX,2EH
MOV AL,F5H; Setting counter unit is second
OUT DX,AL
MOV DX,2FH
MOV AL,00H
OUT DX,AL;
MOV DX,2EH
MOV AL,F6H
OUT DX,AL
MOV DX,2FH
MOV AL,05H; Set 5 seconds
OUT DX,AL
;-----
; Exit extended function mode |
;-----
MOV DX,2EH
MOV AL,AAH
OUT DX,AL

```



## **System Assignments**

- System I/O ports
- DMA channel assignments
- Interrupt assignments
- 1st MB memory map

# Appendix B System Assignments

## B.1 System I/O ports

---

*Table B.1: System I/O ports*

<b>Addr. range</b>	
(Hex)	Device
000-01F	DMA controller (slave)
020-03F	Interrupt controller 1, (master)
040-05F	8254 timer/counter
060-06F	8042 (keyboard controller)
070-07F	Real-time clock, non-maskable interrupt (NMI)
	Mask
080-09F	DMA page register,
0A0-0BF	Interrupt controller 2 (slave)
0C0-0DF	DMA controller (master)
0F0	Clear math co-processor
0F1	Reset math co-processor
0F8-0FF	Math co-processor
1F0-1F8	1st fixed disk
200-207	Game I/O
278-27F	Reserved
2F8-2FF	Serial port 2
300-31F	Ethernet**
378-37F	Parallel printer port 1 (LPT1)
380-38F	SDLC, bisynchronous 2
3A0-3AF	Bisynchronous 1
3B0-3BF	Monochrome display
3C0-3CF	Reserved
3D0-3DF	Color/graphics monitor adapter
3F0-3F7	Diskette controller
3F8-3FF	Serial port 1

\*\* default setting

## B.2 DMA channel assignments

---

*Table B.2: DMA channel assignments*

<b>Channel</b>	<b>Function</b>
0	Available
1	Available
2	Floppy disk (8-bit transfer)
3	Parallel**
4	Cascade for DMA controller 1
5	Available
6	Available
7	Available
**	Parallel port DMA default setting: DMA 3
	Parallel port DMA select: DMA 1, 3

## B.3 Interrupt assignments

---

*Table B.3: Interrupt assignments*

<b>Interrupt#</b>	<b>Interrupt source</b>
NMI	Parity error detected
IRQ 0	Interval timer
IRQ 1	Keyboard
IRQ 2	Interrupt from controller 2 (cascade)
IRQ 3	Serial communication port 2
IRQ 4	Serial communication port 1
IRQ 5	Available
IRQ 6	Diskette controller (FDC)
IRQ 7	Parallel port 1 (print port)
IRQ 8	Real-time clock
IRQ 9	Reserve
IRQ 10	Available
IRQ 11	Reserved for watchdog timer
IRQ 12	PS/2 mouse
IRQ 13	INT from co-processor
IRQ 14	Preliminary IDE
IRQ 15	Secondary IDE for CompactFlash

USB and Ethernet IRQ is automatically set by the system

## B.4 1st MB memory map

---

*Table B.4: 1st MB memory map*

<b>Addr. range (Hex)</b>	<b>Device</b>
F000h - FFFFh	System ROM
E000h - EFFFh	Reserved for BIOS boot
CC00h - DFFFh	available
C000h - CB00h	VGA BIOS
B800h - BFFFh	CGA/EGA/VGA text
B000h - B7FFh	Reserved for graphic mode usage
A000h - AFFFh	EGA/VGA graphics
0000h - 9FFFh	Base memory

\* default setting

