Internal Serial
PC Watchdog™
Hardware Manual

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1. Introduction

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

- Acts as a pass-through serial port with standard PC DB-9 connectors.
- Monitors the PC serial port for control line activity on TxD, DTR, and RTS from the PC.
- Monitors the Ring Indicator (RI) from a MODEM on the serial port for excessive rings without an answer.
- 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.
- Also has a Command Mode that allows a user program to exert additional control over the Watchdog.
- Two externally visible LEDs show status of Watchdog.
- Watchdog has a second relay available on an external plug to trigger external devices.
- 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

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 **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.

Once the Watchdog is ready to arm itself it will check the Dip switches and enable up to three independent operating modes. These modes can ALL be active at once. They are:

- **Command Mode** - Receive commands from PC on serial port and send responses.
- **Monitor Mode** - Monitor RS-232 control lines from the PC serial port for activity.
- **Ring Mode** - Count ring signals from MODEM to detect ring-no-answer conditions.

Additional Dip switches are used to set the timeout period and ring count. If no activity is detected in Command or Monitor Mode by the time the Watchdog timer expires, the PC Watchdog will start its reset sequence on the PC. If the Ring Mode is enabled and an excessive number of rings are detected from a MODEM then the Watchdog will also reset 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 Command 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 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 removing power. Otherwise it may count down and reset your PC at an inopportune time!

3. Dip Switch Settings

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	Monitor Mode
2	Command Mode
3	Ring (RI) Mode
4	Power On Delay (POD)Extend
5	Temperature Reset Enable
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 Mode Switches - SW1, SW2 & SW3

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

It is OK for Ring mode and one more of these switches to be on at one time. The Watchdog will support Ring mode and one other mode together.

3.1.1 Switch #1 - Monitor Mode

When this mode is active the Watchdog will monitor the three output control lines on the serial COM port of the PC. The lines are:

- Transmit Data (**TxD**) on Pin 3 of the DB-9.
- Data Terminal Ready (**DTR**) on Pin 4 of the DB-9.
- Request To Send (**RTS**) on Pin 7 of the DB-9.

Any activity on any of these lines will cause the Watchdog to reset its timeout count.

3.1.2 Switch #2 - Command Mode

If this switch is on the Watchdog enters command mode. This requires that the PC send commands to the Watchdog as serial data to make it reset the timeout counter. This mode will require the user to write support software into their application program or use the BPI_WDog_Tickle program on the CD. This switch must be on to use the BPI_WDog_Config program as well.

3.1.3 Switch #3 - Ring Mode

If this switch is on the Watchdog will count pulses on the Ring Indicator (**RI**) pin 9 of the cable from the MODEM. If the number of rings exceed a preset number (set by switches 6-8) then the Watchdog will reset the PC. If the number of rings is lower, followed by an idle time of about 15 seconds, then the Watchdog will reset the ring counter based on the settings of switches 6-8.

If this is the only switch of three that is on then the Watchdog will not use the timeout mode at all. It will only function as a ring-no-answer Watchdog.

3.2 Switch #4 - Power-On-Delay (POD) Extend

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 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 Monitor or Command Mode the Watchdog will delay starting the timeout counter until it "sees" the first activity in either of these modes. In the Ring mode it will wait until the DTR line to MODEM goes active. When DTR goes active the bottom LED will flash once.

*** 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.*

3.3 Switch #5 - Temperature Reset Enable (TRE)

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). A software command allows you to increase these trip points by adding a fixed offset up to 31°C.

3.4 Switches #6-8 - Timeout Count / Ring Count

These switches set the delay time until the Watchdog resets the PC. As long as the Watchdog is getting activity in Command or Monitor Mode then it will reset the timeout counter with these values. These switches also set the ring counts in Ring Mode for ring-no-answer detection. The settings and times are:

Switches 6-8	Delay Time	Ring Count
OFF-OFF-OFF	5 Seconds	2
OFF-OFF- ON	10 Seconds	3
OFF- ON-OFF	30 Seconds	5
OFF- ON- ON	1 Minute	9
ON-OFF-OFF	10 Minutes	9
ON-OFF- ON	30 Minutes	9
ON- ON-OFF	1 Hour	9
ON- ON- ON	2 Hour	9

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4. Installation of Supplied Components

The standard Watchdog package contains the following items:
- This manual on CD
- The Watchdog timer on a standard PC I/O bracket.
- A DB-9 to DB-9 serial cable.   **- OR -**
- An optional USB→Serial cable
- A reset cable

4.1 Basic Installation

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** (J3 on Rev-B) header in the upper left corner of the Watchdog board. Ignore this step if your PC does not have a front panel reset switch.
- Plug the supplied reset cable onto **J2** on the Watchdog board and plug the other end onto the original reset header on the motherboard. **- OR -**
- If you are using an ATX Reset Adapter then connect the reset cable from J2 on the board to the two (2) pin header on the ATX Adapter.
- Connect the DB-9S end of the serial cable to a COM port on the PC. Connect the other end of the cable (DB-9P) to the **Serial Input** port on the Watchdog. **- OR -**
- Plug the optional USB→Serial cable into a USB port on the PC and connect the other end of the cable (DB-9P) to the **Serial Input** port on the Watchdog. See the next section before doing this step.
- *Optional Step. If you are using the pass through mode of the Watchdog then connect your original serial device to the **Serial Output** port on the Watchdog.*

4.2 USB→Serial Driver Installation

Do not plug in the USB→Serial cable before installing the drivers. Do not use the mini-CD that comes with cable since it does not have the most recent drivers or any 64 bit drivers. The most current drivers for Windows up to and including Win7 32 & 64 bit are on the CD in the directory: Drivers\PN1110_1120_USB-2-Serial. Run the PL2303_Prolific_DriverInstaller_v110.exe program in this directory and it will install the correct driver. Now plug in the cable and it will be assigned a COM port.

5. LED, Buzzer & Aux Relay Operation

5.1 Top LED

During the 2.5 minutes that the Watchdog waits after power-up or after it resets the PC it will flash this LED at a 1 second rate (1 second on, 1 second off). Once the Watchdog has armed itself it will flash the LED at a 350mS rate. In the last 4 seconds before the Watchdog resets the PC it will flash this LED rapidly at a 100mS rate.

5.2 Bottom LED

After the first time the Watchdog resets the PC it will light this LED as a visible indicator that at least one reset (maybe more) has occurred. This LED can be turned off by cycling power on the Watchdog, pushing the PC reset button, or via Command Mode.

This LED will also flash once per second for 100mS to indicate that activity has been detected in Command or Monitor Mode and for each ring pulse from the MODEM in Ring Mode. This flash will be the inverse of the LED state at the time.

5.3 Buzzer

There is a buzzer installed on the board in the lower center. 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.

5.4 Auxiliary Relay Jack

There is a second set of relay contacts are on the 1/8" 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.

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_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.

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_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.

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.

7.1 Linux User's of Serial PC Watchdogs

The Serial versions of the PC watchdogs have been updated with new features and commands that closely resemble the low level interface of the USB PC Watchdog. These feature can be found in the x_OriginalArchive_WDog_Files directory on the CD in a document called: WDog_Serial_CommandAddendum. This doc also covers a method to change the Baud rate up to 14.4K Baud on the new revisions.

8. Appendix A - Specifications

Power Requirements: +5 VDC - 100mA Max.

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

MTBF: 500,000 Hours

TEMP: $\pm\, 2.5$°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.

Aux 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.