PCI-8246

Dual Gigabit Ethernet Ports
PCI-X Card with Bypass Capability

User's Guide

Recycled Paper

Manual Rev. 1.00 October 11, 2004

Part No: 50-15032-100

Getting Service from ADLINK

Customer Satisfaction is top priority for ADLINK TECHNOLOGY INC. If you need any help or service, please contact us.

ADLINK TECHNOLOGY INC.			
Web Site	http://www.adlinktech.com		
Sales & Service	Service@adlinktech.com		
TEL	+886-2-82265877	FAX	+886-2-82265717
Address	9F, No. 166, Jian Yi Road, Chungho City, Taipei, 235 Taiwan		

Please email or FAX your detailed information for prompt, satisfactory, and consistent service.

Detailed Company Information			
Company/Organization			
Contact Person			
E-mail Address			
Address			
Country			
TEL		FAX	
Web Site			
Questions			
Product Model			
Environment	OS: Computer Brand: M/B: CPU: Chipset: BIOS: Video Card: NIC: Other:		
Detail Description			
Suggestions for ADLINK			

Table of Contents

How to use this guide

This manual is designed to assist the user in using the PCI-8246 series modules. The contents are as follows:

Chapter 1 **Introduction**
Overview of product features and specifications.

Chapter 2 **Getting Started on Hardware**
Describes the unpacking procedures and illustrates the connector pin assignments.

Chapter 3 **Getting Started on Software Programming**
Programming information.

Chapter 4 **Driver Installation**
Describes the driver installation.

1

Introduction

PCI-8246 is a high performance 2-port Gigabit Ethernet (GbE) PCI-X card providing bypass capability, which can connect GbE signals on the two GbE connectors while the system is powered down or under software halt.

1.1 Block Diagram

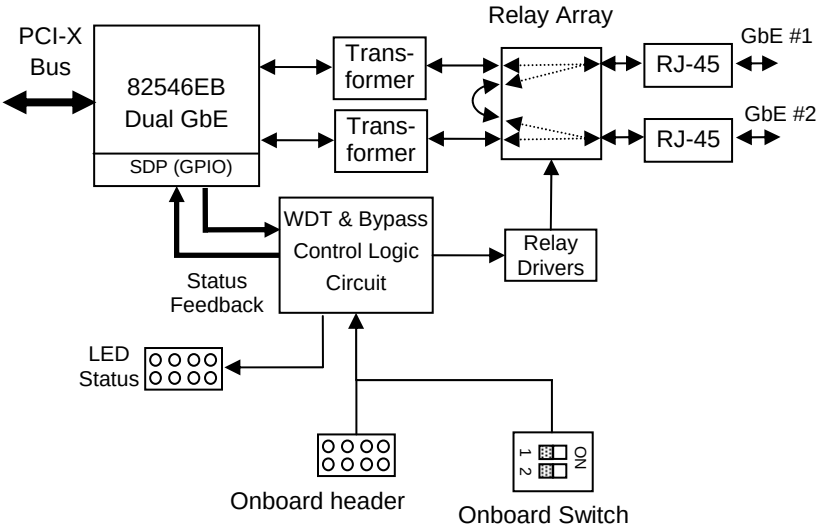


Figure 1: Block Diagram

The PCI-8246 is based on the Intel® 82546EB dual port Gigabit Ethernet controller. The Intel® 82546EB is a highly integrated chip, includes Ethernet

MAC, PHY, and provides PCI-X 133 capability. Please refer to the Intel® 82546EB datasheet for more information on the GbE ports.

The PCI-8246's bypass capability uses a mechanical relay array to control the physical routing of the GbE signals. There are two communications states for the GbE signal routing: 1) ***Normal State***, 2) ***Bypass State***. Please refer to section 1.4 for block diagrams of the two states.

watchdog timer (WDT) and bypass control logic circuits are used to control the relay and communication states. The programmer can control those functions via the Software Definable Pins (SDP) on the Intel® 82546EB by programming its registers. Please refer to section 1.5 for a block diagram of the bypass control circuits.

1.2 Features

- Dual Gigabit Ethernet Ports
- Supports up to PCI-X 133Mhz
- Bypass capability during system power-off or software halt
- Software programmable bypass control
- Programmable watchdog timer, WDT status read-back
- Intel Boot Agent BIOS
- Low-profile bracket available for OEM requirements

1.3 Specifications

- **PCI bus architecture**
  - Bus Type: PCI/PCI-X
  - Bus Width: 32- or 64-bit
  - Bus Speed: 33/66/100/133 MHz
  - Interrupt Level: INTA
  - Data Transfer Mode: Bus-master DMA
  - PCI Voltage: 3.3V or 5V universal

- **Ethernet Controller**
  - Intel® 82546 Gigabit Ethernet Controller, Dual GbE ports
  - Data rates supported (per port): 10,100,1000Mbps
  - IEEE Standard/Network Topology: 10BASE-T, 100BASE-TX, 1000BASE-T
  - IEEE 802.3ab compliant
- **Ethernet Ports**
  - Connector: Two RJ-45
  - Wiring: Cat-5, 4-pair
  - Cable Distance: 100 meters (normal mode) or 40 meters (bypass mode)
- **Bypass Capability and Watchdog Timer**
  - A relay array controls signal routing of the two GbE ports
  - ***Normal State***: GbE signals are straight-through to GbE controller
  - ***Bypass State***: GbE signals are connected to another port and bypass the GbE controller
  - Power off status is ***Bypass State***
  - Programmable watchdog timer (WDT) can switch relay array to ***Bypass State*** during a software halt
  - WDT time out value is programmable as 1, 2, 4, or 8 seconds by DIP switch or by software programmable
- **Ethernet LED**
  - Two LED on each RJ-45 connector
  - For each port, two LED for 1000Mbps indication and Link / Active
  - LED header reserved for custom chassis front panel LED connection
- **Boot ROM Feature**
  - LAN Boot ROM: 128KB onboard
  - Support INTEL® Preboot Execution Environment (PXE) for remote boot
- **OS Support:**
  - Microsoft® Windows® Server 2003 and 2000
  - Microsoft® Windows® XP 32- and 64-bit Editions
  - Windows® NT 4.0
  - Linux 2.4.x or later
  - FreeBSD 4.x or later
  - Novell NetWare® 4.11, 4.2, 5.0, 5.1, 6.0
  - UnixWare® 7.x and OpenUNIX 8 (ddi8), SCO5*

- **Network Management**
  - Intel® Boot Agent
  - ACPI Power Management
  - PXE 2.0 (Network Management does not support Wake on LAN)
- **Compliant Standards**
  - CE Certification:
    - EMI Test: European Standard EN 55022 Class B
    - Harmonic Test: European Standard EN 61 000-3-2
    - Voltage fluctuations Test: European Standard EN 61 000-3-3
    - EMS Test: European Standard EN 50 082-1:1997
  - FCC Approval: Standard for Methods of Measurement
    - ANSI C63.4 – 1992
  - Compliance with CISPR PUB. 22 and FCC Part 15
- **Environment**
  - Operating Temperature: 0 to 55^{o}C
  - Storage Temperature: -20 to 80^{o}C
  - Humidity: 10% to 90% non condensing
- **Dimensions**
  - PCI half-sized, low profile card
  - 174.63 mm x 64.41 mm (L x W)
  - Height of Full-height Panel Bracket: 12.1cm (4.75in)

1.4 Communication States

The following diagram illustrates the ***Normal State***: where the two GbE signals are straight-through connected to the GbE ports via the transformers. The two GbE ports work independently as normal dual GbE ports.

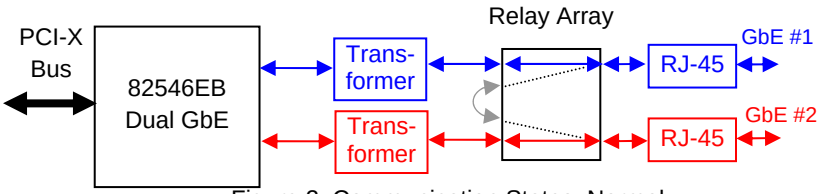


Figure 2: Communication States: Normal

The following diagram shows the ***Bypass State***: where the two GbE signal are cross-over connected to each other so that the Ethernet connection

bypasses the computer or the network appliance where this PCI card is installed in.

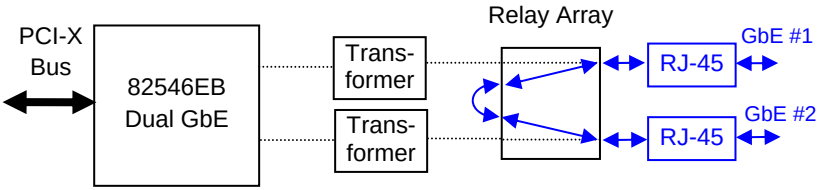


Figure 3: Communication States: Bypass

The relay array is driven by the relay divers which are controlled by the watchdog timer and bypass control logic circuits.

1.5 WDT and Bypass Control Logic

The block diagram of the WDT and bypass control logic circuits is as follows:

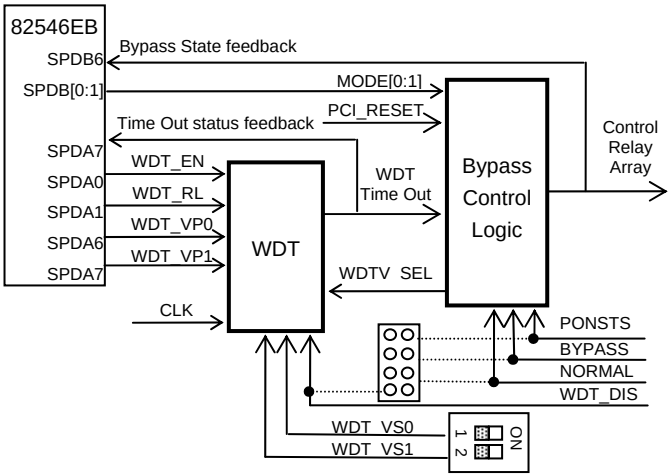


Figure 4: WDT and Bypass Control Logic

Please refer to chapter 2 for switch and jumper setting definition; chapter 3 for programming information including the WDT control.

2

Connectors and Hardware Settings

2.1 Card Panel

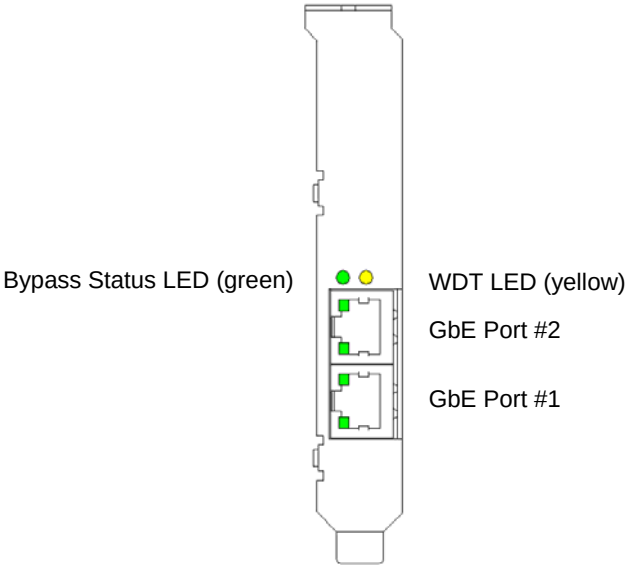
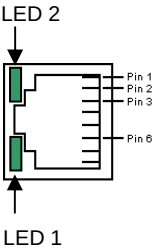


Figure 5: Card Panel

2.2 Gigabit Ethernet Connectors



PIN	LAN1 SIGNAL	LAN2 SIGNAL	FUNCTION
1	LAN1_TDP1	LAN2_TDP1	Transmit Data1 +
2	LAN1_TDN1	LAN2_TDN1	Transmit Data1 -
3	LAN1_RDP2	LAN2_RDP2	Receive Data2 +
4	LAN1_RDP3	LAN2_RDP3	Receive Data3 +
5	LAN1_RDN3	LAN2_RDN3	Receive Data3 -
6	LAN1_RDN2	LAN2_RDN2	Receive Data2 +
7	LAN1_TDP4	LAN2_TDP4	Transmit Data4 +
8	LAN1_TDN4	LAN2_TDN4	Transmit Data4 -

LED Definitions for LAN1/LAN2 (CN3/CN4)

Status		LED 1	LED 2
Network link is not established		OFF	OFF
10 Mbps (10 BaseT)	Link	OFF	ON
	Active	OFF	Blinking
100 Mbps (100 BaseTX)	Link	ON	OFF
	Active	Blinking	OFF
1000 Mbps (1000 BaseT)	Link	Blinking	ON
	Active	Blinking	Blinking

2.3 Control Switch and Header

Control Switch SW2

Position	Name	Description (* Factory default setting)
SW2-1	WDT_VS0	WDT time out value bit 0
SW2-2	WDT_VS1	WDT time out value bit 1

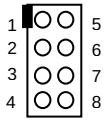
WDT_VS1	WDT_VS0	WDT time out value
OFF*	OFF*	8 second
OFF	ON	4 seconds
ON	OFF	2 seconds
ON	ON	1 seconds

The WDT_VS0/1 switches are used to set the WDT time out value. Please note that the user can also use software to control the WDT value. Please refer to Chapter 3 for detail programmable WDT setting.

Control Header

The Control Header (CN1) is used to enforce Normal and Bypass states as shown below.

CN1



Jumper	Name	Description (* Factory default setting)
1-5	PONSTS	Closed: Power-on ***Normal State*** Open: Power-on ***Bypass State****
2-6	BYPASS	Closed: Force relay array to ***Bypass State*** Open: No enforcement*
3-7	NORMAL	Closed: Force relay array to ***Normal State*** Open: No enforcement*
4-8	WDT_DIS	Closed: Force WDT disable Open: No enforcement*

Enforcement Priority

The Control Header has priority over all software enforcement. Please refer to sections 3.1 and 3.2 for further information on priority.

2.4 PXE Boot Flash Enable Jumper

The PCI-8246 supports remote boot via the PREBOOT EXECUTION ENVIRONMENT (PXE) function by installing a boot ROM. The boot ROM is installed but disabled by default.

JP1: Boot Flash Enable & Disable setting

Description	Disable BOOT Flash	Enable BOOT Flash
JP1	1 – 2 (*)	2 – 3

*: Factory Default Setting

2.5 Status LED Signal Header

The status LED signal header CN2 collects six status signals so that the system integrator can power additional LEDs that can be installed elsewhere on the chassis. The onboard LED driving circuit can sink up to 10mA current for each signal.

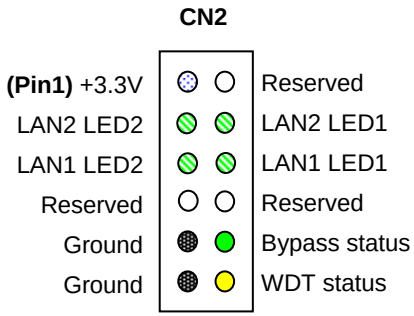


Figure 6: Status LED Signal Header

Pins	Signal	Meaning
Bypass status	ON	***Normal State***
	OFF	***Bypass State*** or Power off
WDT status	ON	WDT time out
	Blinking	WDT running (enabled)
	OFF	WDT disable

LAN1/LAN2 Status		LED1	LED2
Network link is not established		OFF	OFF
10 Mbps (10 BaseT)	Link	OFF	ON
	Active	OFF	Blinking
100 Mbps (100 BaseTX)	Link	ON	OFF
	Active	Blinking	OFF
1000 Mbps (1000 BaseT)	Link	Blinking	ON
	Active	Blinking	Blinking

3

Programming Information

3.1 SDP Register

Block Diagram and 82546EB

The following block diagram (identical to the one in Section 1.5) illustrates the bypass control signals. Programmers need to know how to access the 82546EB PCI controller and its Software Defined Pins (SDP). Please refer to the 82546EB programming document for detailed information.

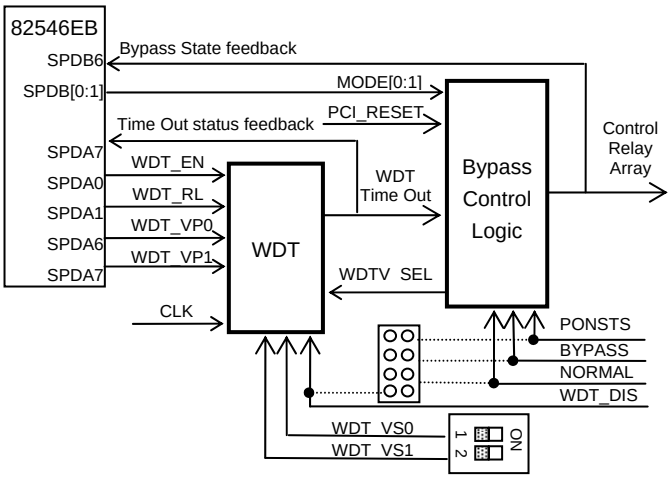


Figure 7: Block Diagram and 82546EB

SDP Registers Definition

The bits in SDP registers are all readable and writable. The following table shows the register definition.

SPD Bit	Name	R/W	Description
SDPB0	MODE0	RW	Bypass control mode bit 0 and 1
SDPB1	MODE1	RW	
SDPB6	Bypass Status	R	Bypass status read back 0: Bypass 1: Normal
SDPB7	WDT Status	R	WDT status read back 0: WDT running or stop 1: WDT Time Out
SDPA0	WDT_CTRL	RW	WDT control bit
SDPA1	WDT_RL	RW	Reload WDT to avoid timeout
SDPA6	WDT_VP0	RW	WDT time out value bit 0 and 1
SDPA7	WDT_VP1	RW	

WDT Enable

WDT_EN	Functions	
0	WDT is disabled.	Power On Default
1	WDT is enabled.	

Bypass Control Mode

MODE0	MODE1	Functions	
0	0	No enforcement. Set WDT reload from the switch setting WDT_VS[1:0]	Power On Default
0	1	No enforcement. Set WDT reload from the programmable WDT_VP[1:0]	
1	0	Disable WDT, force relay array to ***Bypass State*** (1)	
1	1	Disable WDT, force relay array to ***Normal State*** (2)	

Note 1: If the relay array is forced to ***Normal State*** by jumper settings in the Control Header, then this setting is void (see Section 2.3).

Note 2: If the relay array is forced to ***Bypass State*** by jumper settings in the Control Header, then this setting is void (see Section 2.3).

WDT Reload

WDT_RL	Functions
0 -> 1 -> 0	Reload WDT to avoid timeout

When WDT is reload, the circuit will load the WDT value from either WDT_VP[1:0] or WDV_VS[1:0] dependent on the control modes setting.

WDT Time Out Value Setting

WDT_VP1	WDT_VP0	WDT time out value	
0	0	1 second	Power On Default
0	1	2 seconds	
1	0	4 seconds	
1	1	8 seconds	

3.2 Bypass Control Priority

The relay array is controlled by reset, WDT time out, bypass control mode bits, and external settings from the header. Please refer to the following block diagram.

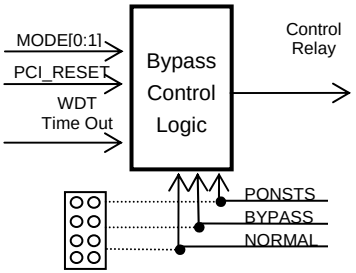


Figure 8: Bypass Control Priority

The control priority is as follows. The setting with higher priority will override the lower priority setting (or status)

Bypass Control Priority	Control source
Highest	Reset
↓	BYPASS state enforcement jumper
	NORMAL state enforcement jumper
	Bypass control mode setting MODE[0:1]
Lowest	WDT time out

3.3 DOS Utilities for Evaluation - Utilities List

Before programming this card, users can evaluate the PCI-8246 bypass capability using the DOS test utility - 8246util.exe:

8246util e:
Enable the WDT. The relay array will be switched to Normal State when executing the command. If the user does not reload the WDT before time out in 1, 2, 4, or 8 seconds depending on the DIP switch setting, then the relay array will be switched to the Bypass State. A 'click' can be heard when the relay switches.

8246util e [x]:
Enable the WDT. Users can determine the time out value by typing the parameter [x]; only 1, 2, 4, or 8 is valid for [x]. The relay array will be switched to Normal State when executing the command. If the user does not reload the WDT before time out in 1, 2, 4 or 8 seconds depending on the setting, then the relay array will be switched to the Bypass State. A 'click' can be heard when the relay switches.

8246util d:
Disable and stop WDT. The relay array will stay in the same state.

8246util w:
Enable WDT and keep reloading WDT. The WDT would keep running unless the program stops running or powers off. The WDT status LED would blink and the relay array would be in the Normal State. The user can adjust the real panel switch to enforce to Bypass State; then adjust the BYPASS switch Off to switch back to the Normal State. The WDT would continue to run. The user can then power off and the relay array will switch back to the Bypass State.

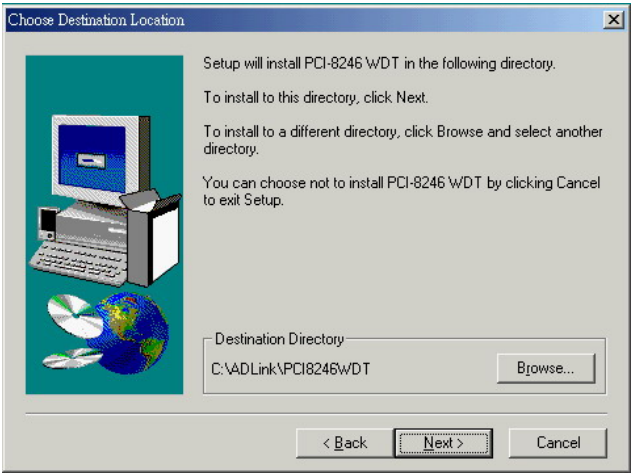
8246util n:
Enforce the relay array to Normal State and WDT will be disabled. The user can set Control Header (CN1) jumpers to force the relay array to Bypass State.

8246util b:
Enforce the relay array to Bypass State and WDT will be disabled. User can adjust set Control Header (CN1) jumpers to force the relay array to Normal State.

3.4 WDT Library Installation for Windows 2000 and XP

ADLINK provides a setup program for installing the PCI-8246 WDT library, driver, and sample program under Windows 2000 or XP. Please follow the instructions below.

1. Place the *ADLINK All-in-One CD* into the appropriate CD-ROM drive.
2. Execute:
   X:\PCI\PCI-8246\WDTutility\2K_XP**SETUP**
   (X indicates the CD-ROM drive letter)
3. A Welcome dialog box appears, click **Next** to start installation.
4. Setup then prompts with the following dialog box for the user to specify the destination directory. The default path is C:\ADLINK\PCI8246 WDT. To install *PCI-8246 WDT for Windows* software in another directory, click **Browse…** to change the destination directory.



5. Click **Next** to begin installing *PCI-8246 WDT for Windows*.
6. The user will be prompted to restart Windows after the software installation process is completed.

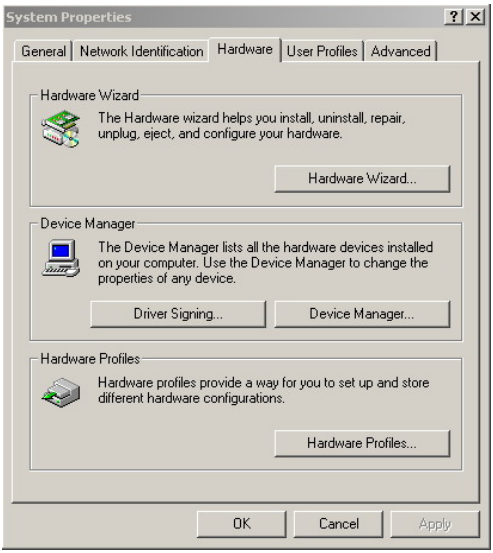
Once the installation process is complete, the PCI-8246 WDT directory should contain the following files and sub-directories:

File/Subdirectory	Description
LIB <DIR>	PCI-8246 WDT import libraries and DLL
INCLUDE <DIR>	Include files for application programming
SAMPLE <DIR>	Sample program

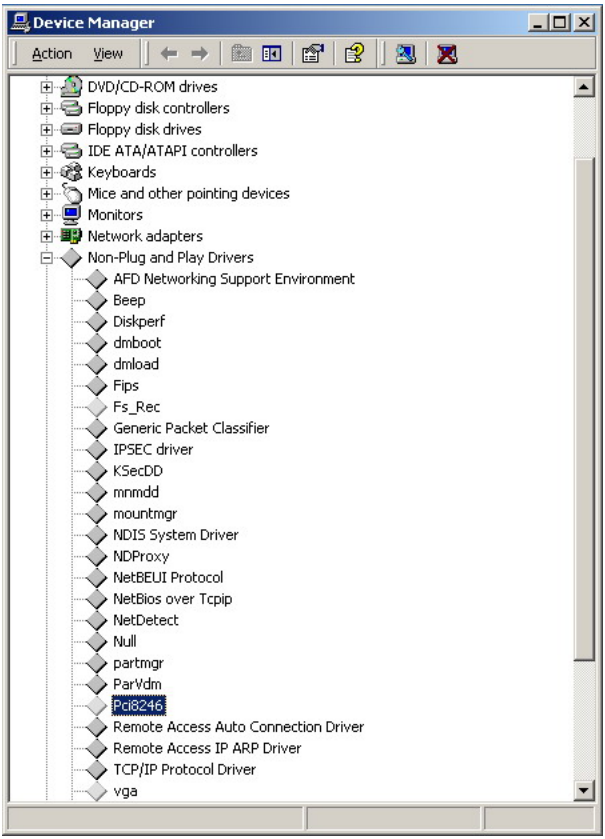
PCI-8246 WDT's DLL is also copied into the Windows System directory (default: C:\Winnt\System32). The driver file PCI8246.SYS is also copied into the Windows System Drivers directory (default: C:\Winnt\System32\Drivers).

To check whether or not installation was successful after installing the PCI-8246 WDT software and re-booting the system, follow the steps below:

1. Right click *My Computer* and select ***Properties***. The System Properties Window will appear. Select the ***Hardware*** Page.

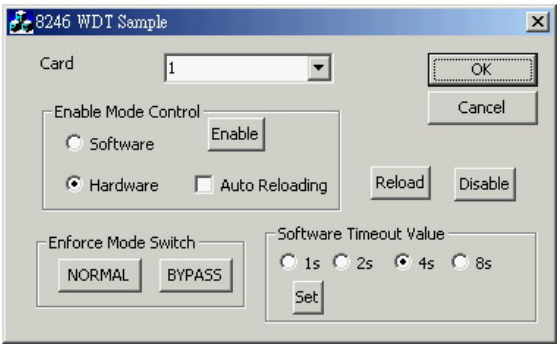


2. Click the ***Device Manager*** button. Click the *View* menu and select ***Show hidden devices*** to display Non-Plug and Play devices.



3. If ***Pci8246*** is listed then the driver is working.

The Visual C++ sample program located in <PCI-8246 WDT directory>\SAMPLE demonstrates the usage of the PCI-8246 WDT Windows Library.



3.5 Function Reference of WDT Library for Windows and Linux

WDT Functions Overview

WDT functions are grouped into the following classes:

- **General Functions**
  - GetCardCount
  - LanWdtSetTimer
  - LanWdtReload
- **Enable/Disable control**
  - LanWdtEnable
  - LanWdtDisable
  - LanWdtEnableReload
- **Mode Enforcement control**
  - LanWdtForceNormal
  - LanWdtForceBypass

Data Type

Type Name	Description	Range	C/C++ Type (for 32-bit compiler)
I16	16-bit signed integer	-32768 to 32767	Short
U16	16-bit unsigned integer	0 to 65535	unsigned short

Function Reference

GetCardCount

Prototype:

I16 _stdcall GetCardCount(void);

Description:

The GetCardCount returns the card count which are installed on the system. User can call this routine to determine how many PCI-8246 card are present.

Parameter:

No

Return Value:

The count of the 8246 cards

LanWdtSetTimer

Prototype:

I16 _stdcall LanWdtSetTimer(U16 card_number, U16 interval);

Description:

The LanWdtSetTimer can set the software timeout value and switch to Mode 2 (software timeout) for selected card.

Parameter:

card_number:

The index of card. On a single card installed system, always use '0'.

interval:

The timeout setting value. Only 1, 2, 4, 8 are vaild.

Return Value:

ERR_NoError, ERR_InvalidBoardNumber, ERR_OpenDriverFail, ERR_IoctlFail.

LanWdtReload

Prototype:

I16 _stdcall LanWdtReload(U16 card_number);

Description:

The LanWdtReload can reload/reset the counter on selected card. User should use this frequently to prevent watchdog timeout.

Parameter:

card_number:

The index of card. On a single card installed system, always use '0'.

Return Value:

ERR_NoError, ERR_InvalidBoardNumber, ERR_OpenDriverFail, ERR_IoctlFail.

LanWdtEnable

Prototype:

I16 _stdcall LanWdtEnable(U16 card_number);

Description:

The LanWdtEnable can enable watchdog function on selected card.

Parameter:

card_number:

The index of card. On a single card installed system, always use '0'.

Return Value:

ERR_NoError, ERR_InvalidBoardNumber, ERR_OpenDriverFail, ERR_IoctlFail.

LanWdtDisable

Prototype:

I16 _stdcall LanWdtDisable(U16 card_number);

Description:

The LanWdtDisable can disable watchdog function and switch to mode 0 (hardware timeout) on selected card.

Parameter:

card_number:

The index of card. On a single card installed system, always use '0'.

Return Value:

ERR_NoError, ERR_InvalidBoardNumber, ERR_OpenDriverFail, ERR_IoctlFail.

LanWdtEnableReload

Prototype:

I16 _stdcall LanWdtEnableReload(U16 card_number);

Description:

The LanWdtEnableReload can enable watchdog timer and reload/reset periodly the counter on selected card. This routine will set up a system timer and poll the watchdog automatically.

Parameter:

card_number:

The index of the card. On a single card installed system, always use '0'.

Return Value:

ERR_NoError, ERR_InvalidBoardNumber, ERR_OpenDriverFail, ERR_IoctlFail.

LanWdtForceNormal

Prototype:

I16 _stdcall LanWdtForceNormal(U16 card_number);

Description:

The LanWdtForceNormal can enforce the relay array into normal mode on selected card.

Parameter:

card_number:

The index of card. On a single card installed system, always use '0'.

Return Value:

ERR_NoError, ERR_InvalidBoardNumber, ERR_OpenDriverFail, ERR_IoctlFail.

LanWdtForceBypass

Prototype:

I16 _stdcall LanWdtForceBypass(U16 card_number);

Description:

The LanWdtForceBypass can enforce the relay array into bypass mode on selected card.

Parameter:

card_number:

The index of the card. On a single card installed system, always use '0'.

Return Value:

ERR_NoError, ERR_InvalidBoardNumber, ERR_OpenDriverFail, ERR_IoctlFail.

Functions Return Code

Status Code	Status Name	Description
0	ERR_NoError	No error occurred
-2	ERR_InvalidBoardNumber	The CardNumber argument is out of range (larger than 31).
-3	ERR_OpenDriverFail	Failed to open the device driver.
-6	ERR_IoctlFail	Failed to perform the IOCTCL on the device driver.

4

GbE Driver Installation

This section describes the LAN driver installation for the ***Intel® 82546EB*** onboard Ethernet controller. The relevant drivers are located on the *ADLINK All-in-One CD*:

1. Boot Windows 2000/XP/Windows Server 2003.
2. The driver is included in the driver CD. Run ***pro2kxp.exe*** under the following directory: ***X:\PCI\PCI-8246\Driver\82546EB\Win2kxp***
3. On the license agreement - read the license agreement. Click ***'I accept the terms in the license agreement'*** if you agree to continue.
4. Location to Save Files, click ***Next*** to save files in folder.

Warranty Policy

Thank you for choosing ADLINK. To understand your rights and enjoy all the after-sales services we offer, please read the following carefully.

1. Before using ADLINK's products please read the user manual and follow the instructions exactly. When sending in damaged products for repair, please attach an RMA application form which can be downloaded from: http://rma.adlinktech.com/policy/.
2. All ADLINK products come with a two-year guarantee
   - The warranty period starts from the product's shipment date from ADLINK's factory.
   - Peripherals and third-party products not manufactured by ADLINK will be covered by the original manufacturers' warranty.
   - For products containing storage devices (hard drives, flash cards, etc.), please back up your data before sending them for repair. ADLINK is not responsible for loss of data.
   - Please ensure the use of properly licensed software with our systems. ADLINK does not condone the use of pirated software and will not service systems using such software. ADLINK will not be held legally responsible for products shipped with unlicensed software installed by the user.
   - For general repairs, please do not include peripheral accessories. If peripherals need to be included, be certain to specify which items you sent on the RMA Request & Confirmation Form. ADLINK is not responsible for items not listed on the RMA Request & Confirmation Form.
3. Our repair service is not covered by ADLINK's two-year guarantee in the following situations:
   - Damage caused by not following instructions in the user's manual.
   - Damage caused by carelessness on the user's part during product transportation.
   - Damage caused by fire, earthquakes, floods, lightening, pollution, other acts of God, and/or incorrect usage of voltage transformers.
   - Damage caused by unsuitable storage environments (i.e. high temperatures, high humidity, or volatile chemicals).
   - Damage caused by leakage of battery fluid during or after change of batteries by customer/user.
   - Damage from improper repair by unauthorized technicians.
   - Products with altered and/or damaged serial numbers are not entitled to our service.
   - Other categories not protected under our warranty.
4. Customers are responsible for shipping costs to transport damaged products to our company or sales office.
5. To ensure the speed and quality of product repair, please download an RMA application form from our company website: http://rma.adlinktech.com/policy. Damaged products with attached RMA forms receive priority.

If you have any further questions, please email our FAE staff: service@adlinktech.com.