

RTD cpuModule GX/HX to CX Series Migration Guide



RTD Embedded Technologies, Inc.

"Accessing the Analog World"®

ISO9001 and AS9100 Certified

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Rev. C

Revision History

Rev. A	03/28/2007	Initial Release
Rev. B	04/20/2007	Improved figures and format. Clarified paragraphs.
Rev. C	04/09/2010	Added information about the Geode LX as a recommended migration path for all Geode GX1 boards, since the GX1 is discontinued.

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Background Information

RTD Embedded Technologies has recently introduced a new series of Geode and Celeron-based cpuModules, referred to as the “CX series”. The CX series converts the 32-pin DIP socket for onboard flash based storage devices from a socket that supports SSD and BIOS Extension devices (such as the M-Systems DiskOnChip) to a socket that supports an ATA/IDE Disk Chip device. CX series cpuModules can be easily recognized by the cpuModule part number (e.g. CME147786CX).

RTD recommends all customers using the GX or HX series of cpuModules transition to the new CX series. The CX series was designed to be a painless upgrade to existing DiskOnChip users and a near-transparent upgrade for non-users of the 32-pin DIP socket. Most of the HX cpuModules have a drop-in equivalent. Users of DiskOnChips will require minor changes, if any, to their existing software.

This document contains information to help customers easily transition to the CX series. Current GX and HX cpuModule customers not wishing to transition to the CX series in their existing projects should contact RTD.

Advantage of the ATA Disk Chip

The ATA Disk Chip is an exciting new flash storage device. Unlike the M-Systems DiskOnChip, it is a true IDE device. It offers all the benefits of a traditional IDE hard drive in a compact, rugged package.

The ATA Disk Chip offers the following advantages over the DiskOnChip:

1. **Natively supported by all major operating systems.** The ATA Disk Chip is compatible with any operating system that understands IDE hard drives, no special drivers are needed.
2. **Interrupts and DMA support.** The ATA Disk Chip is a true IDE device that uses interrupts and DMA to reduce CPU load and improve total system performance.
3. **No BIOS extension firmware required.** Since it operates as an IDE device, the ATA Disk Chip has no need for special firmware which can add several seconds to the system boot time or interfere with other BIOS extension firmware.
4. **Higher capacities.** ATA Disk Chips are currently available in capacities from 32MB to 4GB, in both commercial and industrial temperature ranges, with larger capacities planned.
5. **Better control over the system boot order.** The ATA Disk Chip follows the boot order specified in the BIOS, which allows the user more control over system bootup.

Recommended Migration Path

See the below table for the recommended migration path from the HX or GX series cpuModules.

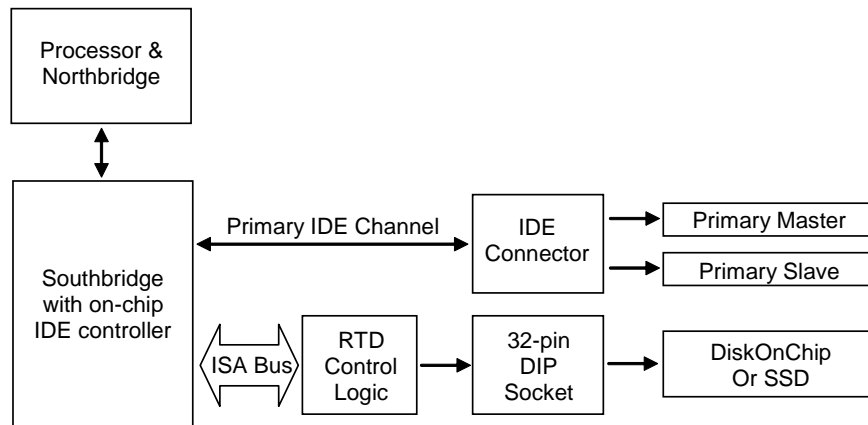
Current cpuModule:	Recommended Replacement
486 series	Geode LX family
PC/104 Geode GX1*	Geode LX family
PC/104-Plus Geode GX1*	Geode LX family
CME47786HX	CME147786CX
CML47786HX	CML147786CX
CMX47786HX	CMX147786CX

In addition to the models listed in the table, RTD also offers a line of **Intel Pentium M** and **Celeron M** processors that also supports the ATA Disk Chip for those who need more computing power. For more information, contact the RTD sales department (sales@rtd.com).

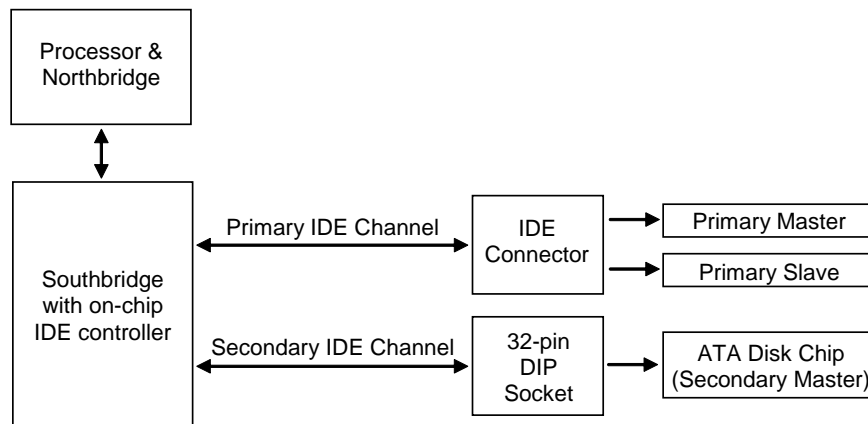
ATA Disk Chip Interface

The architecture difference between the GX/HX series and the CX series is summarized in the block diagrams below:

GX/HX cpuModule



CX cpuModule (Celeron family)



NOTE: The Geode LX series only has a single IDE channel, so the above diagram is slightly different. Refer to the board manual for more information.

On the CX series, the ATA Disk Chip is connected to the secondary IDE channel of the CPU chipset. If an ATA Disk Chip is installed, it will be detected as the Secondary Master IDE device by the BIOS. It can be formatted and partitioned like a traditional hard drive.

One significant difference of the CX series versus the GX/HX series is the presence of the secondary IDE channel on the cpuModule. On the GX/HX series, there was no secondary IDE channel on the cpuModule. This meant that it was possible to use an external add-on IDE controller, configured as the secondary IDE controller (IRQ15). This is not possible with the CX series (while the ATA Disk Chip is enabled). While the Disk Chip is enabled, an external secondary IDE controller may not be used. Additionally, while the Disk Chip is enabled, IRQ15 is no longer available for use by add-on cards.

Hardware Considerations

- Celeron-based HX series customers: The CX series should be a drop-in replacement. I/O connectors and key components have the same location.
- Geode GX1 (GX/HX series) customers: The Geode GX1 chipset has been discontinued. Customers using the Geode GX1 will also need to migrate to the newer Geode LX chipset. Refer to SWM-640000023.
- DO NOT attempt to plug a SSD or BIOS Extension device (like the DiskOnChip 2000) into the 32-pin DIP socket on a CX series cpuModule. Inserting such a device will damage the board.
- On the Celeron family, the ATA Disk Chip uses the Secondary IDE controller. If an external secondary IDE controller is installed in the system, it must be disabled or removed to use the ATA Disk Chip.
- On the Celeron family, the ATA Disk Chip IDE channel uses IRQ15. If an add-on board is using IRQ15, it should be configured for a different IRQ to prevent conflicts with the ATA Disk Chip's IDE channel.
- On the Celeron family, if a customer does not intend to use the ATA Disk Chip, the secondary IDE channel may be disabled. This allows the use of an external secondary IDE controller or IRQ15.
- On the Geode LX family, there is only one IDE channel (Primary). The ATA Disk Chip uses the Primary Master IDE location. An external IDE device must be jumpered as slave. Refer to the board manual for more information.

BIOS Setup Menu Differences

The following changes were made to the BIOS Setup Menus:

1. Menu option to enable/disable the onboard secondary IDE channel was added.
2. Menu option to select the type of ATA Disk Chip installed (DMA mode or PIO mode) was added.
3. Menu option to configure the SSD Socket and BIOS Extension window was removed.

New Software Installations

Installing an operating system such as DOS, Windows, or Linux onto the ATA Disk Chip is quite easy. Since the Disk Chip appears as a hard drive, it should be recognized immediately by the operating system's installer. Installing the OS to the ATA Disk Chip is no different than installing to a traditional IDE hard drive. It can be formatted and partitioned as if it is a hard disk.

Migrating Existing Software

Depending on your operating system, changes to your existing embedded software may be necessary to use the ATA Disk Chip. The changes are described below.

DOS

Since DOS does not use any special drivers for disk access, no changes should be necessary to use the ATA Disk Chip. The M-Systems DOS utilities (DFORMAT, DINFO, etc.) will not work with an ATA Disk Chip, nor are they required.

Windows

For Windows, the recommended migration procedure is to install a new copy of Windows onto the ATA Disk Chip, and copy the necessary files from the old Windows install. If re-installing Windows is not desirable, one can use the Sysprep tool (downloadable from Microsoft), which will force Windows to re-detect the IDE channels.

Simply copying the contents the DiskOnChip over to the ATA Disk Chip will not work. If one simply copies the files, Windows will be unaware of the IDE controller changes. This will cause Windows to generate a “Blue Screen” error with the STOP code INACCESSIBLE_BOOT_DEVICE (0x0000007B) on bootup.

Linux

To use an ATA Disk Chip, IDE controller and IDE hard disk support must be enabled in your Linux kernel. You can also optionally enable the chipset-specific IDE drivers for improved performance.

An M-Systems DiskOnChip 2000 device is usually mapped as /dev/inftla or /dev/msys/fla. The ATA Disk Chip appears as /dev/hdc. You must edit the file /etc/fstab file to properly reference the new device.

It will also be necessary to edit your boot loader configuration. It should be updated to use the Linux kernel on /dev/hdc (instead of /dev/inftla or /dev/msys/fla). Refer to the boot loader’s documentation for information on how to change its configuration. If you are currently using a DiskOnChip-specific boot loader (e.g. DOCBoot) you should replace it with a standard boot loader, such as LILO or GRUB.

Once the Linux distribution is booted and functioning properly, it is recommended that you remove the DiskOnChip drivers from the system. If you are M-Systems binary Linux driver, one can simply delete the kernel modules. If you are using the open source MTD driver, you will probably need to recompile the kernel.

Other Operating Systems

The exact steps for making these changes will depend on your operating system. In general, the changes are as follows:

1. Verify that drivers for the onboard IDE controller are installed and enabled.
2. Re-configure the operating system to use the IDE Secondary Master as the main boot device, instead of the DiskOnChip.
3. Remove any DiskOnChip drivers.

For Additional Information

- If you have questions about your RTD cpuModule or the ATA Disk Chip, contact RTD’s technical support at 814-234-8087 or techsupport@rtd.com.
- Data sheets and specifications for the ATA Disk Chip may be downloaded from the Apacer web site, www.apacer.com.