PCI

PC Watchdog™
Hardware User's Manual

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http://bkp-store.com/
http://www.berkprod.com/

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NOTE: Design Update Effective August 2009

There were two versions of the PCI watchdog. The original version was PN: 1130 that was a standard size PCI card for standard +5V PCI slots. The other one was a low profile version with a universal +5V/3.3V PCI interface. It was available as PN: 1134-STD with a standard bracket or PN: 1134-LPF with a low-profile bracket.

In August of this year the two were merged into a single product in a low-profile format. All the features of both cards are now included in the new version. No features have been excluded. Customers can still order the boards using either the 1130 or the 1134-xxx part numbers.

1. Introduction

The PCI PC Watchdog board is a short PCI card that is used to monitor a PC in order to ensure maximum system availability. The board has the following features:

- Watchdog timer that can be set from 5 seconds to 1 hour via DIP switch or 1 second to 18 hours via software control.
- Eight (8) I/O ports for enhanced watchdog control and monitoring.
- Two on-board relays (DPDT - 2 form C) can be programmed to generate a 4-5 second pulse or latch on continuously after a watchdog-initiated reset.
- Four (4) general-purpose digital inputs.
- Four (4) general-purpose digital outputs.
- Single 8 bit A/D input.
- External watchdog re-trigger digital input.
- Relay contacts and digital I/O signals available on standard DB-25 connector.
- There is a non-volatile memory for saving configuration data.
- Eight bytes of non-volatile memory reserved for user data to implement simple software protection
- Over temperature circuit monitors the internal temperature of the PC.
- Two temperature trip points.
- Trip points can be modified by user software.
- Audible alarm and external digital output for the temperature trip point.
- Programmable options allow the Watchdog to hold the PC in reset after the upper trip occurs.
- Two externally visible LEDs show status of watchdog board. One LED lights after first watchdog-generated reset as a visible indication that a watchdog reset occurred.
- An I/O port allows the user to gain exclusive control of one relay from a user program.
- Programmable power-on delay to allow the PC to complete its initialization sequence.

The latest versions of all manuals and sample code can be found on our site at:

http://bkp-store.com/   or http://www.berkprod.com/

If you have any questions, corrections, or feedback about this manual please contact us at:

http://www.berkprod.com/Other_Pages/Contact_Us.aspx

2.   Operation

This board is designed to monitor PCs used in critical applications such as: File Servers, Voice Mail Systems, ISP systems, industrial applications, etc. The idea is to make sure the PC is always available and running, especially systems that are not continuously monitored.

When the PC is powered up, or after a reset of the PC, the PC Watchdog will wait a preset amount of time (2.5 minutes standard) to allow the PC to complete its reset and initialization sequence. This time will be referred to as **P**ower-**O**n-**D**elay (**POD**). After this time has expired, the PC Watchdog will **Arm** itself and start a watchdog timer running (user defined time-out period) and then wait for a user program to access an I/O port or an external re-trigger signal.

If no activity is detected by the time the watchdog timer expires, the PC Watchdog will start its reset sequence on the PC.

When the PC Watchdog resets the PC it will turn on the bottom LED at the back of the board and leave it on. This provides an indication that at least one PC Watchdog reset has occurred, possibly more. There is also an I/O port that can be polled for a status bit that gets set after the PC Watchdog resets the PC. This allows an application program to determine the type of PC reset. A user program can write to a control port to clear the status bit and the LED.

The PC Watchdog will also activate the two relays to indicate the reset. The options allow pulsing the relays for 3-4 seconds after each reset or latching them on after the first reset. The relays can be reset from software. There is also a software option to allow the operation of one relay to be inverted. The contacts are **DRY** closure type.

The temperature circuit on the board will monitor the internal temperature of the PC. There are **two** standard temperature trip points available: **46°C** (115°) and **56°C (**133°F). At the first trip point the PC Watchdog board will activate one of the relays if the option is selected. It will also activate an audible alarm and an external signal that is available on the DB-25 connector. At the second trip point the PC Watchdog can optionally pull a hard reset on the PC to stop further processing.

There is an option to allow shifting the trip points higher via software control. The trip points can be increased in **1°C** increments up to **77°C (**171°F) and **87°C** (189°F).

3.   DIP Switch Options

There is an eight-position DIP Switch at the top of the board to program the operation of the watchdog board for all types of operation. The switch options are:

Switch	Description
1	Relay #1 Temperature Mode
2	Relay #1 Mode
3	Relay #2 Mode
4	Temperature Reset Enable
5	Power On Delay (POD)Extend
6-8	Watchdog Delay Time

The switches are considered **ON** when the switch is **UP** or **ON**. The switch is considered **OFF** when the switch is **DOWN** or **OPEN**.

3.1   Switch #1 - Relay #1 Temperature Mode (RTM)

ON - activate RELAY #1 when the temperature exceeds the lower trip point (default is 115°F). The mode of operation of RELAY #1 is determined by switch #2. If the temperature drops back below the trip point and then goes above it again, Relay #1 will generate another pulse if it is programmed by switch #2 for pulse mode.

OFF - ignore temperature.

3.2   Switch #2 - Relay #1 Mode (R1M)

ON - RELAY #1 will latch on after a watchdog trip (or a temperature trip if switch #1 is on). The PC will have to be powered down or the PC push-button reset will be needed to clear the relay state. A user program can also turn off the relay.

OFF - RELAY #1 will pulse for 4-5 seconds after a watchdog trip (or a temperature trip if switch #1 is on).

Note: The operation of this switch and Relay #1 can be inverted by a software option.

3.3   Switch #3 - Relay #2 Mode (R2M)

ON - RELAY #2 will latch on after a watchdog trip. The PC will have to be powered down or the PC push-button reset will be needed to clear the relay state. A user program can also turn off the relay.

OFF - RELAY #2 will pulse for 4-5 seconds after a watchdog trip.

Note: A user program can take exclusive control of this relay if required.

3.4   Switch #4 - Temperature Reset Enable (TRE)

ON - this will allow the PC Watchdog to reset the PC and HOLD it in reset whenever the upper temperature trip point occurs point (default is 56°C). When the PC is held in reset the CPU and other functions will stop and some disk drives will even spin down and stop. This may slow or stop the continued temperature rise. If the temperature drops to 4°C above the lower trip point then the watchdog will release the reset on the PC.

OFF - do not reset the PC at the second trip point. The buzzer will change sound to indicate the second trip.

3.5   Switch #5 - Power-On-Delay (POD) Extend

ON - In this mode the watchdog board will first wait 2.5 minutes (150 seconds) after resetting the PC, or after a power on. However, after this delay time it will then wait until it sees the first re-trigger from a temperature read or the external input. Then it will arm itself. See section 8 for changing the 2.5 minute delay.

OFF - watchdog board will wait 2.5 minutes (150 seconds) after resetting the PC, or after power on, before it Arms and starts its internal watchdog timer.

** NOTE ** - Be Careful with this switch. If it is on and the PC locks up during reset then the board would not get "tickled" since no program would load. This would leave the PC permanently frozen. A better option is store a longer POD time in non-volatile memory. Or use configuration program to set a longer time.

3.6   Switch #6-8 - Watchdog Delay Time

These switches set the delay time until the watchdog resets the PC. As long as the watchdog is receiving re-trigger pulses it will continue to reset the delay time. The settings and times are shown below:

Switches 6-8	Delay Time	Switches 6-8	Delay Time
OFF-OFF-OFF	5 Seconds	ON-OFF-OFF	5 Minutes
OFF-OFF-ON	10 Seconds	ON-OFF-ON	10 Minutes
OFF-ON-OFF	30 Seconds	ON-ON-OFF	30 Minutes
OFF-ON-ON	1 Minutes	ON-ON-ON	1 Hour

These times can be overridden with other delays by a user program.

4.   Installation

Perform these steps to install the board in your computer:

A. Power down the computer and remove the cover.
B. Minimize static buildup by touching the frame of the PC or the power supply case to ensure all static electricity is discharged to ground.
C. Find an empty PCI slot and remove the back cover plate from the PC. Save the screw from the cover plate.
D. Make sure the board has been properly configured with the switches.
E. Pay close attention to the alignment of the board and the I/O slot of the PC as you insert the board into the slot.
F. Install the screw in the bracket on the back panel.
G. Remove the front panel reset cable from the motherboard and install it at J2 on the watchdog board. Ignore this step if your PC does not have a front panel reset cable.
H. Install the enclosed cable from J1 on the watchdog board to the reset header on the motherboard. **- OR -**
I. If you are using an ATX Reset Adaptor then connect to reset cable from J1 on the PCI board to the two (2) pin header on the ATX Adaptor.
J. Replace the cover on the PC and apply power.
K. The top LED on the watchdog board should start to flash after power has been applied.

4.1   Driver Installation

As of Feb 15, 2011 there are now all new drivers for the PCI PC Watchdog that support 32 and 64 bit versions. The old drivers are still on the CD if you need to use them. They can be found in a .ZIP file:

Drivers\PN1130_PCI_Win32-64__Archive\Old_PCI_Win32.zip

The new drivers now have a preferred method of install as well as an older XP style. See the next two sections.

NOTE: The CD has a program to tickle the Watchdog without having to write any software. See the BPI_WDog_Tickle directory on the CD for a "tickle" program that can be setup to install automatically.

4.1.1 Preferred Driver Installation Method

When you power up the PC you *may* get a found new hardware screen (depends on Windows version). Ignore this screen and just click the cancel button. Put the CD in the drive and navigate to the following directory depending on your version of windows:

32 Bit Versions: Drivers\PN1130_PCI_Win32-64\i386
64 Bit Versions: Drivers\PN1130_PCI_Win32-64\amd64

Run the program dpinst.exe. It will install the driver and it will put an entry in the Ad_Remove Programs in Control Panel to allow removal of the driver.

If the driver installs OK you should see a final window like this one:
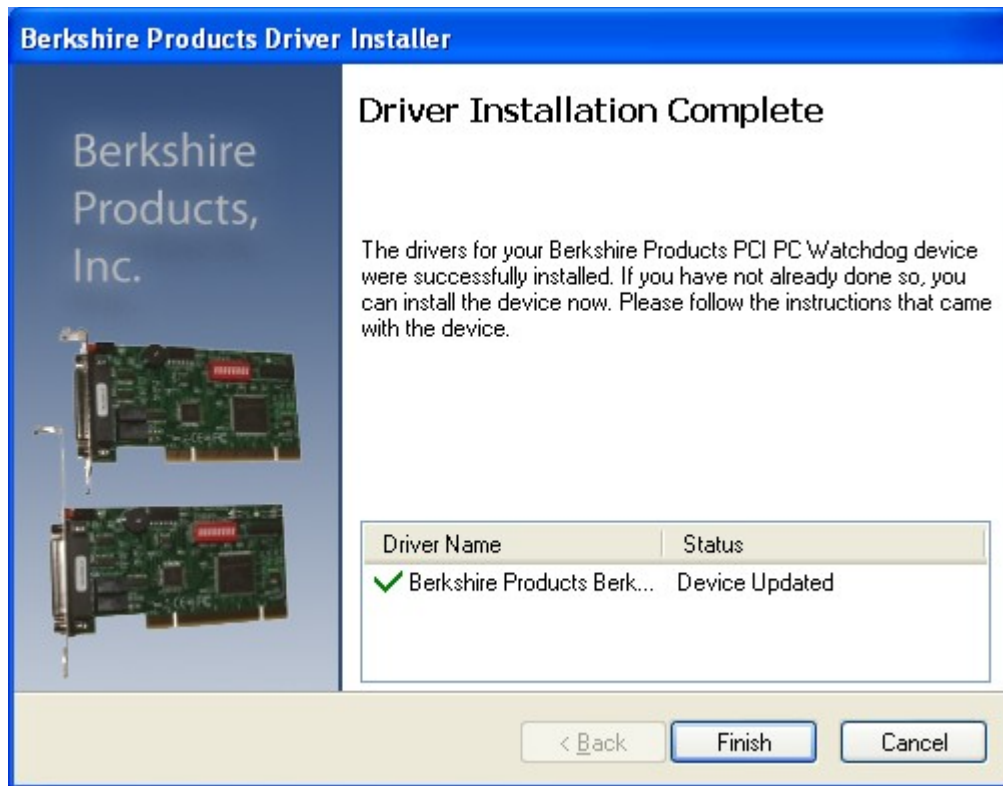
You may be required to restart the computer before the changes go into effect.

4.1.2 XP Style Installation (Not Recommended)

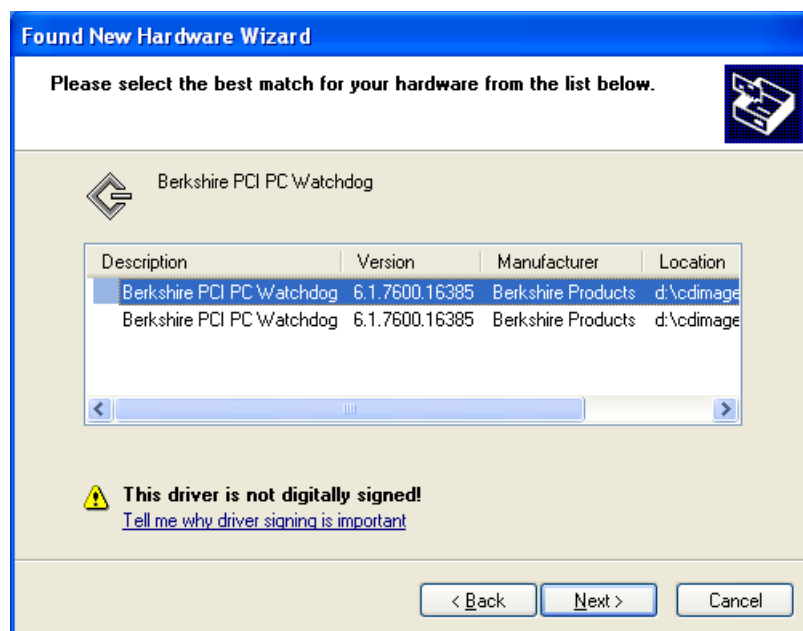When you power up the PC you *may* get a found new hardware screen (depends on Windows version) such as this one from Windows XP:

Make sure the CD is in the PC drive and click next to allow Windows to find the driver files.

If you get a window like this – make sure you select the proper driver for your version of Windows, 32 or 64 bit.

5. Connectors

This section covers the internal and external connections to the board.

5.1 J1 & J2 - Reset Headers

There are two headers on the upper right corner board label **J1** and **J2**. The reset cable from the front panel reset switch should be removed from the motherboard and connected to **J2**, which is labeled **Reset Switch** for the push-button switch. The orientation of this cable on the header is not critical.

The enclosed cable that came with the board should be connected from **J1** (labeled **Reset To CPU**) to the reset header on the motherboard or the 2-Pin header on the ATX Reset Adaptor. Orientation of this cable on the headers is not critical either.

These cable connections must be done correctly for proper operation of the watchdog. From now on when you press the front panel reset button on the PC it will reset the watchdog board as well as the PC.

5.2 P1 - DB-25 Connector

The DB-25 connector provides access to the watchdog circuits. Be sure that you take appropriate anti-static precautions before making connections. The pin definitions are:

1	+5V	14	Relay #1 - COM-2
2	Relay #1 - COM-1	15	Relay #1 - NC-2
3	Relay #1 - NC-1	16	Relay #1 - NO-2
4	Relay #1 - NO-1	17	Relay #2 - COM-2
5	Relay #2 - COM-1	18	Relay #2 - NC-2
6	Relay #2 - NC-1	19	Relay #2 - NO-2
7	Relay #2 - NO-1	20	Temperature Trip
8	A/D Input	21	External Trigger
9	Digital Output 0	22	Digital Input 0
10	Digital Output 1	23	Digital Input 1
11	Digital Output 2	24	Digital Input 2
12	Digital Output 3	25	Digital Input 3
13	GROUND		

5.3   P1 - DB-25 Connector – (Old Low Profile PCI)

This table is included for reference for those customers with the original Low Profile version of the board. The original Low Profile PCI PC Watchdog only had a subset of the connections on the DB-25 connector. The pin definitions are:

1		14	
2	Relay #1 - COM	15	
3		16	
4	Relay #1 - NO-1	17	Relay #2 - COM-2
5	Relay #2 - COM-1	18	Relay #2 - NC-2
6	Relay #2 - NC-1	19	Relay #2 - NO-2
7	Relay #2 - NO-1	20	Temperature Trip
8		21	External Trigger
9	Digital Output 0	22	Digital Input 0
10	Digital Output 1	23	Digital Input 1
11		24	
12		25	
13	GROUND		

Note: Use a shielded cable to connect to this port. Connect the cable shield to pin 13. This will help attenuate any RFI from this port.

5.3.1   Power & Ground

Limited power is available on pin 1 on the standard PCI PC Watchdog. The +5V line is protected with a 100mA re-settable fuse. *Do not attempt to defeat this device.*

5.3.2   Relay Contacts

These contacts on pins 2-7 and pins 14-19 come from relays on the PCI PC Watchdog board. Do not switch more than **24 Volts** or **0.25 Amps** with these contacts!

5.3.3   Temperature Trip Output

The trip signal on pin 20 is an open collector darlington transistor output that will be in the off or high impedance state when the temperature is below the lower trip temperature. When the temperature exceeds the lower trip point, this pin will go low to about +0.8V. Do not switch more than **+5 Volts** or **25 milli-Amps** with this output!

5.3.4   External Trigger Input

This pin (21) expects a TTL (0-5V level) input signal. This signal should toggle faster than the watchdog timeout period. The rising edge is the active re-trigger signal. The signal should remain high and low for a minimum of 2.5 μS. This input has the same electrical characteristics as the digital inputs (section 5.3.6).

5.3.5   Digital Outputs

These signals on pins 9-12 come from open collector drivers with a 1.0K pull-up resistor. Do not switch more than **+5 Volts** or **15 milli-Amps** with these outputs! If you switch an inductive load (relay) then you must supply a protection diode as well.

5.3.6   Digital Inputs

These inputs on pins 22-25 accept TTL level inputs only. A high level should be greater than +2.0V and a low level should be less than +0.8V. Under no circumstances should inputs exceed +5.0V or drop below ground. The inputs have a 1.0K pull up resistor (to +5.0V) so you can use a dry contact switch to pull the input low.

5.3.7   A/D Input

This input is connected to the CPU via a 10K series resistor with diodes to VCC and ground for protection. It is not a high accuracy input! The A/D input level can be between ground and VCC (+5V) of the PC.

6.   LEDs and Buzzer

6.1   External LEDs

There are two LEDs on the back of the board. After the PC powers up the PC Watchdog will wait a programmed amount of time, Power-On-Delay (**POD**), before it enters its watchdog armed mode. During this time the top LED will pulse at a 1 second rate (1 second on, 1 second off). As shipped the POD time is 2.5 minutes.

When the PC Watchdog is ready and armed it will start flashing the top LED at a ½ second rate as an indication that it is running OK. When the watchdog is within 4 seconds of resetting the PC it will flash this LED at a 1/10 second rate.

If the watchdog board resets the PC, the top LED will return to its one second toggle rate while it waits again for the PC to undergo a new reset sequence. When this occurs, the bottom LED will be forced on. The LED can be cleared by cycling power on the PC, pressing the front panel reset button, or by a user program.

6.2   D1 - Watchdog Trip

This SMT LED in the upper left corner of the board will emit a short pulse whenever the watchdog board receives a re-trigger pulse as the result of I/O activity or a re-trigger signal from the external input. If the I/O activity is too frequent, the LED will appear to be on continuously.

When the board powers up (or after a PC reset) the trip LED will flash for about 1 second if there are any problems detected on the board. The LED will flash once for ¼ second if the board is working correctly.

6.3   Buzzer

There is a buzzer installed on the board in the upper left corner. When the first temperature trip occurs the buzzer will beep. When the second trip point occurs the buzzer will be on continuously. The buzzer will sound briefly when the board resets the PC and when the board powers up. If the board has a power up problem it will emit another long 1 second beep in sync with the trip LED.

There are buzzer options in the supplied DLL and the BPI_WDog_Config program that allow you to disable the buzzer and change the length of time it sounds at reset.

7.   Watchdog Programs, Drivers and API

In April of 2010 all the software for the PC Watchdogs is now common. That means the programs and DLL will work with all versions of PC Watchdogs.

7.1   BPI_WDog_Config Program

This program is in the BPI_WDog_Config directory of the CD along with its manual. It is in a .msi file that will install it automatically. You can use this program to test the watchdog and configure the non-volatile (**NV**) memory options.

7.2   BPI_WDog_Tickle Program

This program is for users who do not want to write their own applications or install watchdog support in their current application. It is in the BPI_WDog_Tickle directory on the CD as a .msi file that will install it automatically. It is used to "tickle" the watchdog and keep it from resetting the PC until the PC actually freezes.

7.3   Drivers

Any drivers that your board may need are on the Drivers directory on the CD.

7.4   DLL & Sample Code

The new DLL for all the watchdogs is called Wdog_Univrsl.dll. Sample code (and the DLL) is provided on the CD for C & C++ in the Wdog_Univrsl_ConsoleAp directory. There is also sample code for VB.net in the VB_NET_DLL_Sample directory.

7.5   Web Site Downloads

The latest versions of sample code, DLL, Documents, etc can be found on our site at:

  http://bkp-store.com/ or http://www.berkprod.com/

These downloads are ZIP files of the current CD image, Make sure you unzip them with the option to preserve directory structure.

8.   Original Distribution Files

The original files that were shipped with this PC Watchdog are still on the CD under the main directory: x_OriginalArchive_WDog_Files. These are provided for continuing support for prior users. New users should not use these since they are no longer supported and will not be updated.

9.   Appendix A - Specifications

Bus Type:	32 Bit Universal +3.3 or +5.0V PCI & PCI-X (not Express)
Power:	+5V - 350mA Max.
Environmental:	-25 - 70°C Operating -25 - 80°C Storage 5-95% Relative Humidity - Non Condensing
MTBF:	500,000 Hours
Relays:	24 Volts @ 0.25 Amp Max.[1] 250,000 Closures Minimum
Temperature:	Basic Accuracy = ±2.5°C Trip Point Accuracy = ±3.0°C

1. The Relays should not switch more than +24V. The creepage limits imposed by trace spacing on the board will not allow higher voltages. Switching higher voltages could result in damage to the board, damage to the PC, or risk electrical shock.

10.   Appendix B - Warranty

Berkshire Products, Inc. warrants to the original consumer or other end user purchaser that this product is free from defects in materials or workmanship for a period of one (1) year from the date of purchase. During the warranty period, and upon proof of purchase, the product will be repaired or replaced (with the same or functionally equivalent model) at our option, without charge for either parts or labor.

This warranty does not apply to defects due directly or indirectly to misuse, abuse, negligence, accident, repairs or alterations made by the customer or another party.

UNDER NO CIRCUMSTANCES WILL BERKSHIRE PRODUCTS, Inc. BE LIABLE IN ANY WAY TO ANY PURCHASER FOR DAMAGES, LOST REVENUE, LOST WAGES, OR ANY OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THIS PRODUCT.

Berkshire Products, Inc. reserves the right to make modifications in this product without prior notification.

11. Appendix C - Service and Tech Support

We are available to help you with your questions and problems that you may have with our product. Our technical support is available:

Monday through Friday (except holidays)
8:30 AM to 5:00 PM (Eastern Time)
770-271-0088

Email: support@berkprod.com

11.1 Calling Tech Support

To help our tech support personnel with your problem, please try to have the following information ready:

- Type of PC
- Type of operating system and version
- Other peripheral boards in the PC
- Clear description of the problem

11.2 Product Returns

Please call our tech support personnel before returning a product. Many times the problem can be corrected over the phone. If the tech support representative determines that your product must be returned, they will assign you a **RMA #.**

Package the product in a secure container and return it to us freight prepaid. We will not accept COD freight charges! Indicate the **RMA #** on the package or shipping label.

If the repairs are done under warranty the unit will be returned FedEx ground rate and we will pay the freight charges. If you prefer faster a Federal Express service, please provide your Federal Express account number.

If your unit is out of warranty, repairs and shipping will be charged COD or other method established in advance.

12. Appendix D - Agency Approvals

The PC Watchdog meets the following agency approvals.

12.1 FCC - Class A

This equipment generates and uses radio frequency energy and if not installed and used properly, that is in strict adherence with the manufacturer's instructions, may cause interference to radio and television reception. It has been tested and found to comply with the limits for a Class A computing device in accordance with the specifications in Subpart J of Part 15 of FCC rules, which are designed to provide reasonable protection against such interference in a commercial installation. If this equipment does cause interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient the receiving antenna.
- Relocate the computer with respect to the receiver.
- Move the computer away from the receiver.
- Plug the computer into a different outlet so that the computer and receiver are on different branch circuits.
- Consult the dealer or an experienced radio/TV technician for help.

12.2 CE

The PC Watchdog has successfully passed all appropriate tests that are necessary for its certification under EMC directive 89/336/EEC. The following tests were done:

EN 50881-1:92	Generic emission requirements
EN 55022	Radiated and conducted emissions
EN 50082-1:97	Generic immunity requirements
EN 61000-4-2	Electrostatic discharge (ESD)
EN 61000-4-3	Electronic fast transient / burst
EN 61000-4-5	Surge
EN 61000-4-6	Conducted RF
EN 61000-4-8	Magnetic field
EN 61000-4-11	Voltage dips