# Ethernet - USB
# PC Watchdog™
# Hardware Manual

**BERKSHIRE PRODUCTS, INC.**

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# 1. Introduction

The Ethernet USB PC Watchdog is a device that is used to monitor a PC in order to ensure maximum system availability. If the PC locks up or becomes unresponsive the board will restart the PC. It has the following features:

- Connects to a PC USB port or to a **powered** hub on a PC running 2000, XP, Vista or Linux.
- Receives power from USB bus.
- 10/100 Ethernet port supports a fixed IP, user defined, or DHCP address.
- Watchdog timer that can be set from 5 seconds to 1 hour via DIP switch or 1 second to 18 hours via software control.
- Monitors the PC USB bus for activity or communication "tickles".
- Monitors the Ethernet port for activity via UDP for communication "tickles".
- Status information available with http interface for web browser.
- Optionally monitor an external digital input for "tickle" activity.
- Status Information available from the USB or Ethernet ports.
- Audible alarm for watchdog timeout re-boots.
- Can be used right from the box without any support programs with supplied monitor / "tickle" program.
- Has an on-board temp sensor to detect fan failures or other over-temp conditions.
- Two temperature trip points for alarm sound and reset of PC.
- Trip points can be modified by user software.
- Programmable options allow the Watchdog to hold the PC in reset after the upper temperature trip occurs.
- Two externally visible LEDs show status of Watchdog (only with Standard bracket).
- Watchdog has a second relay available on an external jack to control other devices such as audible alarms or security alarm panels.
- Board has two user inputs – one digital input and one analog input.
- Programmable power-on delay to allow the PC to complete its initialization sequence.
- Non-Volatile memory to store operating parameters.
- Cables available to connect to external or internal motherboard USB ports.
- Three mounting holes available for internal or custom mounting.
- Meets the MD1 spec for a low-profile board.

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

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

After power-up or a push-button reset the watchdog will perform an initialization sequence where it connects to the USB port and sets up the Ethernet port. The dip switches allow different Ethernet IP configurations.

After the power up, or after a reset of the PC, the Watchdog will wait 2.5 minutes (shorter or longer times allowed in via programming) before it arms itself. This time is called the Power-On-Delay time or **POD**. This allows the PC to complete its reset and initialization sequence. There is a dip switch option to allow the Watchdog to extend this time for PCs that need additional re-boot time.

Once the Watchdog is ready to arm itself it will check the dip switches and load a value into its countdown timer. There are software options available to override the dip switches with custom time values. If no activity is detected from the USB or Ethernet port (or optional digital input) by the time the Watchdog timer expires, the PC Watchdog will start its reset sequence on the PC.  As long as activity is present (board "tickled") the watchdog will continue to reload the countdown timer.

The watchdog also monitors the temperature and looks for two temperature trip points. These trip points can also be modified by software. At the first trip point it begins sounding a buzzer that beeps. The duration of the beeps increases as the temperature goes. At the upper trip point the buzzer will be on solid. A dip switches is provided to set the temperature mode. If the switch is on then the watchdog will assert the reset to the PC when upper trip is exceeded. This will stop the CPU, hard drives, etc and allow the PC to cool down, at which point the watchdog will allow the PC to restart.

The two LEDs on the Watchdog bracket are used for status indication. The top LED provides the arming status of the Watchdog by varying the rate at which the LED flashes. When the Watchdog resets the PC it will turn on the bottom LED and leave it on which provides an indication that at least one Watchdog reset has occurred, possibly more. The PC can turn this LED off via software and also get a count of the number of resets that have occurred. The bottom LED will also flash (on or off) once per second for a tenth of a second if the Watchdog timer is "tickled" in the prior second.

*Note: If you stop your application program or you reset the PC with CTL-ALT-DEL, then be sure to disable the Watchdog by unplugging the reset cable or remove power by disconnecting he USB cable. Otherwise it may count down and reset your PC at an inopportune time!*

# 3. Dip Switch Settings

All the switches are read at power up and after each time that the Watchdog resets the PC. A switch that is **DOWN** is **OFF** and a switch that is **UP** is **ON**. The following sections cover the switch options.

| Switch | Description |
|--------|-------------|
| 1-2 | Ethernet Mode |
| 3 | Disable Buzzer |
| 4 | Temperature Reset Enable |
| 5 | Power On Delay Extend |
| 6-8 | Watchdog Delay Time |

## 3.1 Ethernet Mode Switches - SW1 & SW2

These two switches set the Ethernet operating mode of the Watchdog. See the next section for more information on the settings

## 3.2 Switch #3 - Buzzer Disable

If this switch is on the buzzer will be disabled.

## 3.3 Switch #4 - Over- Temp Reset

If this switch is on then the Watchdog will reset and hold the reset on a PC during an over-temp condition. The first trip point is **46**°C (115°F) at which point the buzzer will start to sound. The second trip point where the Watchdog can reset the PC is **56**°C (133°F). If the Watchdog resets the PC, it will remain in reset until the temperature drops back below **50**°C (122°F). There is a software 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).

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

After a power up or a PC reset the Watchdog normally waits 2.5 minutes (see programming manual for changing this time) to allow the PC to re-boot. Sometimes the PC will require more than 2.5 minutes to complete the re-boot, which can be accommodated by turning on this switch.

In this mode the Watchdog will delay starting the timeout counter after the **POD** time until it gets the first "tickle" communications from the Ethernet or USB ports. It will ignore tickles from the digital input since it might be a free running signal.

*Note: If the PC does not complete the re-boot process correctly, then this option can disable the Watchdog as well as leave the PC frozen since the watchdog would never get the first "tickle" from the USB port. If you think you may need more time then increase the POD value with the non-volatile memory option described in the programmers manual.*

## 3.5  Switches #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 or a non-volatile memory option.

## 4. Ethernet Dip Switch Settings

These two switches allow four options for the Ethernet interface:

| Switch 1-2 | Ethernet Mode |
|---|---|
| OFF - OFF | Disabled |
| OFF - ON | Fixed IP |
| ON - OFF | User non-volatile memory IP |
| ON - ON | DHCP |

Note that there is an option in the USB side DLL to override the Ethernet DIP Switch options.

## 4.1 Disabled

This option completely disables the Ethernet port. If you plan to use your own fixed IP addresses stored in the non-volatile memory then start with this setting until you can get your values stored.

## 4.2 Fixed IP

This option sets the Ethernet interface to the following fixed IP addresses:

    IP Address:    192.168.1.60
    Subnet Mask:  255.255.255.0
    Gateway:       192.168.1.1

## 4.3 Non-Volatile Memory

This option sets the Ethernet interface to fixed IP addresses that you store in the non-volatile memory. See the Programming manual for more information. *Make sure you have put a valid set of addresses in the non-volatile memory before using this option!*

## 4.4 DHCP

This option allows the Ethernet interface to get its IP addresses from a DHCP server if one is available on your network.. The board will ID itself to the DHCP server as "BPWdg???" where the ??? will match the last three hex digits of the MAC address and may be non-printable characters.

**Note:** Once an IP address has been set the board will respond to pings.

# 5.  Hardware Installation

The standard Watchdog package contains the following items:

- The Ethernet USB PC Watchdog timer on a standard or low-profile PC I/O bracket.
- An external or internal USB interface cable.
- A CD-ROM.
- A reset cable

The user needs to provide their own Ethernet cable since distances to the nearest hub can vary widely.

## 5.1  Installation of Supplied Components

Perform these steps to install the Watchdog:

- Locate an unused I/O slot in the PC. Remove the blank bracket and install the Watchdog.
- Make sure the Dip switches are set properly before applying power to the Watchdog since it only checks the switches at power up and after each reset of the PC.
- Disconnect the PC reset cable from the motherboard. Plug this cable onto the **J2**  header labeled **Reset SW** in the upper right corner of the Watchdog board. *When the PC reset pushbutton is pressed it will now reset the PC and the watchdog board.*
- Plug the supplied reset cable onto **J1** labeled **CPU Reset** on the Watchdog board and plug the other end onto the original reset header on the motherboard or on the 2 Pin header on the **ATX Reset** A**dapter** for a PC without a reset header.
- Connect the USB cable to Host port on the PC or a port on a powered hub. Connect the other end of the cable to the Watchdog. ***A non-powered hub will not work because of the current requirements for this board.***
- Or connect the internal cable to **J5** behind the external USB jack and to a USB header on the motherboard.

## 5.2 Internal USB Installation Notes

The internal cable with the four pin single row receptacle at each end is used to connect to the motherboard header, **J5**, right behind the main USB jack.. Pin 1 (+) is the RED wire. The red wire should connect to the Plus (+) terminal on the motherboard header and Pin 1 (+) on the board.

This header is located directly behind the standard USB connector on the board. The pin-out of the header is:

| + | 1 |
|---|---|
| D- | 2 |
| D+ | 3 |
| G | 4 |

*Do not reverse the cable – damage could be done to the Watchdog or the motherboard.*

*Do not use the regular USB cable if using the motherboard header connection.*

The bracket can be removed from the board for internal mounting in a PC cabinet. The bracket is attached to the board at the two stereo jacks. There are three mounting holes (0.125" / 3.18mm diameter) available on the board. And there is a mechanical PDF drawing on the CD that provides the dimensions for the holes.

## 5.3  Auxiliary Relay Jack

There is a second set of relay contacts are on the 1/8" (3.5mm) stereo jack, **J3**, on the bracket  The two relay contacts are on the inner two contacts of the jack (Tip & Ring). The sleeve of the jack is grounded through its connection to the bracket. This relay can be controlled by software. These dry contacts can switch a maximum of 24 volts and 250 mA. Do not exceed these ratings.

A good source for the plug to use with this jack is the Radio Shack PN: 274-869. Another option is to get a 1/8" (3.55mm) extension cable from Walmart, Best Buy, etc and cut off one end. Strip back the insulation and use the two inner conductors.

## 5.4  Input Jack

There is second 1/8" stereo jack, **J7**, on the board that is used for the two inputs. The Tip of this plug is the analog input and it can provide an 8 Bit value based on inputs between 0.0 and +3.3 Volts. Do not exceed these values on the input. The second input is the digital input on the Ring portion of the connector and it can handle a range of 0.0 to +5.0 Volts. This input can also be used to "tickle" the watchdog on rising edges with a non-volatile memory option. Both the inputs can read from user software. The sleeve is connected to ground.

NOTE: The Digital Input has a 10K pull-up resistor so it idles High. This means that you can pull the input low with a dry contact closure such as a relay.

# 6. Windows Software Installation

The first time the board is plugged into the USB port Windows will show a window about new hardware found. Insert the CD in the drive and let Windows automatically find and install the drivers for the FTDI USB chip on the board.

If the install is successful the device manager screen for Universal Serial Bus controllers should have an entry for USB Serial Converter and the Properties should look like:
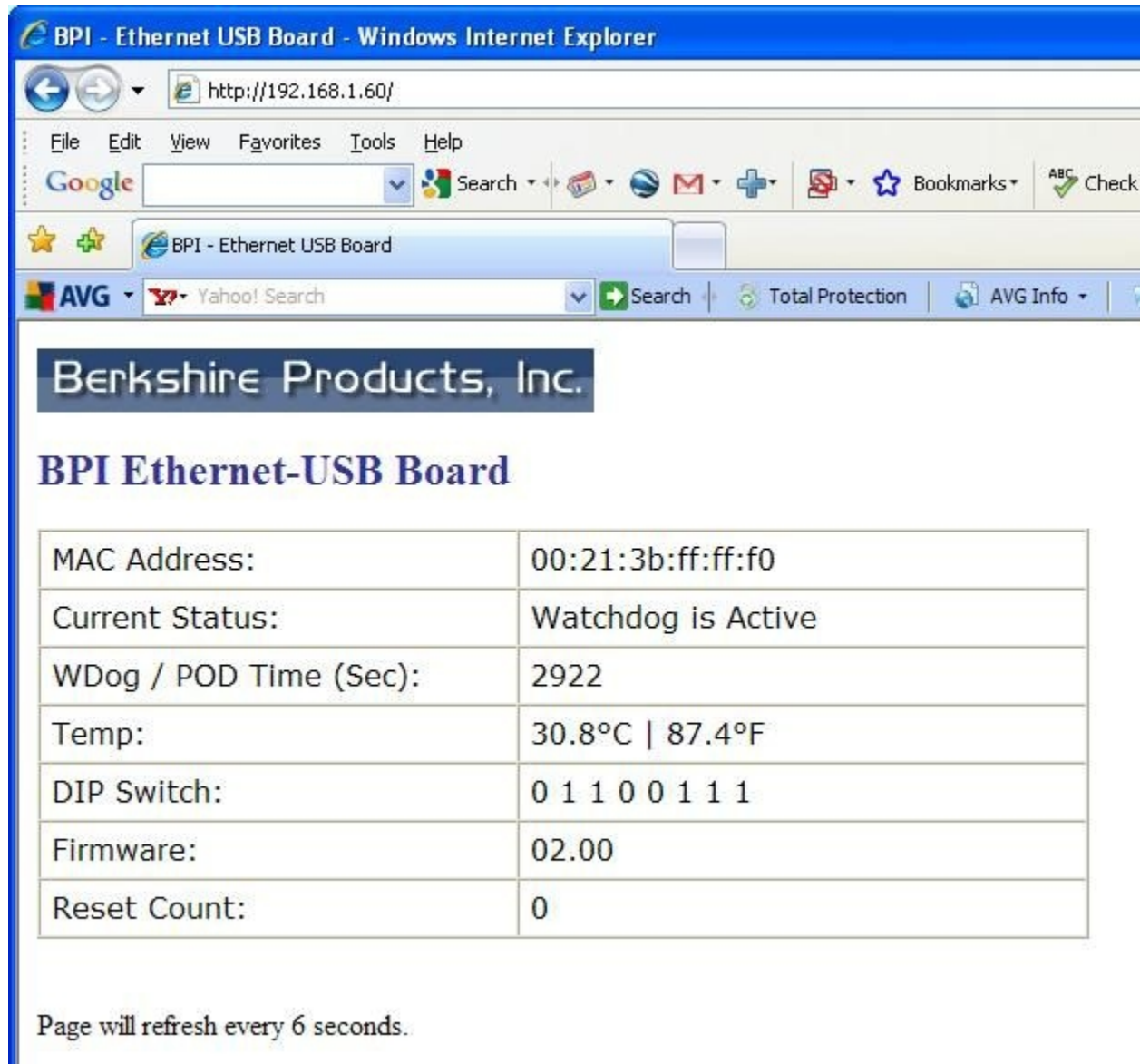


Note that this screen shot is from Windows XP and may look different for other versions of Windows. Note that the Location info is: **ETH_USB Wdog**.

If you need to manually remove the drivers there is a program called FTClean.exe on the CD in the drivers subdirectory.

## 7. Web Browser Status Page

Once an IP address has been assigned you can use a web browser to get some info from the board. This option requires that the board have version 2.xx or higher firmware. The example below shows what the status page looks like if the board has a fixed IP address of: 192.168.1.60.



Notes:
- Future revs of firmware may show more or less info then this example.
- The web page is temporarily unavailable during the few seconds that the board is resetting the PC after a watchdog timeout.

# 8. LEDs and Buzzer

## 8.1 Dual LEDs

There are two LEDs in a vertical mount 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 arms itself and starts the watchdog mode. During this time the top LED will pulse at a 1 second rate (1 second on, 1 second off).

When the PC Watchdog is ready and armed it will start flashing the top LED at a 350 milli-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. This LED can be cleared by cycling power on the PC, pressing the front panel reset button, or by a user program.

If the watchdog board is receiving re-triggers ("tickles") from the USB, Ethernet, or external digital input then it will flash the bottom LED for 1/10 of a second once each second. If the LED is on because of a reset, the flash will be inverted and the LED will flash off for 1/10 of a second. Note that this LED will not flash during the **POD** time if it gets "tickle" events.

## 8.2 SMT USB Comm

This surface mount LED is located at the top of the board. This LED will come on when the USB port has been activated and the board is talking to the PC. It will also flash to indicate USB communications activity with the PC or when the USB bus is in suspend mode when the PC reboots. During FLASH downloads this LED will be on while blocks of data are being sent via the USB bus.

## 8.3 SMT ETH Comm

This surface mount LED is located at the top of the board. This LED will come on when the Ethernet port has been activated (IP assigned). It will also flash to indicate Ethernet communications activity with the PC or when the USB bus is in suspend mode when the PC reboots . During FLASH downloads this LED will be on when the on-board CPU is writing a block of data to flash memory.

## 8.4  Buzzer

There is a buzzer installed on the board. 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. There is a dip switch setting to completely disable the buzzer.

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.

# 9. 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.

## 9.1 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.

## 9.2 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.

## 9.3 Drivers

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

## 9.4 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.

## 9.5 Web Site Downloads

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

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.

# 10. 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.

# 11. Appendix A - Specifications

**Power Requirements**:  +5 VDC - 250mA Max (Supplied by USB)

**Environmental:**           -20 - 65°C Operating
-20 - 70°C Storage
5-95% Relative Humidity - Non Condensing

**MTBF:**                        500,000 Hours

**TEMP:**                        ± 2.0°C (on board temp sensor)

Note: You may find that the board will continue to work just fine beyond the specified temperature limits, especially at lower temperatures. These temperature limits are those specified by the manufacturers of the integrated circuits.

**Auxiliary Relay:**          SPST (1 form a)  - 24V @ 0.25A max (250mA)

This relay has contacts that are available on the 1/8" (3.5mm) Stereo jack below the two vertical LEDs. The tip of the plug is one relay contact and the ring (second terminal on the plug) is the other relay contact. The major or last conductor (sleeve) of the plug is ground and is connected to the PC bracket.

## 12. 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.

# 13. 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

## 13.1 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
- Clear description of the problem

## 13.2 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 UPS ground and we will pay the freight charges. If you prefer Federal Express, 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.

# 14. Appendix D - Agency Approvals

The PC Watchdog meets the following agency approvals.

## 14.1 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.

## 14.2 CE

The Internal Serial PC Watchdog has successfully passed all appropriate tests that are necessary for its certification under EMC directive 89/336/EEC.