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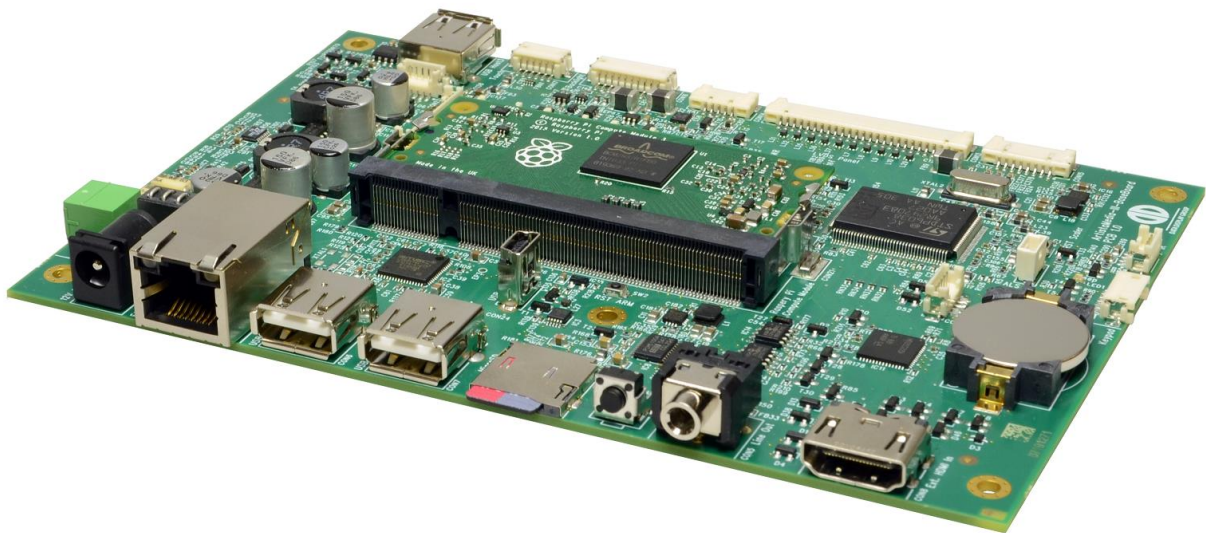TECHNOLOGIES

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Manual

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Artista-IoT

Industrial ARM Platform based on Raspberry Pi CM3

PA-36-XXX

Version 1.0

19.09.2017

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1 Revision History

Date	Rev.No.	Description	Page
19.09.2017	1.0	Initial version	All

2 Introduction

Artista-IoT is an industrial ARM platform based on Raspberry Pi Compute Module 3 (CM3) and ArtistaMedia-III Base Board. The base board carries the Compute Module and has been developed by Distec GmbH, a member of the Data Display Group.

Per default the product is delivered with a preinstalled Raspbian operating system. This is intended to be a well-known demo system to show and test the features of Artista-IoT. The preinstalled Raspbian operating system is not intended to be used in a commercial embedded product.

WARNING:
The standard Raspbian OS installation is not robust against power fail situations. Thus the OS always needs to be shut down properly before power off. Otherwise the flash disc image might be corrupted and the OS will not boot any longer and must be completely overwritten with a new image!

3 Flashing Raspberry Pi OS Disk Images to Artista-IoT

Artista-IoT is an embedded ARM platform consisting of a Raspberry Pi Compute Module 3 (CM3) and the ArtistaMedia-III Base Board.

The Compute Module has an on-board eMMC device connected to the primary SD card interface. That means, the Raspberry Pi OS disk image must be programmed to that flash memory via USB. The Compute Module is not able to boot from the external SD card of the ArtistaMedia-III Base Board.

A general description, how to flash the eMMC on the Raspberry Pi Compute Module can be found here:
https://www.raspberrypi.org/documentation/hardware/computemodule/cm-emmc-flashing.md

Since the instruction above is written for using the Raspberry Pi Compute Module I/O board, the differences for Artista-IoT with ArtistaMedia-III Base Board are described below.

3.1 Connecting to the Compute Module eMMC as USB Mass Storage Device

To flash the Compute Module eMMC, you either need a Linux or Windows system. A software tool on the host system and an USB connection between the host and Artista-IoT is required.

3.1.1 For Linux Users

To mount the eMMC flash memory of the Raspberry Pi Compute Module as USB Mass Storage Device under Linux the tool "usbboot" is required.

A detailed description, how to get, build and use it can be found in the section "BUILDING RPIBOOT ON YOUR HOST SYSTEM (CYGWIN/LINUX)" at the link below:
https://www.raspberrypi.org/documentation/hardware/computemodule/cm-emmc-flashing.md

3.1.2 For Windows Users

For those who just want to enable the Compute Module eMMC as a USB Mass Storage Device under Windows, the stand-alone software tool called "RPiBoot.exe" is the recommended option. It has been tested on Windows 10 (32 and 64 bit) but previous Windows versions should also work.

A detailed description, how to get and install it can be found in the section "WINDOWS INSTALLER" at the link below:
https://www.raspberrypi.org/documentation/hardware/computemodule/cm-emmc-flashing.md

3.1.3 Required Hardware

Beside a host system with Linux or Windows operating system, a standard USB-A to Mini-USB-B adapter cable is required. It is used to connect the host system with CON24 of Artista-IoT.

Part	Part Number	Part Description
Mini USB Cable	KA-30-207	USB-Cable type A/Mini 5pin. m/m 1m

3.2 Writing the OS Disk Image to Compute Module eMMC

Before the operating system disk image can be flashed to the on-board eMMC memory of the Raspberry Pi Compute Module, it must be connected to the host system as USB mass storage device. A description how to do this can be found in the section above.

3.2.1 For Linux Users

A detailed description, how to write the operating system disk image to the Compute Module eMMC under Linux can be found in the section "WRITING TO THE EMMC - LINUX" at the link below:
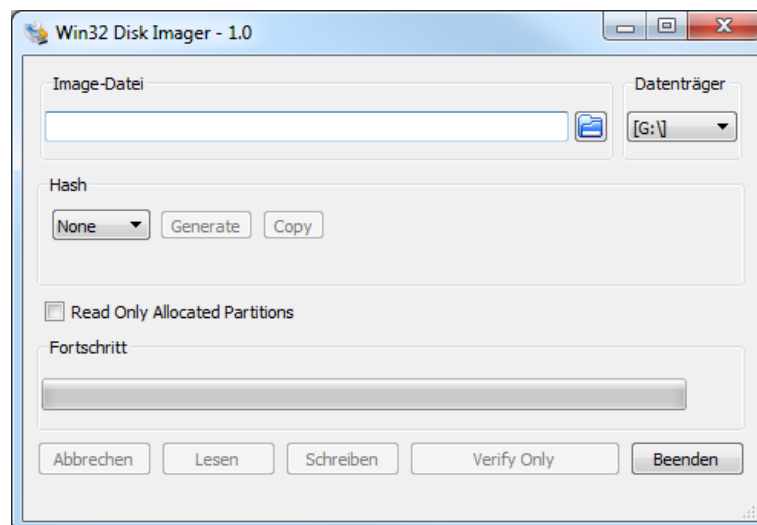https://www.raspberrypi.org/documentation/hardware/computemodule/cm-emmc-flashing.md

3.2.2 For Windows Users

A useful tool to write operating system disk images to an USB Mass Storage Device under Windows is "Win32DiskImager".

Its installer can be downloaded from the Sourceforge Project page at the link below:
https://sourceforge.net/projects/win32diskimager/

3.3 Step by Step Instruction for the Flash Process with Artista-IoT

This section describes how an operating disk image can be installed on the Raspberry Pi Compute Module of Artista-IoT via USB.

1.) Disconnect power supply from Artista-IoT

2.) Connect the standard USB-A to Mini-USB-B adapter cable KA-30-207 to your PC and CON24 of Artista-IoT (this is the straight Mini-USB connector on the board)

3.) Start "usbboot" (Linux) or „RPiBoot.exe" (Windows)

4.) Connect power supply to Artista-IoT

5.) Raspberry Pi Compute Module 3 (CM3) now boots to a special mode, where you can access the on-board eMMC flash memory from the PC as USB Mass Storage Device

6.) Use "dd" (Linux) or "Win32DiskImager" (Windows) to write the system image to Raspberry Pi Compute Module eMMC

7.) Disconnect power supply from Artista-IoT

8.) Disconnect the USB cable from Artista-IoT

9.) Connect power supply to Artista-IoT again and boot it the first time

4 Adapting Standard Raspberry Pi OS Disk Images for Artista-IoT

If you already have a system disk image for a standard Raspberry Pi 3 and want to install this on Artista-IoT the following things have to be considered:

1.) The disk image must be located in the on-board eMMC of the Raspberry Pi Compute Module (max. possible size is 4 GiB):

   The disk image must fit into the eMMC flash memory of the Raspberry Pi Compute Module of Artista-IoT. This flash device has a size of 4 GiB and is connected to the primary SD card interface of the Raspberry Pi SoC. Unfortunately, it is not possible to boot from the external SD card of Artista-IoT, which is connected to the secondary SD card interface.

2.) Copy custom "dtblob.bin" into the "boot" partition of your Raspberry Pi disk image

3.) Modify "config.txt" in the "boot" partition of your Raspberry Pi disk image

4.1 Custom "dtblob.bin" for Artista-IoT

Distec provides a custom "dtblob.bin" file for Artista-IoT. This file is required to configure the hardware interfaces of Artista-IoT properly.

This file must be copied into the "boot" partition of the Raspberry Pi disk image.

The custom "dtblob.bin" comes with the preinstalled Raspbian OS of Artista-IoT.
If you don't have access to this file, please ask your sales contact in the FORTEC Group to get it.

Please refer to section Connecting to the Compute Module eMMC as USB Mass Storage Device to see, how you can access to the "boot" partition of Artista-IoT.

General information about the "dtblob.bin" file can be found here:
https://www.raspberrypi.org/documentation/configuration/pin-configuration.md

4.2 Adapting "config.txt" for Artista-IoT

The Raspberry Pi uses a configuration file called "config.txt" to store system configuration parameters. It must be located in the "boot" partition of the Raspberry Pi disk image.

This file must be adapted to support Artista-IoT properly.

The adapted "config.txt" comes with the preinstalled Raspbian OS of Artista-IoT.

Please refer to section Connecting to the Compute Module eMMC as USB Mass Storage Device to see, how you can access to the "boot" partition of Artista-IoT.

General information about the "config.txt" file can be found here:
https://www.raspberrypi.org/documentation/configuration/config-txt/

4.2.1 Standard Adaptations for Artista-IoT

Per default, the following entries must be added to the end of your "config.txt" file to support Artista-IoT:

```
# Disable black borders
disable_overscan=1

# HDMI with sound
hdmi_drive=2

# HDMI RGB full (0-255)
hdmi_pixel_encoding=2

# Enable MicroSD card reader, accessible on "MicroSD" connector:
dtoverlay=sdio

# UART0 port for Debug console, accessible on "UART0" connector:
dtparam=uart0

# UART1 port for scaler communication, accessible on "GPROBE" connector:
dtoverlay=uart1,txd1_pin=32,rxd1_pin=33
core_freq=250

# Enable RTC, accessible over I2C1:
dtoverlay=i2c-rtc,ds1307

# I2C1 port for RTC and I2C touch controllers, accessible on "GPIO" and "Touch" connectors:
dtparam=i2c1
```

4.2.2 Supporting the Goodix I2C Touch Screen of the Artista-IoT Starter Kit

Support for the Goodix I2C touch screen of the Artista-IoT Starter Kit is available in the current Raspbian Linux kernel (version 4.9 and above).

To enable it, the following entries must be added to the end of your "config.txt" file:

```
# Enable Goodix gt9271 touchscreen on "Touch" connector:
dtoverlay=goodix,interrupt=34,reset=35
```

FORTEC
ELEKTRONIK AG

Our company network supports you worldwide with offices in Germany, Austria, Switzerland, the UK and the USA. For more information please contact:

Headquarters

Germany

FORTEC
ELEKTRONIK AG

FORTEC Elektronik AG
Lechwiesenstr. 9
86899 Landsberg am Lech

Phone: +49 8191 91172-0
E-Mail: sales@fortecag.de
Internet: www.fortecag.de

Fortec Group Members

Austria

FORTEC
ELEKTRONIK AG

FORTEC Elektronik AG
Office Vienna
Nuschinggasse 12
1230 Wien

Phone: +43 1 8673492-0
E-Mail: office@fortec.at
Internet: www.fortec.at

Germany

DISTEC
A FORTEC GROUP MEMBER

Distec GmbH
Augsburger Str. 2b
82110 Germering

Phone: +49 89 894363-0
E-Mail: info@distec.de
Internet: www.distec.de

Switzerland

ALTRAC
A FORTEC GROUP MEMBER

ALTRAC AG
Bahnhofstraße 3
5436 Würenlos

Phone: +41 44 7446111
E-Mail: info@altrac.ch
Internet: www.altrac.ch

United Kingdom

DISPLAY TECHNOLOGY
A FORTEC GROUP MEMBER

Display Technology Ltd.
Osprey House, 1 Osprey Court
Hichingbrooke Business Park
Huntingdon, Cambridgeshire, PE29 6FN

Phone: +44 1480 411600
E-Mail: info@displaytechnology.co.uk
Internet: www. displaytechnology.co.uk

USA

APOLLO DISPLAY TECHNOLOGIES
A FORTEC GROUP MEMBER

Apollo Display Technologies, Corp.
87 Raynor Avenue,
Unit 1Ronkonkoma,
NY 11779

Phone: +1 631 5804360
E-Mail: info@apollodisplays.com
Internet: www.apollodisplays.com