

APPLICATION NOTE

RTD Linux Support Overview



RTD Embedded Technologies, Inc.

"Accessing the Analog World"®

ISO9001 and AS9100 Certified

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Rev F



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Revision History

09/14/2004	Revision A issued
07/15/2005	Revision B issued Added Fedora Core 4 notes to "2.6 Kernels" section
04/07/2010	Revision C issued Document Title changed Content significantly re-written to cover current Linux distributions Added information about x86 compatibility Added AS9100 Information
10/20/2014	Revision D issued Removed 2.4 kernel support Added 3.x kernel support
12/17/2015	Revision E issued Added 4.x kernel support Added Verified Compatible Linux Distros section
07/20/2016	Revision F issued Added entries for Atom CPU Board into compatible Linux distros table

Introduction

RTD strives to provide Linux support for all current board-level products. This document outlines RTD's Linux compatibility. Where applicable, RTD offers software packages to provide Linux support.

During software development and testing, RTD will use the latest released version of a popular Linux distro, as well as the latest stable kernel release from kernel.org. RTD currently uses the following:

- openSUSE 11.4 with default 2.6.37 kernel
- openSUSE 13.2 with default 3.16 kernel
- openSUSE 13.2 with kernel 4.2 from kernel.org

cpuModule Linux Support

RTD's current cpuModule products are x86 compatible. From an operating system perspective, there is little difference between an RTD cpuModule and a typical desktop PC. This makes Linux support fairly straightforward.

Most standard desktop Linux distributions can be installed onto an RTD cpuModule with little effort. The procedure for installing Linux onto an RTD cpuModule is essentially the same as a desktop PC:

1. Obtain a copy of the Linux distribution install discs (CD or DVD).
2. Attach a DVD-ROM or CD-ROM drive to the RTD cpuModule (attach to IDE/SATA or USB).
 - Note: If using a USB-powered ROM drive, you may experience problems during install due to the USB-spec current limiting on the port. If the drive appears to become unresponsive during install, especially after disk spin-up, then please use a drive that has its own power supply.
3. Configure the BIOS to boot to the DVD/CD drive.
4. Insert the Linux install disc.
5. Boot to the install disc.
6. Follow the on-screen instructions.

NOTE: The ATA Disk Chip provided by RTD has a limited capacity (typically 1, 4, or 8GB). Desktop Linux distributions usually contain several large software packages (e.g. OpenOffice.org). Due to disk space constraints, it may be necessary to forego these packages when installing to an ATA Disk Chip.

A major benefit of x86 compatibility is that most onboard hardware should work "out of the box" under Linux. This includes:

- ATA Disk Chip (uses a standard IDE/SATA Interface)
- VGA
- Serial Ports
- USB
- Ethernet

Special RTD Features: Most RTD cpuModules include special features such as Advanced Digital I/O (aDIO) and Advanced Analog I/O (aAIO). To use these features, drivers are provided by RTD. These drivers are similar to the ones provided for our peripheral modules (see below).

NOTE: The RTD drivers are not necessary to use the standard PC features of your cpuModule. If you do not intend to use the RTD special features, no additional drivers will be needed.

Peripheral Module Linux Support

RTD offers a diverse range of Peripheral Modules (Data Acquisition, Wireless, etc). The required software support for these modules can vary. Some peripheral boards are natively supported by the Linux kernel, and require no additional software support from RTD. Others require RTD drivers.

Linux support for Peripheral Modules can be divided into four categories:

1. **Native Support** – Drivers are built into the Linux kernel. No additional software support from RTD is required.
Examples: Ethernet, USB, and FireWire
2. **RTD Support** – Drivers are provided by RTD.
Example: dataModules, aDIO
3. **Hybrid Support** – Drivers for core functionality are built into the Linux kernel. RTD provides software packages for extended functionality and improve ease of use.
Examples: GPS and Cellular Modems
4. **Community Support** – Drivers were developed by the open source community, and are not under the control of RTD.
Example: Frame Grabbers

RTD-developed Linux Drivers

Due to the fragmented nature of Linux, it is almost impossible to produce a Linux driver that is compatible across all Linux kernels and distributions in use. As a result, RTD focuses Linux development and testing on a specific set of popular kernels and distributions.

The current test matrix for RTD Linux drivers is:

- 2.6 Kernel Support
 - openSUSE 11.4 with the standard kernel (2.6.37) included with the distribution
- 3.x Kernel Support
 - openSUSE 13.2 with the standard kernel (3.16) included with the distribution
- 4.x Kernel Support
 - openSUSE 13.2 with the latest "stable" 4-series kernel from www.kernel.org

NOTE #1: This test matrix applies to current RTD driver development. Older drivers may have been developed with older Linux distros. Consult the README.TXT included in the driver package for specific information.

NOTE #2: The version number of the latest stable kernel from www.kernel.org will vary. RTD will use latest stable version that is available at the time the driver is developed.

The specific Linux distribution and kernel revision used for driver development/testing is documented in the README.TXT file that is included with the software package. Consult this documentation to verify compatibility prior to compiling the driver.

Linux Support Limitations

1. **Kernel Version** - The Linux kernel APIs are a “moving target”. The APIs frequently change between kernel revisions. Additionally, the kernel supplied by the distribution vendor may have patches applied that alter the APIs. Therefore, RTD cannot guarantee compatibility with Linux platforms other than those documented in README.TXT. It may be necessary to modify the driver source code and/or Makefiles to accommodate an unsupported platform.
2. **Real-Time Linux** - Several real-time versions of Linux exist. These Linux versions have wildly divergent programming models, with no clear market share leader. As a result, RTD Linux drivers currently do not utilize the feature of any real-time Linux platform. Note that on most platforms, the standard RTD Linux driver will usually compile and run, however it will not be able to take advantage of the real-time features.
3. **Non-x86 Processor Architectures** - RTD Linux drivers are currently developed and tested only with x86 processors. RTD does not provide support for non-x86 platforms.

Since full source code is provided by RTD, the customer is free to modify the driver as necessary to accommodate their platform.

Verified Compatible Linux Distros

The following tables list all Linux distros where installation was attempted, for every RTD cpuModule. If specific steps were required for success, or oddities encountered, they are noted. A blank entry means the install was nominal. Entries shaded red were unsuccessful.

PCI Express and PCI Single Board Computers

Intel Atom (CML24)

Operating System	Notes on install
openSUSE 12.2	Does not see SATA devices during install. SATA controller most likely not supported in that kernel version.
openSUSE 12.3	Does not see SATA devices during install. SATA controller most likely not supported in that kernel version.
openSUSE 13.1 64-bit	
openSUSE 13.2 64-bit	
Ubuntu 15.10 64-bit	

Core 2 Duo (CMA22M, CMX32M, CME34M, CMV34M)

Operating System	Notes on install
CentOS 5.4	If without LVDS, must set BIOS to Analog VGA only before install.
CentOS 5.6	
CentOS 5.9	
CentOS 6.5	
Debian 6.0.3	
Debian 8.2	After install there may be a second internal display that is set to primary. Feel around off screen for the login box then right click into settings>display to shut of the display.
Fedora 13	
Fedora 14	
Fedora 17	Requires nomodeset kernel parameter.
Fedora 20	Requires nomodeset kernel parameter.
openSUSE 10.2	
openSUSE 11.0	
openSUSE 11.2	
openSUSE 11.3	Xwindow server would not start, command prompt only after install.
openSUSE 11.4	Had to add acpi=off to install args.
openSUSE 12.1	Had to add acpi=off to install args.
openSUSE 12.2	
openSUSE 12.3	Install gave error about creating hd partition, but retry succeeded and it works fine now.
openSUSE 13.1	
openSUSE 13.2	
Porteus 3.1	
Ubuntu 10.04	
Ubuntu 11.04	
Ubuntu 12.04	
Ubuntu 15.10	If install process doesn't show up at first, alt tab to select it and hit enter to begin installation. Afterwards go to display settings and shut off Built in Display.

Core i7 (CMA34CRx)

Operating System	Notes on install
CentOS 6.5 (64.bit)	
Fedora 22	
openSUSE 11.4	CRS requires "nomodeset" boot parameter. CRD and CRQ require "nosmp" boot parameter
openSUSE 12.2	After install was getting "GPU hung" errors. Did ipper update and it appears fixed.
openSUSE 13.1	
openSUSE 13.2	Installs, but you'll need to change BIOS to "EFI First" for it to boot afterwards if you installed it as EFI.
Ubuntu 12.04	
Ubuntu 14.04.1	
Ubuntu 15.10	
Debian 6.0.3	

Debian 8.2	
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AMD Fusion G Series (CMA24G, CMX34G)

Operating System	Notes on install
CentOS 6.4 (32-bit)	Use basic video driver installation method or you will have a corrupt display after booting to the OS.
CentOS 6.5 (64-bit)	
Debian 6.0.4	
Debian 8.2	
Fedora 22	System seemed to be unresponsive immediately after install was complete (mouse moved, but nothing was clickable). Reset system, appears to work fine.
openSUSE 11.4 (32-bit)	Installed, but Display Port is not immediately supported, and OpenGL appears to not work correctly. Resolved by installing AMD proprietary Catalyst driver.
openSUSE 11.4 (64-bit)	Installs with ELILO bootloader, but that is incorrectly omitted from the Install DVD image.
openSUSE 12.2	
openSUSE 12.3	
openSUSE 13.1	
openSUSE 13.2	
Ubuntu 15.10	

ISA & PCI Single Board Computers

Geode LX (CME136, CME137)

Operating System	Notes on install
CentOS 6.3	Failed to begin installation.
Fedora Core 6	
Fedora 15	Failed to begin installation; Requires more than 512mb of ram for installation.
Red Hat 7.3	USB 2.0 devices cause machine to lock up. Disable 2.0 in BIOS so they're used as 1.1 devices, and it works fine.
Red Hat 9.0	
Ubuntu 10.04	
openSUSE 11.4	
openSUSE 12.1	
openSUSE 12.2	Installed fine, but on boot XServer crashes (illegal operation). No resolution found. Text mode works fine.
openSUSE 13.1(32-bit)	Installation requires greater than 512mb ram

Celeron (CME146, CME147)

Operating System	Notes on install
CentOS 5.6	
Fedora 13	When installing, choose basic video install. Then edit kernel parameters to delete the videox driver and add "nohz=off"
openSUSE 10.0	Requires kernel boot parameter "maxcpus=0" for install
openSUSE 11.2	

openSUSE 11.4	
Red Hat 9.0	If the display (desktop) comes up too large for the monitor, set panel type to analog only in BIOS.

Celeron M (CMA157, CMX158)

Operating System	Notes on install
Debian 6.0.3	
Red Hat 9.0	

Pentium M (CMA157, CMX158)

Operating System	Notes on install
CentOS 5.6	
CentOS 6.3	The graphical installer requires > 512 MB RAM, or it will default to text installer which only does a MINIMAL install. Recommended to install on a 1 GB RAM CPU
Fedora 13	Select install with basic video driver, and then add "nohz=off" to install args.
openSUSE 10.2	
openSUSE 11.0	
openSUSE 11.4	Requires nomodeset arg in kernel parameters.
openSUSE 12.1	Install stopped at blank screen for CMA157. Added acpi=off to install args, installed fine.
openSUSE 12.2	Installed without problems, but graphical glitches in KDE. Using a 3.8.8 kernel looked fine.

Technical Support & Driver Updates

Updated software and documentation is frequently posted to the RTD web site. Be sure to visit www.rtd.com regularly for newer versions, or contact tech support if an current driver is not available.

Users with questions regarding RTD products and software are encouraged to contact Technical Support:

Phone: 814-234-8087

E-Mail: techsupport@rtd.com

Note that RTD Technical Support is not a general Linux help desk. Customers who require general Linux support are encouraged to contact their Linux distribution supplier, and/or visit their local Linux Users Group (LUG).