

USB PC Watchdog™ Hardware Manual

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1. Introduction

The USB PC Watchdog is an internal device that is used to monitor a PC in order to ensure maximum system availability. It has the following features:

- Connects to USB port on a PC running Win98, ME, 2000, XP, Vista, Win7 including 64-Bit versions.
- Receives power from USB bus.
- 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 line activity in the passive mode.
- Can be used right from the box without any support programs.
- Has an on-board temp sensor to detect fan failures or other over-temp conditions.
- Two temperature trip points.
- Trip points can be modified by user software.
- Audible alarm for the temperature trip point.
- Programmable options allow the Watchdog to hold the PC in reset after the upper trip occurs.
- Also has an active Mode that allows a user program to have additional control over the Watchdog.
- Two externally visible LEDs show status of Watchdog.
- Watchdog has a second relay available on an external jack to control other devices such as triggering an alarm panel.
- New Rev-C version has user available digital input for 0.0 to +5.0 inputs.
- Digital input that can be used as external watchdog “tickle” or for edge detection.
- Programmable power-on delay to allow the PC to complete its initialization sequence.
- Non-Volatile memory to store operating parameters.
- Eight bytes of non-volatile memory reserved for user data to implement simple software protection
- **New**: non-volatile memory option to allow low temperature trip points.

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, etc. The idea is to make sure the PC is always available and running; especially for 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 **Power-On-Delay (POD)**. After this time has expired, the PC Watchdog will **Arm** itself and start a watchdog timer running (user defined time-out period). 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 enable up to two independent operating modes. These modes can both be active at once. They are:

- **Passive Mode** – monitors the USB bus for a 32mS polling (interrupt) transaction. **Please note that this mode is no longer recommended.**
- **Active Mode** – requires that the host communicate with the board via direct communications on a regular basis.

Additional DIP Switches are used to set the timeout period and temperature mode. If no activity is detected in Passive or Active Mode by the time the Watchdog timer expires, the PC Watchdog will start its reset sequence on the PC.

The two LEDs on the Watchdog 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. In Active Mode the PC can turn this LED off 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 a Watchdog timer reset ('tickle') event occurred 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 the USB cable. Otherwise it may count down and reset your PC at an inopportune time!

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 can activate the Aux relay if the option is selected. It will also activate an audible alarm. At the second trip point the PC Watchdog can optionally activate the reset relay to stop the PC from 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)**.

New for Firmware 3.10 and higher:

The temperature circuit on the board can also monitor the internal temperature of the PC for low temperature trip points. There are two low temperature trip points available between **30°C** (86°F) and **-40°C** (-40°F). At the first trip point the PC Watchdog board will activate the Aux relay if the option is selected. It can also activate the buzzer. At the second low temperature trip point the PC Watchdog can optionally activate the reset relay to stop the PC from further processing.

The new feature is available with a DLL function call or by using BPI_WDog_Config program.

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	Enable Passive Mode
2	Enable Active Mode
3	Disable Buzzer
4	Temperature Reset Enable
5	Power On Delay
6-8	Watchdog Delay Time

3.1 Mode Switches - SW1 & SW2

These two switches set the operating mode of the Watchdog. If both of these switches are off then the Watchdog powers up in factory diagnostics mode and will not operate properly!

It is OK for one or both of these switches to be on at one time. The Watchdog will support both modes together.

3.2 Switch #1 - Passive Mode

When this mode is active the Watchdog will monitor the USB for a 32mS polling (interrupt) packet from the host PC. Each packet will cause the Watchdog to reset its timeout count. If the PC locks up and the packets stop then the Watchdog will count down to zero and reset the PC. **We recommend that you no longer use this option. There is a program on the CD that will “tickle” the board in Active Mode.**

3.3 Switch #2 - Active Mode

If this switch is on the Watchdog enters command mode. This requires that the PC send commands to the Watchdog as USB data packets to make it reset the timeout counter. Commands can be sent with the BPI_WDog_Tickle program and with a user application program using the DLL.

3.4 Switch #3 - Buzzer Disable

If this switch is on the buzzer will be disabled. The buzzer can also be disabled with software options.

3.5 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)**.

3.6 Switch #5 - Power On Delay (POD)

After a power up or a PC reset the Watchdog normally waits 2.5 minutes to allow the PC to re-boot. This time can be shortened in software Command Mode. 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 Passive or Active Mode the Watchdog will delay starting the timeout counter until it "sees" the first activity in either of these modes.

*** 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 to store a longer POD time in non-volatile memory.*

3.7 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.

4. Supplied Components

The standard Watchdog package contains the following items:

- The USB PC Watchdog timer on a standard PC I/O bracket.
- A USB interface cable (Internal or External type)
- A CD-ROM.
- A reset cable

4.1 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 **J1 (J5 on Rev-B)** header labeled **Reset SW** in the upper left corner of the Watchdog board.
- Plug the supplied reset cable onto **J2 (J4 on Rev-B)** labeled **CPU Reset** on the Watchdog board and plug the other end onto the original reset header on the motherboard.
- Connect the External type USB cable to Host port on the PC or a port on a hub. Connect the other end of the cable to the Watchdog. We recommend connecting to a primary port on the PC rather than using a hub. That way you do not have to worry about the hub powering down or going into sleep mode.
- If you have an **internal cable** then see next section

4.2 USB Internal Connection Header

The USB also has a four (4) pin 0.100" single row header for internal USB connection to a USB header on a PC motherboard. 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

- The enclosed cable with the four pin single row receptacle at each end is used to connect to the motherboard header. The plus (+) connection should be the RED wire.
- It should be connected to pin #1 of the USB board header that is marked with a plus (+) sign.
- The red wire should connect to the Plus (+) terminal on the motherboard header which is typically marked as pin 1 also.

NOTES:

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.

4.2.1 Internal Mounting

The USB can be mounted internally by removing the standard PC bracket and using #4-40 hardware. There is a mechanical drawing file on the CD which shows the dimensional information for the mounting holes on the board. The board is light enough to be installed with double side Velcro tape as well.

4.3 Driver Information

When you plug in the USB cable the board will identify itself to system as an HID device and the OS will assign it to the HID driver. This driver should already be installed on the PC as part of the standard install.

The CD has a program to tickle the Watchdog without having to write any software. See the BPI_WDog_Tick directory on the CD for a “tickle” program that can be setup to install automatically.

4.4 Auxiliary Relay

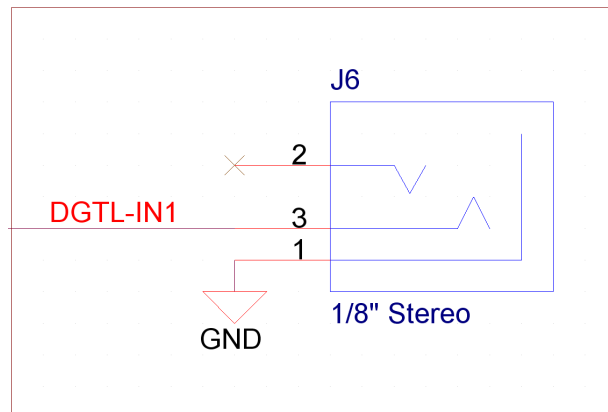
There is a second set of relay contacts that are on the 1/8" (3.5mm) stereo jack on the bracket above the LEDs. The two relay contacts are on the inner two contacts of the jack (Tip & Ring). The sleeve of the jack is grounded through its connection to the bracket. This relay can be controlled by software. 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.

4.5 External Digital Input (Rev-C Boards)

This input is on the lower stereo jack at the bottom of the bracket on Rev-C boards. The input accepts levels from 0.0 to 5.0V and it has a 1.0K pull up resistor to keep the input high when it is unconnected. The pull up also allows the user to connect a dry contact switch to the jack to pull the input low. The Ring (Right channel) terminal of the jack is connected to the input and the sleeve of the jack is ground. The Tip (Left Channel) contact of the jack is not used. The DLL has a function that allows this input to be used as digital input and an external “tickle”.

The figure below shows the schematic connection on the jack:



5. LEDs and Buzzer

5.1 Dual 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 (set by the switch option) before it enters its 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 300 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 then it will flash the bottom LED for 100 milliseconds during each second.

5.2 SMT USB Active

This surface mount LED is located next to the USB socket on the board. This LED will flash rapidly when you first plug in the USB to indicate the enumeration process. After the device has been configured then this LED may flash to indicate USB activity.

5.3 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 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.

6. 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.

6.1 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.

6.2 BPI_WDog_Tickler 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_Tickler 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.

6.3 Drivers

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

6.4 DLL & Sample Code

The new DLL for all the watchdogs is called Wdog_Univrs1.dll. Sample code (and the DLL) is provided on the CD for C & C++ in the Wdog_Univrs1_ConsoleAp directory. There is also sample code for VB.net in the VB_NET_DLL_Sample directory.

6.5 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.

7. 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.

8. Appendix A - Specifications

Power Requirements: +5 VDC - 75mA Max.

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

MTBF: 500,000 Hours

TEMP: $\pm 2.5^{\circ}\text{C}$

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 above the two 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.

9. 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.

10. 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

10.1 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

10.2 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.

11. Appendix D - Agency Approvals

The PC Watchdog meets the following agency approvals.

11.1 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.

11.2 CE

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