



TOSHIBA POS Terminal

ST-A20

Watch Dog Timer Driver Specification (Windows)

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TOSHIBA TEC CORPORATION

No. EAA-02676

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Table of Contents

1. Overview.....1

1.1 Introduction..... 1

1.2 Application 1

1.3 Configuration 1

2. Functions.....2

2.1 Functions of the WDT Driver..... 2

2.1.1 Boot Monitor (monitoring of lock state when booting POS terminal)..... 3

2.1.2 Operation Monitor (Monitoring of lock state during normal operation of POS terminal)..... 4

2.2 Precautions for Executing CheckDisk (CHKDSK command) 5

2.3 Registry 6

3. Remarks.....7

3.1 Log..... 7

3.2 Driver Installation Check 8

1. Overview

1.1 Introduction

This document describes the operation specifications of the Watch Dog Timer Driver developed by TOSHIBA TEC Corporation (hereinafter referred to as “the WDT Driver”). Please note the specifications are different from those of generally available watch dog timer drivers.

An Application Program Interface (API) is not provided. The WDT Driver operates when loaded by Windows. The WDT Driver setup is made in the registry.

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1.2 Application

The WDT Driver runs on the following hardware and operating systems (OS).

Hardware: ST-A20 POS terminal

OS: Windows XP Professional
Windows XP Embedded
WEPOS (Windows Embedded for Point of Service)
POSReady 2009(Windows Embedded POSReady 2009)
Windows 2000 Professional
Windows Vista Business

1.3 Configuration

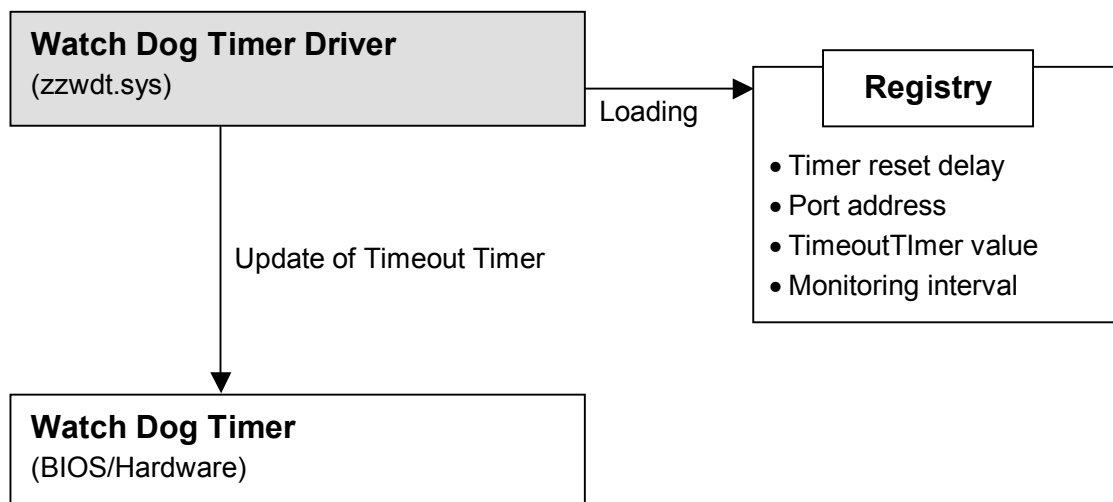


Fig. 1 Watch Dog Timer Configuration

2. Functions

2.1 Functions of the WDT Driver

The WDT Driver provides the following two functions:

1. Monitoring of lock state when booting POS terminal (hereinafter referred to as "Boot Monitor")
2. Monitoring of lock state during normal operation of POS terminal (hereinafter referred to as "Operation Monitor")

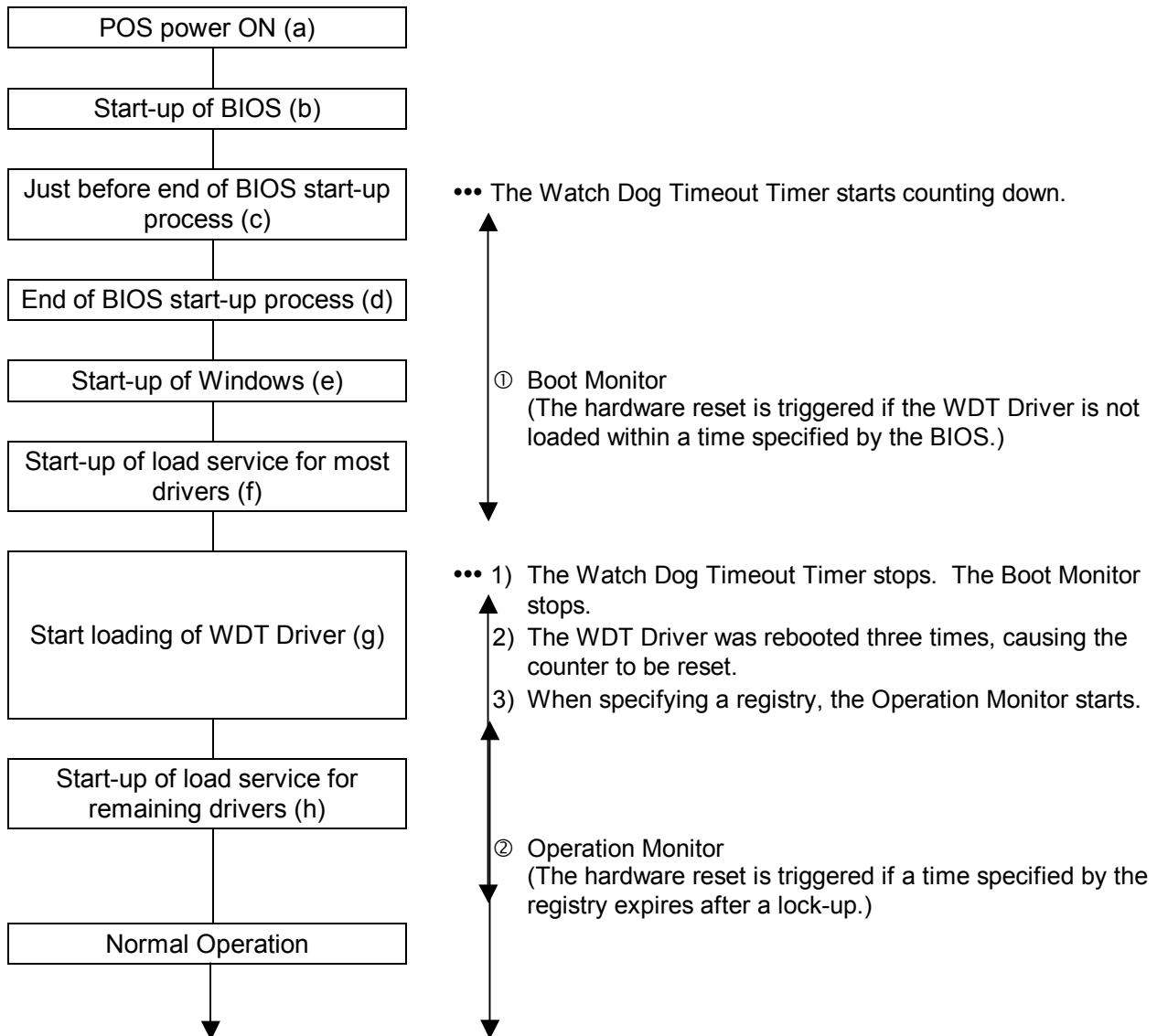


Fig. 2 Watch Dog Timer Flow

2.1.1 Boot Monitor (monitoring of lock state when booting POS terminal)

The Boot Monitor monitors a lock state of the POS terminal for a period from power-on to start-up of the driver service. (Period ① shown in Fig. 2)

The Watch Dog Timer setup items are in the BIOS setup menu.

When the Watch Dog Timer is enabled, the POS terminal is hardware reset if a specified Watch Dog Timer expires. When it is disabled, no hardware reset is triggered even if the POS terminal is in a lock state because the Watch Dog Timer is not operating.

When the Watch Dog Timer is enabled, the POS terminal is hardware reset if the WDT Driver cannot be loaded within a specified period of time because the Windows boot failed (Step (e) in Fig. 2) or the POS terminal entered in a lock state while a driver, which is to be loaded prior to the WDT Driver, was loaded.

During a start-up of the POS terminal, pressing the [F2] key shows the BIOS setup screen, while pressing the [F8] key shows the Windows boot option screen. Please note the timer on the BIOS setup screen does not start counting down when it appears, but the timer on the Windows boot option screen has already started counting down when it appears.

After the most drivers are loaded and most services are started (Step (f) in Fig. 2), the WDT Driver is loaded (Step (g) in Fig. 2). If loading/starting such driver/service fails and the POS terminal enters in a lock state, the WDT Driver is not loaded and a hardware reset is triggered when a period of time, starting from a power-on and specified by the BIOS, expires. Please carefully determine this time so that the WDT Driver can be loaded within the specified period of time.

The hardware reset is retried up to five times. At the 6th lock-up, the POS terminal halts. The counter for each of six trials is cleared whenever Windows is successfully rebooted or shut down. It is incremented by a hardware reset or power-off and on due to other factors.

For details of BIOS including BIOS setup, refer to the ROM-BIOS Setup Specification provided by the hardware engineering section.

2.1.2 Operation Monitor (Monitoring of lock state during normal operation of POS terminal)

There are WDT Driver setup items in the registry. When constant monitor is enabled (by setting a value other than "0" to [TimeoutTimer]), the POS terminal is hardware reset if it enters a lock state because the WDT Driver stops its operation while the POS terminal is operating normally (Step (i) in Fig. 2).

The WDT Driver updates the Watch Dot Timeout Timer to a value specified by [TimeoutTimer] at intervals specified by [WatchInterval] set in the registry. The timer value is always counted down from the one specified by [TimeoutTimer] and when the value becomes zero, the POS terminal is hardware reset. That is, when Windows locks up, the WDT Driver halts, and a specified period of time expires after a lock-up, the POS terminal is hardware reset. When the application locks up, a hardware reset is not triggered because the WDT driver keeps operating.

The setup in the registry is read while the WDT Driver is loaded. Because this setup cannot be read again while the POS terminal is in operation, no setup changes are available. To enable the registry changes, reboot the POS terminal.

The Operation Monitor is available only when the Watch Dog Timer is enabled by the BIOS. A timeout time specified by the BIOS is effective only for the Boot Monitor. A timeout time for the Operation Monitor is specified by the registry.

If the Operation Monitor is not enabled, a driver or service to be loaded after the WDT Driver halts if the application enters in a lock state (locks up in Step (h) in Fig. 2)

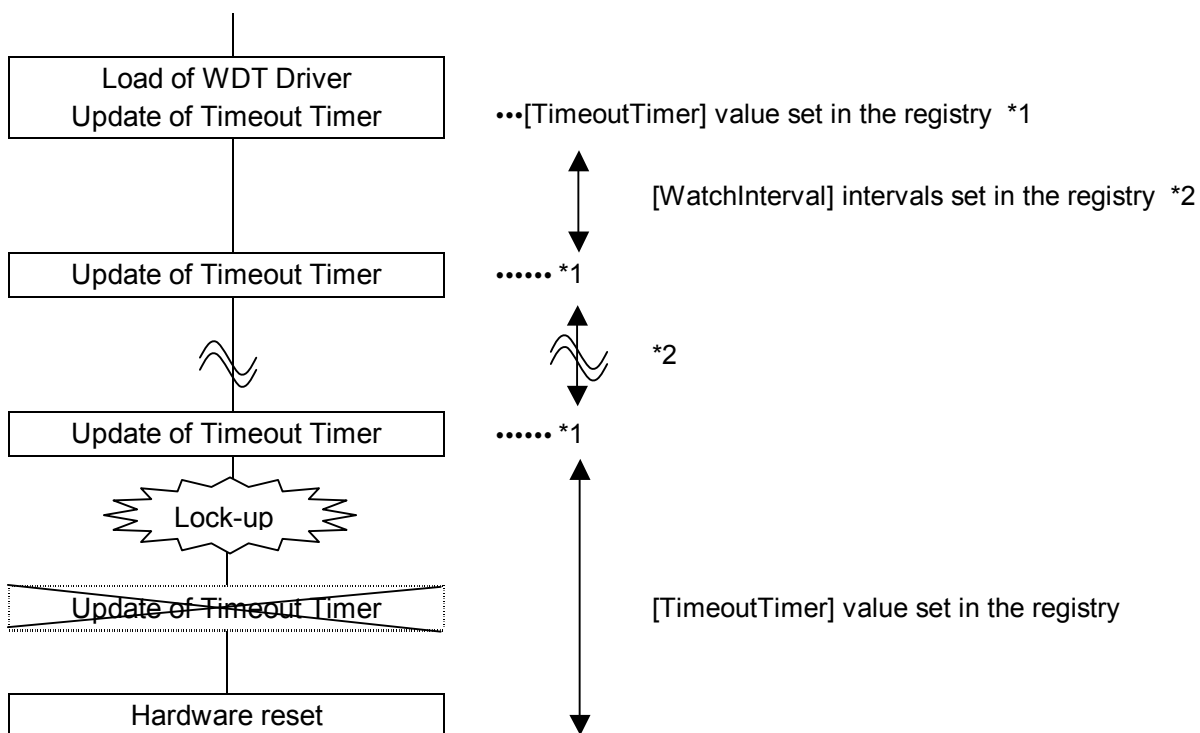


Fig. 3 Operation Monitor Flow

2.2 Precautions for Executing CheckDisk (CHKDSK command)

In the following cases, CheckDisk is performed before the operation system is started (before the drivers are loaded). Depending on the BIOS setup, the Watch Dog Timer expires before the drivers are loaded. In this case, a reboot and CheckDisk are performed again in order.

1. Start-up by a reboot after executing a CheckDisk command at a next reboot, for example, by entering "CHKDSK /R" on the command prompt.
2. Start-up after the power of the POS terminal is forced to be turned off and on during operation, for example, by a reset switch, or start-up after a power failure has occurred when the uninterruptible power supply (UPS) is disabled. (Note: CheckDisk is not always performed.)

To prevent this phenomenon, disable the Watch Dog Timer in the BIOS menu before performing CheckDisk at a start-up.

For details of BIOS including BIOS setup, refer to the ROM-BIOS Setup Specification provided by the hardware engineering section.

2.3 Registry

The registry to be set is as follows:

[HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\zzwdt\Parameters]

Key	Type	Description	Default/[Range]
DriverWaitTimer	REG_DWORD	Timer reset delay [s]	00000005h (5 sec.)/[0h to 1A4h]
PortAddress	REG_DWORD	Default port address	00000865h
TimeoutTimer	REG_DWORD	Time from lock-up to hardware reset [s]	00000000h (with constant monitor disabled)/ [0h, 3Ch to FFh]
WatchInterval	REG_DWORD	Monitor interval [s]	00000005h (5 sec.)/[1h to 7Fh], but 1/2 or less of TimeoutTimer value

<Notes>

If there is no registry, each of the following items is activated by default.

(DriverWaitTimer)

- When a value is larger than 1A4h (420 seconds=7 minutes), DriverWaitTimer performs with the value, "1A4h".
- When a large value is set, a time from a start-up of the WDT Driver to a reset of the Watch Dog Timeout Time gets longer. When a small value is set, the WDT Driver may be loaded before some of other drivers, which should be loaded prior to the WDT Driver, are loaded. An optimal value is determined based on the factors such as the BIOS setup, the number of driver services to be loaded and their setup, CPU speed, and memory capacity. Determine the optimal value for each system.

(PortAddress)

- A PortAddress value is determined for each hardware. Do not change the value being set.
- PortAddress uses 2 bytes of the specified address.

(TimeoutTimer)

- If this value is set "0 sec.", Operation Monitor is not performed. The settable value range is 60 sec. to 255 sec. If the value is 1 sec. to 59 sec., 60 sec. is selected. If 256 sec. or larger is selected, 255 sec. is selected.

(WatchInterval)

- The Watch Dog Timeout Timer is updated at intervals specified by WatchInterval. If this value is small, performance of the POS terminal is degraded. If this value is large, the TimeoutTimer value becomes inaccurate. Usually, no change is required.
- A time from lock-up to hardware rest is:
At a maximum: TimeoutTimer value,
At a minimum: (TimeoutTimer value) – (WatchInterval value)

Example:

where WatchInterval = 10 [s], TimeoutTimer = 100 [s],
a time from lock-up to hardware reset is 90 sec. to 100 sec.

- Settable WatchInterval value is 1/2 or less than TimeoutTimer value. If a value larger than that is set, the value, which is a half of the TimeoutTimer value, is set to WatchInterval.

3. Remarks

3.1 Log

When detecting an error during an operation, the WDT Driver records the error in the event log (system log).

Hardware reset by the Watch Dog Timer due to Windows lock-up is not recorded.

When the POS terminal is operating normally, no log is recorded.

Details of errors

Event ID	Type	Description	Dumpdata
1	Error	Failed to create controller data	Not exist
2	Error	Failed to create device object.	Exists
3	Error	Failed to register symbolic link.	Exists
4	Error	Failed to delete symbolic link.	Exists
5	Error	Failed to start the timer to update the Watch Dog Timer.	Not exist
6	Error	Failed to map the I/O address.	Not exist
7	Error	Failed to identify a model. Does not clear the Watch Dog reboot counter.	Not exist
97	Warn	Failed to obtain registry parameters.	Exists

When any of the above errors occur, software problem may exist.

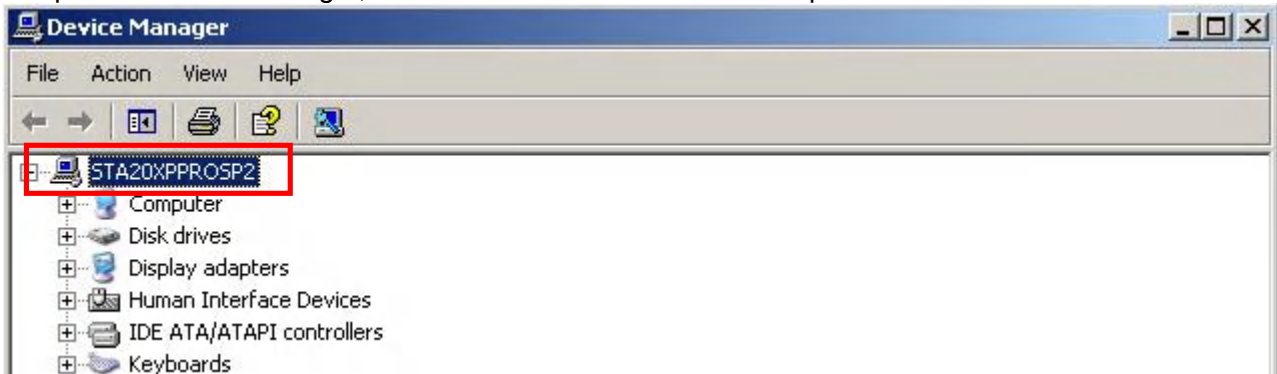
When Dumpdata exists, a Windows status code is returned.

When failed to set registry parameters, the POS terminal operates by default.

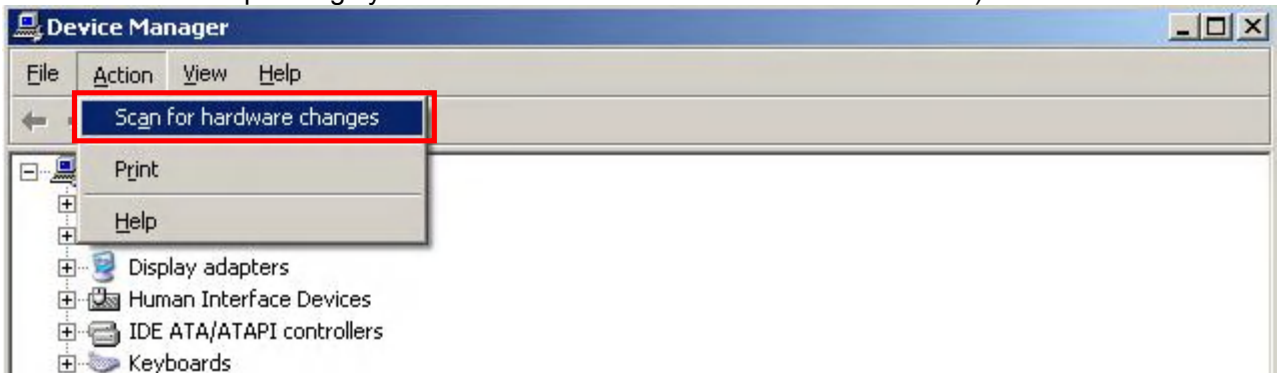
3.2 Driver Installation Check

Whether or not the WDT Drive was successfully installed can be checked with the Device Manager.

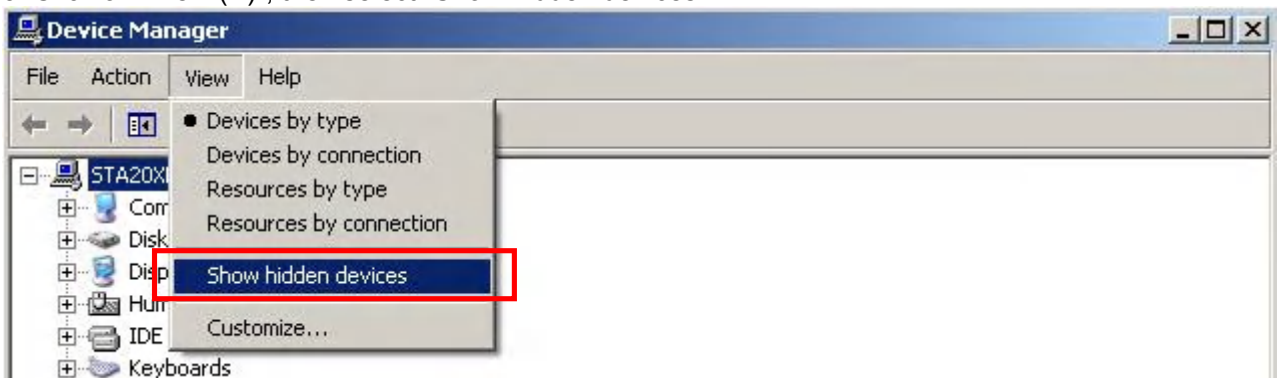
1. Open the Device Manager, then select a PC icon named <computer name>.



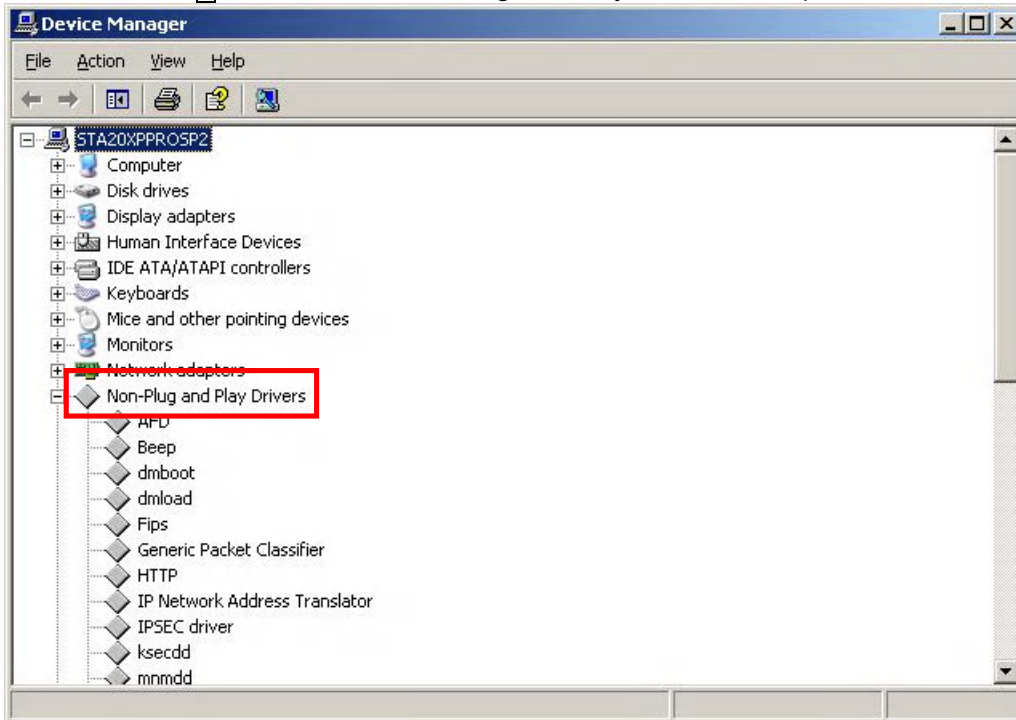
2. Click on "Action (A)", then select "Scan for hardware changes (A)". (This operation is required only once when the operating system is started after the WDT Driver is installed.)



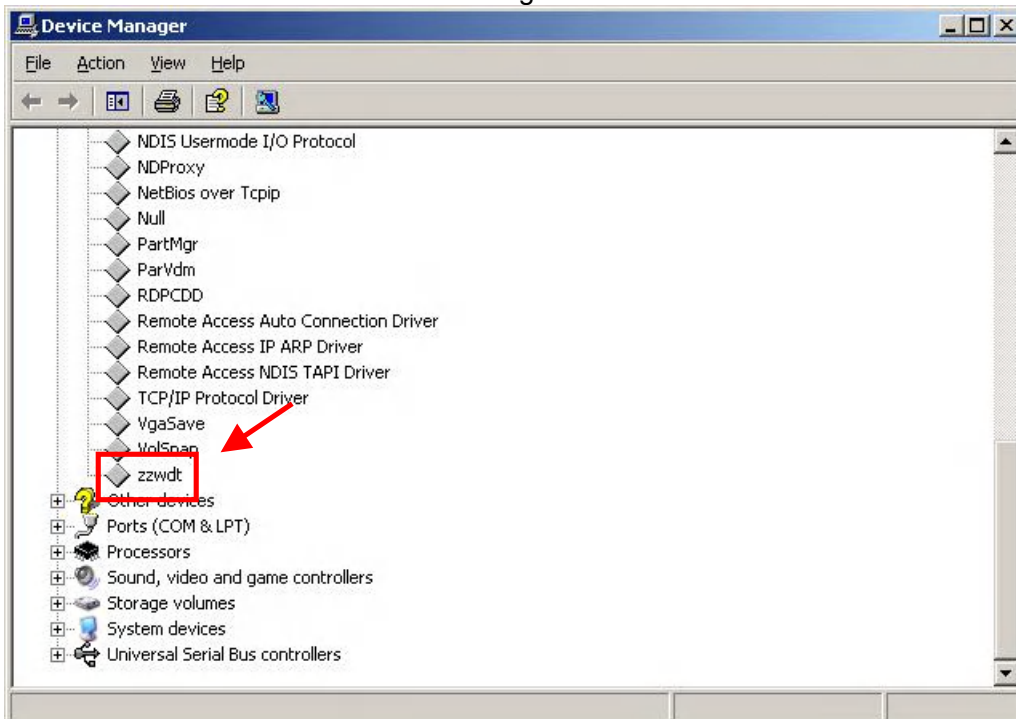
3. Click on "View (V)", then select "Show hidden devices".



4. Click on the  mark next to “Non-Plug and Play Drivers” to expand the item.



5. Check that “zzwdt” is shown as in the figure below.



(Notes and Restrictions)

1. The WDT Driver was not successfully loaded if an error symbol such as "!" (yellow exclamation mark) or "x" (red cross mark) is shown, or "zzwdt" is not shown under the "Non-Plug and Play Drivers" item.
2. When Step 2 above is omitted (Step 3 is performed after Step 1), the screen will be as described below for Windows 2000 and Windows XP respectively.
Windows 2000: Although the "Device status" box on the screen displays an error message, the WDT Driver performs correctly.
Windows XP: "zzwdt" is not shown on the Device Manger.

For both cases, executing "Scan for hardware changes " in Step 2 will show a correct display.

