TOSHIBA

TOSHIBA POS Terminal

ST-A10/ST-A20/ST-B10/ST-B20/ST-C10/ ST-M30

Watch Dog Timer Driver Specification (Windows)

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TOSHIBA TEC CORPORATION

Revision Record

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Watch Dog Timer Driver Specification

Rev. No.	Date	Pages	Description
	Jul 29, 2008	---	Original issue
1	Nov 6, 2009	1,6	The descriptions about the ST-A10, ST-B10 and ST-B20 have been added. The PosType key has been added to the registry.
2	Dec 30, 2011		Adding ST-C10 and ST-M30 support

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1. Overview

1.1 Introduction

This document describes the specifications of the Watch Dog Timer Driver operation developed by TOSHIBA TEC Corporation.

Please take note that the WDT driver develop by TOSHIBA TEC Corporation is different from general watch dog timer drivers which available in the market.

Application Program Interface (API) is not provided by WDT driver. The WDT Driver will operate once is loaded by Windows. The WDT Driver setting can be configured in the registry which is described in section 2.4.

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1.2 Scope

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

OS / Hardware	Windows 2000 Professional SP4	Windows XP Professional SP3	WEPOS1.1	Windows Embedded POSReady 2009	Windows Vista Business SP1	Windows 7 Professional SP1 (32bits)
ST-A10	✓	✓	✓	✓		
ST-A20	✓	✓	✓	✓	✓	✓
ST-B10		✓	✓	✓		
ST-B20	✓	✓	✓	✓	✓	✓
ST-C10		✓	✓	✓		✓
ST-M30		✓	✓	✓		✓

OS / Hardware	Windows 7 Professional SP1 (64bits)	POSReady 7 (32bits)	POSReady 7 (64bits)
ST-A10			
ST-A20		✓	
ST-B10			
ST-B20		✓	
ST-C10		✓	
ST-M30	✓	✓	✓

✓ - means the OS is supported on that platform

1.3 Structure

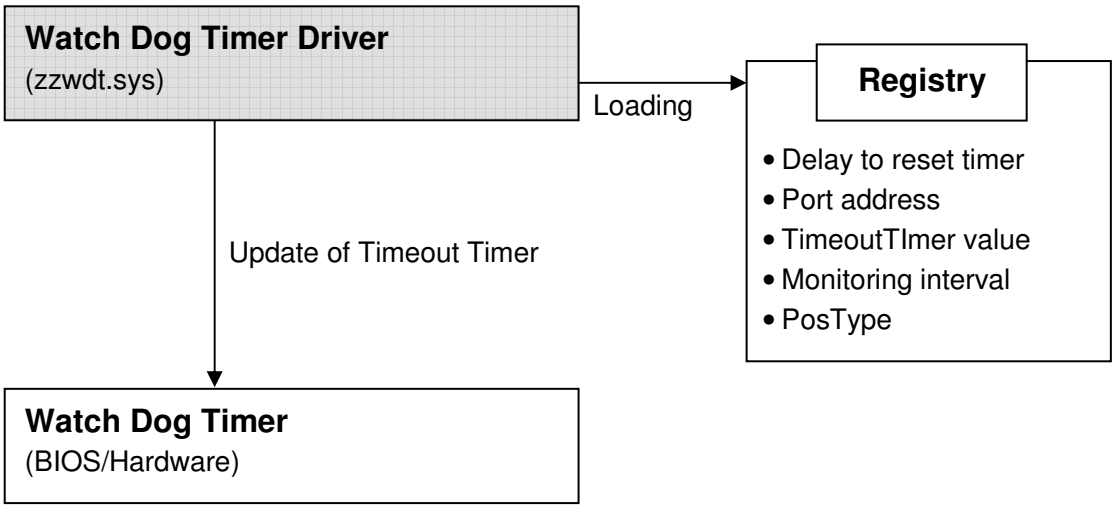


Fig. 1 Watch Dog Timer Structure Overview

2. Functions

2.1 File Name

zzwdt.sys

2.2 Functions of the WDT Driver

The WDT Driver provides the following 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”)

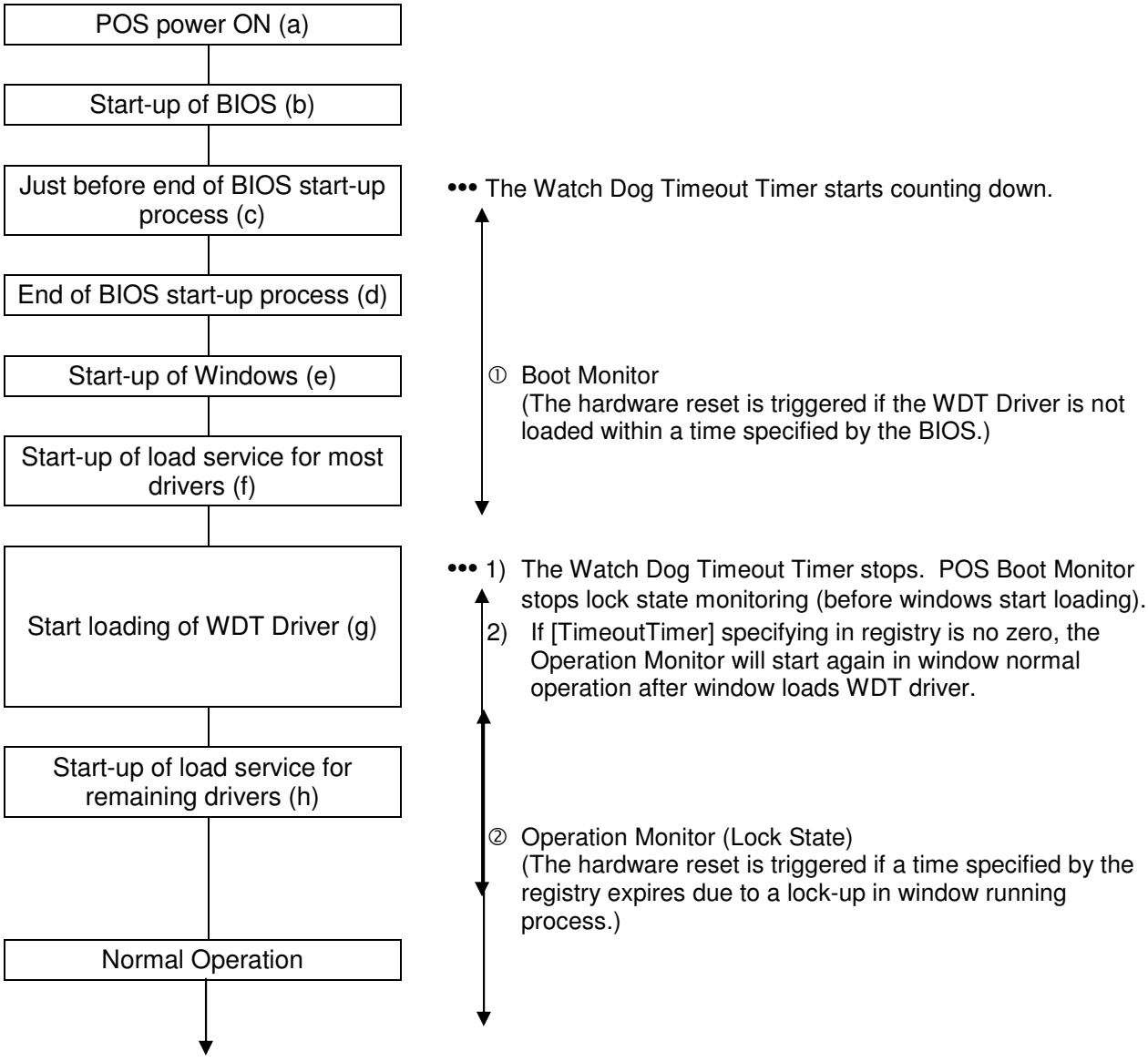


Fig. 2 Watch Dog Timer Flow

2.2.1 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 setting can be configured under BIOS setup menu.

When the Watch Dog Timer is enabled, the POS terminal will trigger hardware reset if a specified interval value for Watch Dog Timer expires. When it is disabled, no hardware reset is triggered even if the POS terminal is in a lock state as the Watch Dog Timer is not operating.

When the Watch Dog Timer is enabled, the POS terminal will trigger hardware reset if the WDT Driver cannot be loaded within a specified period of time due to the Windows boot failure (Step (e) in Fig. 2) or the POS terminal entered a lock state while loading some other driver prior to the WDT Driver.

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 take 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 a lock state before the WDT Driver loaded, a hardware reset will be triggered after a period of time, starting from power-on and until the timeout value specified in the BIOS expires. Please make sure the interval/time setting under BIOS setup for WDT is long enough for the WDT Driver to load by the OS before timeout.

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

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

The setting of WDT driver can be configured by registries provided as mention in section 2.4. WDT monitoring can be enabled by setting a value other than “0” to [TimeoutTimer]. During normal operation of the POS terminal (Step (i) in Fig. 2), if a locked state happens which cause WDT driver cannot reset the timeout value in register, then WDT will hardware reset the POS machine once timeout become 0. Generally, WDT Driver will always reset the WDT register timeout value to a value which is specified by [TimeoutTimer] registry before the timeout value becomes 0. The reset process will repeat at interval which is specified by [WatchInterval] registry. If the timeout value counts down from the one specified by [TimeoutTimer] and becomes zero before reset registry happens, the POS terminal will be hardware reset by WDT.

For example, if a process access the kernel space is being lock up cause the WDT driver halts and cannot perform register reset, then the POS machine will be hardware reset once timer timeout. However, if the lock up happen in application or user space and WDT driver still can perform registry reset, as a result hardware reset will not be triggered in this case.

The WDT setting related registries will only be read once when the WDT driver is loaded by OS. As a result, any changes to registries value will take no effect after the system boot up into OS successfully. In order to enable the registries changes, reboot of the POS terminal is required.

The Operation Monitor is available only when the Watch Dog Timer is enabled in the BIOS setting. A timeout time specified in the BIOS is only taking effect for the Boot Monitor (before windows starts loading). A timeout interval for the OS Operation Monitor is specified by the registry provided in section 2.4.

If the Operation Monitor is not enabled (WDT disabled in BIOS), even if the system already loaded with WDT Driver, hardware reset will no happen if a driver or service halts or enter the lock-up state (lock-up happen in Step (h) in Fig. 2). As a result, system will remain hanging until user manually reset the POS terminal.

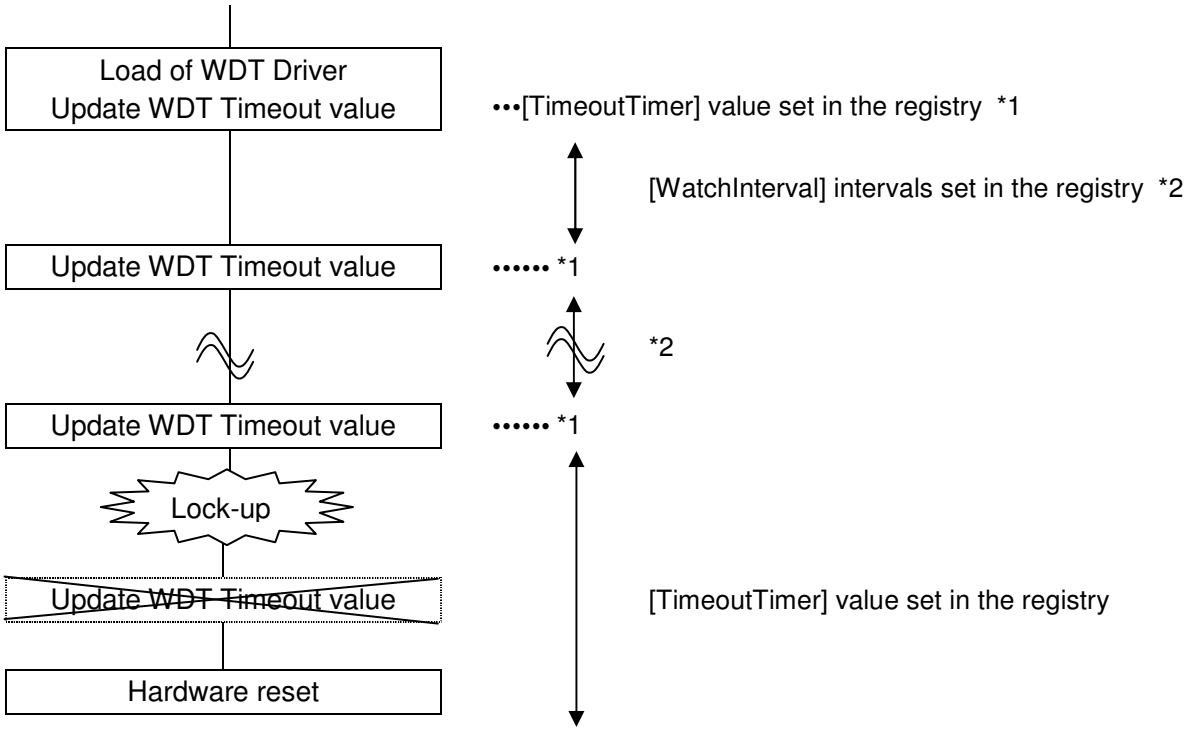


Fig. 3 Operation Monitor Flow

2.3 Precautions for CheckDisk Execution (CHKDSK command)

The following cases (1. and 2.) might cause a CheckDisk operation is performed before the OS starts loading.

1. Next reboot after executing a CheckDisk command. This can be done by entering “CHKDSK /R” command using the command prompt.

2. Next start-up of the POS terminal after being forced turn OFF and ON during operation due to some reasons. For example, user forces POS terminal to power off by long pressing reset switch or a power failure has occurred when the uninterruptible power supply (UPS) is disabled. (Note: CheckDisk is not always performed.)

In this case, the WDT timeout value configured under BIOS setup menu is important as it will be used by WDT before OS loading. If the WDT timeouts before the CheckDisk finish and before the WDT driver being loaded by OS, then hardware reset will be trigger in the middle of the CheckDisk process. As a result, the POS system will reboot and the CheckDisk operation will be performed again. The entire CheckDisk and WDT hardware reset process might keep repeating until user takes action accordingly.

In order to prevent this problem, user should disable the Watch Dog Timer in the BIOS menu before performing CheckDisk at a start-up.

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

2.4 Registry

The registries can be configured is describing as below:

[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
PosType	REG_DWORD	Pos type	00000004h
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 the registry is not configured in system, then each of the items will use default value.

(DriverWaitTimer)
- When a value is larger than 1A4h (420 seconds=7 minutes), [DriverWaitTimer] will use 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. The optimal value should determine base on each system models.

(PortAddress)
- A PortAddress value is fixed for each device. Do not change the registry value.
- PortAddress uses 2 bytes of the specified address.

(PosType)
- A PosType value is fixed for each device. Do not change the registry value.
  1: ST-A20/ST-B20
  2: ST-A10/ST-B10
  3: ST-C10
  4: ST-M30

(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, then driver will set this value to 60 sec. If 256 sec or larger value is configured, then the driver will set this value to 255 sec.

(WatchInterval)
- The Watch Dog Timeout Timer is updated at intervals specified by WatchInterval. If this value is small, the POS terminal performance is degraded. If this value is large, the TimeoutTimer value becomes inaccurate. Usually, no change is required.

- A time from lock-up to hardware reset is:
  At a maximum: TimeoutTimer value,
  At a minimum: (TimeoutTimer value) – (WatchInterval value)

Example:
When WatchInterval = 10 [s], TimeoutTimer = 100 [s],
Time from lock-up to hardware reset is 90 sec. to 100 sec.

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

3. Remarks

3.1 Log

When an error is detected during an operation, the WDT Driver will log the error in the event log (system log).
NOTE: Hardware reset by the Watch Dog Timer due to Windows lock-up is not recorded.
When the POS terminal is in normal operating, no log is recorded.

Details of errors

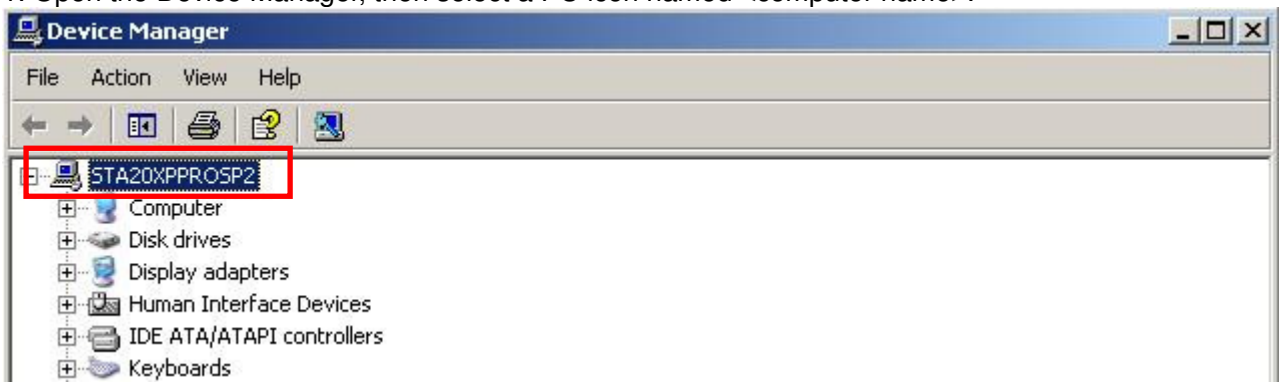
Event ID	Type	Description	Dumpdata
1	Error	Failed to create controller data	Not exist
2	Error	Failed to create device object.	Exists
3	Error	Failed to register symbolic link.	Exists
4	Error	Failed to delete symbolic link.	Exists
5	Error	Failed to start the timer to update the Watch Dog Timer.	Not exist
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 read registry parameters, the WDT driver operates by using default value.

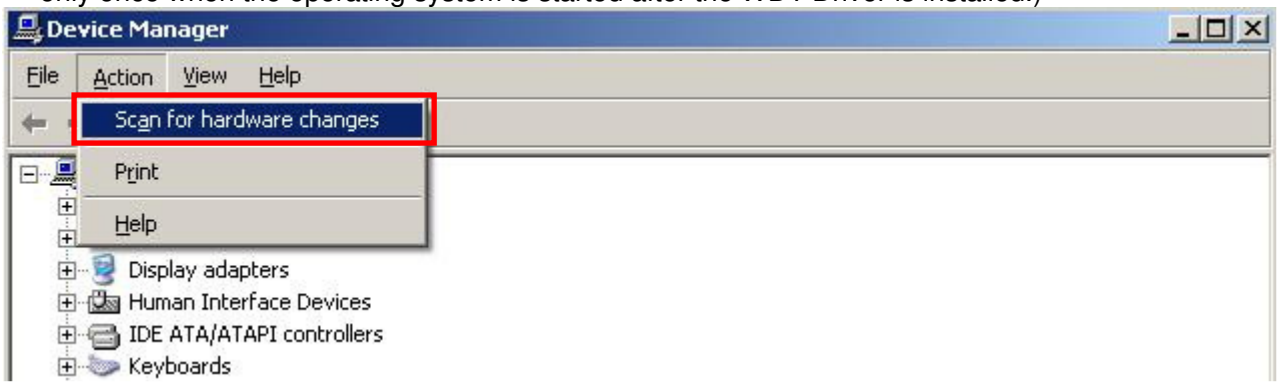
3.2 Driver Installation Confirmation

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

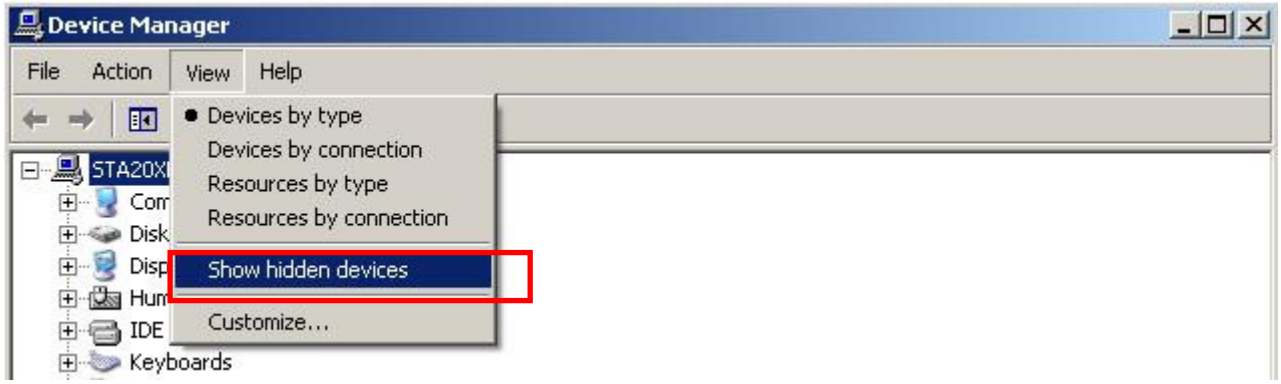
1. Open the Device Manager, then select a PC icon named <computer name>.



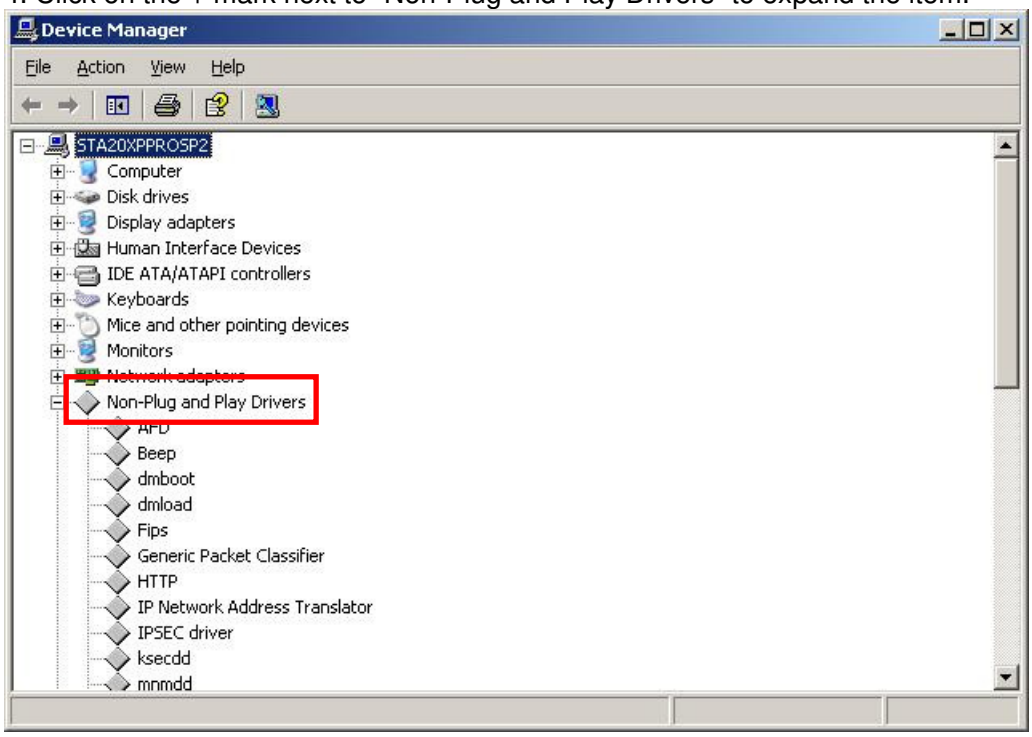
2. Click on “Action (A)”, and then select “Scan for hardware changes (A)”. (This operation is required only once when the operating system is started after the WDT Driver is installed.)



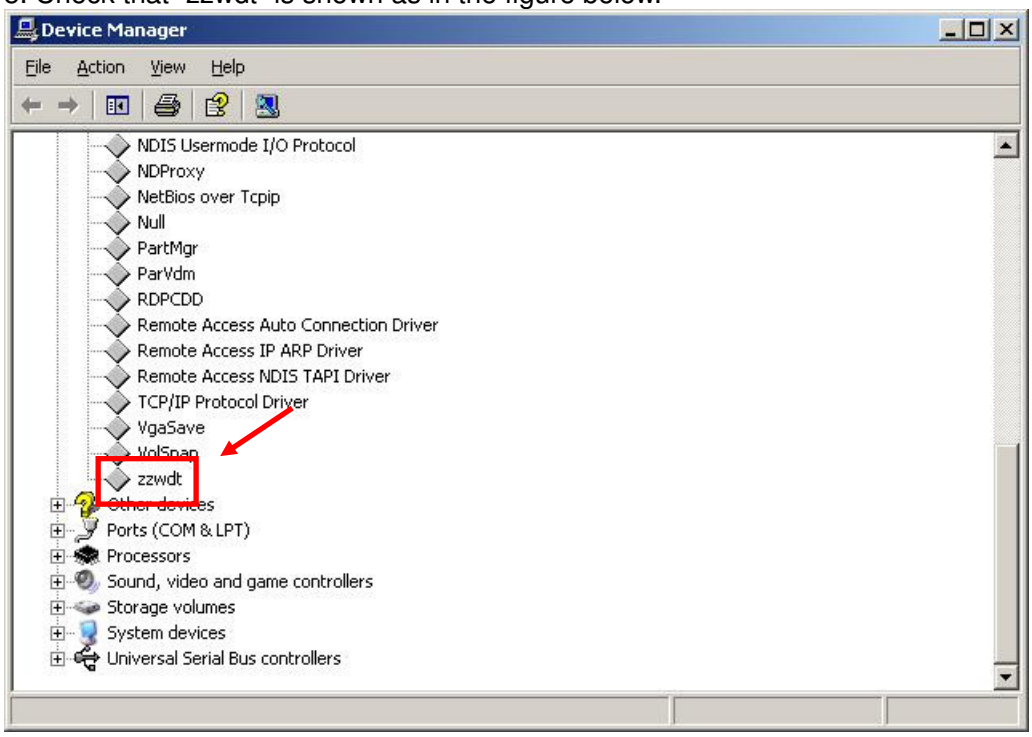
3. Click on “View (V)”, and then select “Show hidden devices”.



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.

3. On ST-M30, WDT driver will start Operation Monitor in normal OS if user enables WDT in the BIOS and TimeoutTimer value is not zero. However, if user tries to stop and start again the WDT driver (zzwdt) using properties under zzwdt device manager, the Operation Monitor will always remain stop until a system reboot happen.

