AEROTECH

Optimizing A3200 Performance Guide

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Global Technical Support

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Chapter 1: Introduction

To get real-time controller performance, the Automation 3200 runs alongside Windows in the TenAsys INtime real-time operating system. The A3200 runs on a PC. Thus controller performance, like general Windows performance, depends on the PC hardware configuration and the software configuration. The variety of available PCs and the different system configurations of those PCs make it important for you to optimize your system before you use the A3200. You can also optimize the A3200 controller software.

NOTE: This guide tells you how to optimize the A3200 for real-time use. For information about testing the real-time performance of the A3200, refer to **Analyzing A3200 Performance** in A3200 Help.

Related Topics (refer to A3200 Help)

Available Memory
Analyzing A3200 Performance
Optimizing Performance in VELOCITY ON Mode

Chapter 2: PC Performance

To see the PC configuration recommended by Aerotech, refer to the **System Requirements** topic of the Help file, or go to www.aerotech.com, open the **A3200 Software-Based Machine Controller** page and click the **Specifications** tab.

The A3200 installation and INtime real-time operating system try to configure your system for the best possible performance. But, you might need to manually change some system settings so that the A3200 has the best possible real-time performance. Aerotech recommends that you change the settings that follow.

Configure INtime to run in Dedicated mode

In Dedicated mode, INtime uses one core for real-time controller processing and the other cores for Windows processing. A3200 configures INtime to run in **Dedicated** mode by default.

TO VERIFY THAT INTIME IS RUNNING IN DEDICATED MODE

1. Click **Start**, click **All Programs**, click **INtime**, and then select **INtime Configuration**.
2. Double-click **Node Management**. The **INtime Node Management** dialog comes into view.
3. Select **AerotechNode0**.
4. Click the **System** tab.
5. Make sure that **Boot mode** is set to **Dedicated**.
6. Click **Save** and then click **Close**.
7. Restart your computer.

> **NOTE:** Aerotech recommends that you do not use **Shared** mode because it can cause real-time performance problems on some PC platforms and might not be compatible with some Microsoft security updates.

Uninstall Software That Causes Problems with Real-Time Performance

Some software causes problems with the real-time performance of the A3200. If these problems occur, Aerotech recommends that you uninstall this software.

TO UNINSTALL SOFTWARE THAT CAUSES PROBLEMS WITH REAL-TIME PERFORMANCE

1. Open **Control Panel**
2. Click **View By** and then select **Large Icons**. Then click **Programs and Features**.
3. Select and uninstall the software programs that cause problems with the real-time performance of the A3200.
   - All software programs from PC manufactures such as ASUS, Dell, GIGABYTE, HP, and Lenovo. Programs known to cause problems are in the list that follows:
     - Dell Precision Optimizer
     - Dell OpenManager Client Instrumentation (OCMI)
     - GIGABYTE software programs
   - Some antivirus software might cause problems with the real-time performance.

> **NOTE:** For some software programs, the uninstaller might cause BIOS settings to change. After you uninstall the software programs that cause problems, Aerotech recommends that you change your PC to use the settings in the **Change Performance Settings in the BIOS/CMOS Setup** section.

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Change Performance Settings in the BIOS/CMOS Setup

Different PC and BIOS manufacturers have different procedures to configure the BIOS/CMOS settings. During startup, press **F1**, **F2**, **F10**, **F12**, **Delete**, or **Esc** to configure the BIOS/CMOS settings.

Aerotech supplies free support for A3200 installation if you purchase an Aerotech industrial PC or an approved PC from the supplier list that follows. If you have one of the approved PCs, use the settings supplied in the **Specifications and BIOS Settings** for your PC, which is available on the Aerotech website and in A3200 Help.

PCs Approved by Aerotech

- Dell (Precision 5810, BIOS version A12 or A16)
- BSI (RMS575-AERO)
- Polywell (Aero1650, Aero1763, Aero1960, or Aero2030)
- Advantech (AIMB-785 Motherboard)

If you have a PC that is was not configured by Aerotech, use the information that follows to make changes to your PC to help you run A3200 software. Aerotech does not guarantee the real-time capabilities of a PC that is not approved for A3200 installation because BIOS settings and chip sets are different for each motherboard manufacturer.

Table 3-1:   Recommended Settings for PCs Not Approved by Aerotech

Feature	Description	Aerotech Recommendations
Active State Power Management (ASPM), Advanced Configuration and Power Interface (ACPI)	These features are power management features that can decrease the power consumption of the PC.	Disable ASPM, ACPI, or the power management features that apply to the PC. Power management features can decrease real-time performance.
Processor States, Power States, C-States, C2 State, CPU Idle State	These features decrease the power consumption of the PC.	Use the lowest-numbered C-State possible (C0) or use a High Performance mode.
SpeedStep (Intel), Cool'n'Quiet (AMD), P-States, Power-Performance States	These features balance the power consumption and the performance of the PC.	Disable these features or use the lowest-numbered P-state possible (P0).
Sleep States, S-States, Suspend States	These features manage the sleep, suspend, and standby modes of the PC.	Use the lowest-numbered S-state possible (S0 or S1) or use a High Performance mode. If there is a section to Block Sleep, select this option.
Turbo Mode, Turbo Boost, Boost Performance	Features that use the word "turbo" usually change the CPU clock rate during operation.	Disable all features that dynamically change the processor clock rate during execution. Changing this rate during execution can decrease real-time performance.
Hyper-Threading, HT, HTT	This Intel feature allows a physical processor core to be virtualized into 2 logical cores.	Disable hyper-threading. Windows executing on one logical core can change the performance of INtime executing on another logical core.
SMM (System Management Mode), SMI (System Management Interrupt)	This is an operating mode of the PC that includes error handling, safety functions, security functions, power management, hardware emulation, and system configuration.	Disable SMM and SMI. They can take processing time from the CPU and can make INtime performance worse.

Feature	Description	Aerotech Recommendations
TPM 2.0 Security, Trusted Platform Module, Trusted Computing	This is a security feature that is available only on some PCs.	Disable the Trusted Platform Module feature. Access to this feature can cause a System Management Interrupt to occur, which gets processing time from the CPU and makes INtime performance worse.
UEFI, EFI, UEFI/EFI partitions/booting/storage	Unified Extensible Firmware Interface (UEFI) is a firmware interface for PCs designed to replace BIOS. It supplies services that are available to the OS.	Change this setting only if you have problems with INtime performance. In the BIOS, disable UEFI/EFI partitions and booting. Then, configure the BIOS to use legacy BIOS or legacy boot mode. UEFI booting can cause Windows to use System Management Mode to access the BIOS. This takes processing time from the CPU and makes INtime performance worse. If Windows is installed and is using a UEFI/EFI partition, you might have to reinstall Windows after you change the BIOS configuration.
Intel Virtualization, VT, VT-d, Directed I/O	This is a virtualization technology that gives virtual machines full access to the hardware.	Disable virtualization features that can cause problems with INtime performance or with HyperWire card interrupts.

Change Power Options in Windows

Aerotech recommends that you change some of the power management settings in Microsoft Windows. Some of the options in this procedure might not be available on your PC.

TO CONFIGURE POWER OPTIONS FOR WINDOWS 7, WINDOWS 8.1, AND WINDOWS 10

1. Open **Control Panel**.
2. Click **View By** and then select **Large Icons**. Then click **Power Options**.
3. Select **High performance**. You might have to expand **Show additional plans** and then select **High Performance**.
4. Click **Change plan settings**. The **Edit Plan Settings** dialog comes into view.
5. Configure the settings that follow.

    1. Set **Turn off the display** to **Never**.
    2. Set **Put the computer to sleep** to **Never**
    3. Click **Save Changes**.
6. Click **Change advanced power settings**. The **Power Options** dialog comes into view.
7. Configure the Windows Power Options features as follows.

    - Hard Disk: Set **Turn off hard disk after** to **Never**.
    - Sleep:
        - Set **Sleep after** to **Never**.
        - Set **Allow hybrid sleep** to **Off**.
        - Set **Hibernate after** to **Never**.
        - Set **Allow wake timers** to **Disable**.
    - USB settings: Set **USB selective suspend setting** to **Disabled**.
    - Power buttons/Sleep buttons: Set all hibernate buttons, power buttons, and sleep buttons to **Shutdown** or **Do Nothing**.
    - PCI Express: Set **Link State Power Management** to **Off**.
    - Processor Power Management
        - Set **Minimum processor state** to **100%**.
        - Set **Maximum processor state** to **100%**.
    - Display: Set **Turn off display after** to **Never**.
    - Disable all other Sleep, Standby, Hibernation, or Lower Power Mode settings that are shown.
8. Click **Apply** and then click **OK**.

Disable Windows Fast Startup

Windows 8.1 and Windows 10 use a boot mode called **Fast Startup**, which is enabled by default. When this boot mode is enabled, it can cause problems with INtime. Aerotech strongly recommends that you disable this setting. Some of the options in this procedure might not be available on your PC.

TO DISABLE FAST STARTUP FOR WINDOWS 8.1 AND WINDOWS 10

1. Open **Control Panel**.

2. Click **View by** and select **Large icons**. Then click **Power Options**.

3. On the left in the **Power Options** dialog, click **Choose what the power button does**. The **System Settings** dialog comes into view.

4. Click **Change settings that are currently unavailable**.

5. In the **Shutdown settings** section of the dialog, configure the settings that follow.

   ■ Clear the **Turn on fast startup (recommended)** box.

   ■ Clear the **Sleep** box.

   ■ Clear the **Hibernate** box.

6. Click **Save changes**.

Configure Windows 10 Automatic Updates

NOTE: To prevent problems, you must configure Windows 10 updates to work with your A3200 and INtime system. Refer to the User Guide to Windows 10 Updates on www.aerotech.com.

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Disable Audio Hardware

Disable your audio hardware if you do not need to use it. If you know how to change BIOS settings, disable your audio hardware from the BIOS. Then, do the procedure that follows to disable all audio devices from within Windows.

TO DISABLE AUDIO HARDWARE FROM DEVICE MANAGER IN WINDOWS 7, WINDOWS 8.1, AND WINDOWS 10

1. Open **Control Panel**.
2. Click **View by** and select **Large icons**. Then click **Device Manager**.
3. In **Device Manager**, expand the **Sound, video and game controllers** category.
4. For all audio devices in the list, right-click each device and select **Disable**. In the warning dialog, click **Yes** to disable each audio device.
5. Close **Device Manager**.

Change the Display Configuration

Problems with real-time performance can be caused by the graphics card or the graphics driver. Try one or more of these possible solutions.

Change the settings in the Graphics Card Configuration Utility

Open the configuration utility for your graphics card. Typically, you can right-click on the Desktop and select the item to configure the display or graphics properties. Aerotech recommends these settings.

- Configure the card to use a **Performance** mode as an alternative to a **Quality** mode.
- Disable the power management features of the card.
- Disable all hardware acceleration modes (also called turbo modes).

Change the display adapter to use basic graphics

Some graphics cards can decrease the real-time performance of your PC because they use advanced graphics features. Standard display drivers decrease the workload of the card and improve the performance of the PC. If your graphics card is causing problems with real-time performance, change the display adapter to **Standard VGA Graphic Adapter** or **Microsoft Basic Display Adapter**. Then, if your screen resolution is not satisfactory you can change it to a better resolution.

Use a medium-performance modern graphics card

Aerotech recommends that you do not use high-end display adapters because they can cause interference with the A3200. Use a medium-performance onboard integrated graphics adapter or a medium-performance PCI express dedicated graphics card. If your graphics card causes problems with A3200 performance, try a different graphics adapter.

Do Not Use Software and Hardware That Can Decrease Performance

Some third-party software programs, device drivers, and hardware devices can cause jitter and latency on a PC. This has an effect on the real-time performance of the A3200 and INtime.

Devices that require too much PCI Express bus bandwith can cause communication errors or motion dropouts when the A3200 accesses the PCI Express bus. Here are some examples.

- Vision or frame grabber software
- Frame grabber PCI Express devices
- Other high-bandwith PCI Express devices

To help real-time performance, remove all third-party software and hardware devices. If you must have one or more of these items in your system and you have real-time performance problems, use a dual PC (client/server) configuration. On a dual PC solution, A3200 and INtime run on a server PC and all other software programs run on a client PC. For more information, refer to Remote Server and Client Installation and Configuration in A3200 Help.

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Chapter 3: Controller Performance

The A3200 installation tries to configure your system for the best possible performance. However, you might need to change some controller settings so that the A3200 performance on your PC is acceptable. To change controller settings, use these recommendations for your AeroBasic program.

- In Configuration Manager, change the value of the EnabledTasks Parameter to disable unused tasks.
- Decrease the number of task programs that run at the same time.
- Decrease the use of the CRITICAL START Command and CRITICAL END Command. These commands cause the controller to execute program lines at a fast rate and can decrease real-time performance.
- If the MotionUpdateRate Parameter is set to a value greater than 1.0 and you have motion problems or bad controller performance, change the MotionUpdateRate to 1.0 to decrease the workload of the controller.
- Do not use the ON Command and the ONGOSUB Command more than 20 times in a program.

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