

***Not Recommended for New Installations.***  
Please contact Technical Support for more information.

## ***RS-232 Watch Dog Timer***

**Model 232WDT**

**Documentation Number 232WDT2295**

This product  
**Designed and Manufactured**  
**In Ottawa, Illinois**  
**USA**

of domestic and imported parts by

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## 1.0 Introduction

The 232WDT, used in conjunction with the Watch Dog TSR (WD\_TSR), gives your program the ability to shut down a critical project when a hardware or software component fails.

232WDT uses a serial communication port on your PC and is efficient enough to be powered by the port. This is a nice feature because it eliminates the cost and clutter of an external power supply, power cord, etc. An optional external power supply is available if you cannot or do not want to derive power from your PC.

**NOTE: When using an external supply, the supply should be connected only to specifically labeled power inputs (power jack, terminal block, etc.). Connecting an external power supply to the handshake lines may damage the unit. Contact technical support for more information on connecting an external power supply to the handshake lines.**

WD\_TSR enhances the use of the 232WDT by providing a simple API to the user. It handles all the asynchronous I/O chores in approximately 2K of memory. The complete asynchronous interface for 232WDT is given in the Specification Section for users who wish to control the Watch Dog directly.

## 2.0 Getting Started

Connect the DB25 female connector of the 232WDT to an RS-232 port of your computer. The Watch Dog output connections are made on the terminal blocks as shown in Figure 5.1. Copy the software to the directory where you wish to work on your DOS system.

Enter the following command at the DOS prompt:

### **WD\_TSR**

This installs the Watch Dog TSR (WD\_TSR) and arms the Watch Dog. I.e. the output switch (open collector darlington pair) closes.

Change to one of the directories, C, PASCAL, or BASIC. Enter the following command at the DOS prompt:

### **WD\_DEMO**

The menu options as shown in Figure 5.2 will be displayed.

You can use these options to experiment with 232WDT. Source code written in C, Pascal and QuickBASIC is included.

At this time the Watch Dog is armed (this is the TSR default). Select option 2 to stop it. Five seconds after you select option 2, the output switch opens.

Now the Watch Dog is idle. Select option 1 to arm it. The output switch closes.

In Timeout Mode (option 3) a user-specified timeout is entered. This time period, plus five, is the amount of time the Watch Dog waits before the switch opens. If the Start/Reset (option 1) command is issued during this time period, the timeout value will reset to its beginning value. As long as Start/Reset is issued to the TSR, it knows that you are still running and the Watch Dog will not timeout.

Let the Watch Dog go idle (stop issuing the Start/Reset command, option 1). Select option 4 to Set Free Running Mode. Select option 1 to start it. The output switch closes. As the Watch Dog is no longer in Timeout Mode, it will stay armed without any further action on your part. In this mode, the TSR completely maintains the Watch Dog.

To remove the TSR and exit the program, select option 6. This removes WD\_TSR and drops power to 232WDT. Immediately after you select the option, the output switch opens because the power is gone.

You may use option 7 to exit without removing WD\_TSR. It will maintain the Watch Dog in whatever state you left it in.

That's all there is to it!

Figure 5.3 explains the command line options for WD\_TSR. You will need these if you do not use COM1 on your DOS System.

Figure 5.4 explains the command line options for WD\_DEMO. If you invoke WD\_DEMO with any command line options, it simply does what you request and then exits. This allows you to use the Watch Dog without writing any code at all. See the batch file in Figure 5.5.

You may generate Figure 5.4 by entering the following command at the DOS prompt:

**WD\_DEMO-h**

All of the above information uses a one second time base which is the default. In applications where tighter timing is required, 232WDT can be made to run ten times faster in which case the time base becomes .1 seconds.

### 3.0 Application Program Interface (API)

WD\_TSR handles all asynchronous communications with 232WDT. It presents a simple API for use by programs like WD\_DEMO. The API is implemented via soft interrupt calls to the DOS multiplexed interrupt 2fh. Example code of WD\_DEMO. is provided in C, Pascal, and QuickBASIC.

The calling convention is as follows:

Load the high byte of the AX register (ah) with the multiplexer ID (MUX\_ID) for WD\_TSR.

MUX\_ID = ABh

Load the low byte of the AX register (al) with the value of one of the Watch Dog functions defined by WD\_TSR. These are:

Function	Value
Installation Check (INSCHK)	0
Start/Reset the Watch Dog (RUN)	1
Stop the Watch Dog (STOP)	2
Timeout Mode (TIMEOUT)	3
Free Running Mode (FREE)	4
Request Status (QUERY)	5
Set Speed (SPEED)	6
Remove WD_TSR (REMTSR)	7
Request I/O	8

Make a soft interrupt call to the multiplexer interrupt (MUXTSR). Multiplex Interrupt = 2Fh

On return, the AX, BX, CX, and DX registers will contain any results.

The following sections describe each API call in detail. Please note that these calls can be done from any language.

### **3.1 Installation Check**

This option checks for WD\_TSR installed. If WD\_TSR is installed, al will contain the MUXID on return.

Calling sequence is:

```
MUXID -> ah
INSCHK -> al
Soft interrupt call to MUXTSR
```

On return if al equals MUXID WD\_TSR is installed.

### **3.2 Start/Reset**

This option arms the Watch Dog. There are no return values.

Calling sequence is:

```
MUXID -> ah
RUN -> al
Soft interrupt call to MUXTSR
```

Output switch closes.

### **3.3 Stop**

This option idles the Watch Dog. There are no return values.

Calling sequence is:

```
MUXID -> ah
STOP -> al
Soft interrupt call to MUXTSR
```

Output switch opens.

### **3.4 Set Timeout Value**

This option puts the Watch Dog in Timeout Mode. There are no return values.

Calling sequence is:

```
MUXID -> ah
TIMEOUT ID -> al
N -> bx
Soft interrupt call to MUXTSR
```

Output switch closes following a Start/Reset command. It will stay closed for N + 5 time periods unless another Start/Reset command is received. In Timeout Mode the user continually issues Start/Reset commands to maintain the armed state.

### **3.5 Set Free Running Mode**

This option puts the Watch Dog in Free Running Mode. Ie. it clears Timeout Mode. There are no return values.

Calling sequence is:

```
MUXID -> ah
FREE -> al
Soft interrupt call to MUXTSR
```

Output switch closes following a Start/Reset command. It will stay closed until stopped.

### **3.6 Query**

This option requests the status of the Watch Dog. The return values are as follows:

al is zero if the Watch Dog is running slow  
al is one if the Watch Dog is running fast

bl is zero if the Watch Dog is idle  
bl is one if the Watch Dog is armed

bh is zero if the Watch Dog is in Free Running Mode  
bh is one if the Watch Dog is in Timeout Mode

cx is the Timeout count N

dx is the current Timeout count  
(counted down value of N)

Calling sequence is:

```
MUXID -> ah
QUERY -> al
Soft interrupt call to MUXTSR
```

### **3.7 Speed Select**

This option selects the speed of operation of 232WDT. There are no return values. 232WDT is a two speed device. The default is slow (1 second) timer. Fast speed is .1 second timer.

Calling sequence is:

```
MUXID -> ah
SPEED -> al
```

bl is zero for slow speed (1 second timer)  
bl is one for fast speed (.1 second timer)  
Soft interrupt call to MUXTSR

232WDT changes polling rate to interval specified.

### **3.8 Remove**

This option removes WD\_TSR. There are no return values.

Calling sequence is:

```
MUXID -> ah
REMTSR -> al
Soft interrupt call to MUXTSR
```

Output switch opens (power is removed from 232WDT).

### **3.9 I/O Query**

This option queries WD\_TSR for COM address and IRQ. The return values are as follows:

```
ax COM address
bl COM IRQ
```

Calling sequence is:

```
MUXID -> ah
IOQUERY -> al
Soft interrupt call to MUXTSR
```

232WDT reports I/O address and IRQ.

### **3.10 WD\_TSR Help**

This option produces the WD\_TSR help screen shown in Figure 5.3.

## 4.0 Specifications

### 4.1 Watch Dog Output

The Watch Dog Output is a switch (open collector darlington pair). It should be connected as shown in Figure 5.1. The switch turns on in the armed (run) state and off in the idle (fault) state. It has reasonable current capability and therefore can be used to drive a relay. Specifications for the output are as follows:

$I_{MAX} = 200 \text{ mA}$  sinking  
 $V_{MAX} = 30 \text{ V}$   
On Voltage Drop = 1.2 V

### 4.2 Watch Dog Asynchronous Interface

232WDT derives power from the host computer's RS-232 port and performs its function by communicating through the RS-232 port at 9600 bps, no parity, 8 data bits, and 1 stop bit.

To power 232WDT, assert RTS and DTR. 232WDT will transmit an 'I' every second indicating that it is idle.

Send 232WDT a '#' it will respond with an 'A' indicating it is armed.

Once armed you must send a '#' every time interval or 232WDT will count down to idle.

Normal asynchronous traffic looks like this:

```
232WDT      IIII A 0 0 0 0 0 0 1 2 3 4 D IIIIII  
PC          # # # # # # #
```

The darlington transistor output "switch" will repond to this sequence as follows:

```
232WDT      IIII A 0 0 0 0 0 0 1 2 3 4 D IIIIII  
PC          # # # # # # #  
"Switch ON"  xxxxxxxxxxxxxxxxxxxxxxx  
"Switch OFF" xxx                      xxxxxx
```

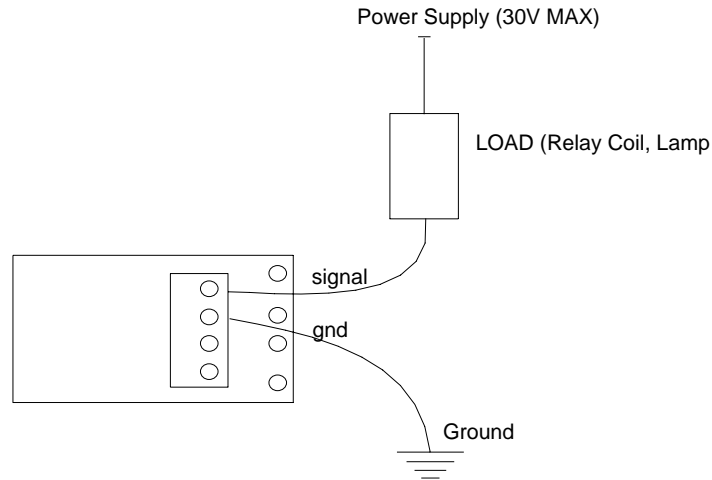
To shutdown 232WDT, drop RTS and DTR. The 232WDT will go mute sans power.

To change the speed of the Watch Dog you may send a '0' or '1' in place of any of the '#' characters.

'0' -> slow speed (one second timer)

'1' -> fast speed (.1 second timer)

## 5.0 Figures



Connect an RS-232 port of the host computer to the 25-pin female connector of the Watch Dog.

The connection point on the Watch Dog Output is via the terminal block. Output is an open collector darlington pair. The switch turns on in the armed (run) state and off in the idle (fault) state.

1. COM1 is simplest. 232WDT will run at any combination of the following:

Address: 000 - 3f8h  
IRQ: 2 3 4 5 6 7 10 11 12 14 15

These are specified as command line arguments to WD\_TSR.

Normal configurations are:

COM1 address 3f8 IRQ 4  
COM2 address 2f8 IRQ 3  
COM3 address 3e8 IRQ 4  
COM4 address 2e8 IRQ 3

**Figure 5.1 - 232WDT Connections**

Options:

1 = Start/Reset	5 = Speed Select
2 = Stop	6 = Remove TSR and Exit Program
3 = Set Timeout Mode	7 = Exit Program
4 = Set Free Running Mode	

**Figure 5.2 - WD\_DEMO Option Menu**

The WD\_TSR offers the following command line options:

- A - Specify Base Address
- I - Specify IRQ
- M - Specify Manual Mode (Override Run Mode Default)
- Q - Set Quiet Mode (No Publish[1])
- S - Specify Timeout Mode (Override Free Running Mode Default)

Default Base Address, and IRQ, are 03f8 and 4 respectively.

Override the base address and/or IRQ when you start WD\_TSR as follows:

```
wd_tsr -a02f8 -i3
```

Supported address' are: 0000 - 03f8h

Supported IRQs are: 2 3 4 5 6 7 10 11 12 14 15

1. Default is to publish. Two messages are possible:

- Watch Dog TSR is active (exit code 0)
- Watch Dog TSR is already active (exit code 1)

For diagnosing problems you can use the wd\_demo program to inquiry about the TSR state.

**Figure 5.3 - WD\_TSR Command Line Options**

This program (WD\_DEMO) Demonstrates the Watch Dog API.

You can specify a number of dash (-) options when you start WD\_DEMO as follows:

- h Help (publishes this screen).
- r Run the Watch Dog
- s Stop the Watch Dog
- u Uninstall the Watch Dog

Use 'wd\_demo -h' to produce this help screen (other options will be ignored).

If you do not specify any options the program runs interactively

#### **Figure 5.4 - WD\_DEMO Command Line Options**

```
@echo off
cls
wd_tsr
if errorlevel=1 goto e1

echo The Watch Dog installed ok and is armed as default

rem
rem Run the critical application program which is to be protected rem

critical

rem
rem Critical application exited - shutdown
rem

wd_demo -u

echo The Watch Dog is idle
:exit

:e1
echo The Watch Dog was already installed
:exit
```

**Figure 5.5 - Demo Batch File**