

# Freescale MQX™ RTOS 4.1.0 FRDM-K22F120M GA Release Notes

## 1 Introduction

These are the Release Notes for the FRDM-K22F120M GA standalone package for Freescale MQX™ RTOS 4.1.0. Freescale PK22FN512VLM12 belongs to the Kinetis K series processor family of the 32-bit microcontrollers. The software is built based on Freescale MQX RTOS version 4.1.0. It includes the full set of RTOS services and a standard set of peripheral drivers. This package can be installed and used as standalone.

For more information, see the *Freescale MQX™ RTOS 4.1.0 Release Notes* (MQXRN) and *Getting Started with Freescale MQX™ RTOS* (MQXGSRTOS).

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## 1.1 Development tools

The FRDM-K22F120M release was tested with the following development tools:

- IAR Embedded Workbench® for ARM® Version 6.70.1
  - Support available for Kinetis ARM Cortex®-M4 devices.
  - See build projects in the iar subdirectories.
- ARM-MDK - Keil μVision® Version 5.0
  - Support available for Kinetis ARM Cortex-M4 devices.
  - See build projects in μv4 subdirectories.
- GNU Tools for ARM Embedded Processors version 4.7-2013-q3
  - Support available for Kinetis and Vybrid devices.
  - Makefile build option: TOOL=gcc\_arm.
- Makefile support (mingw32-make version 3.8.2)
  - Library makefiles are located in <MQX\_library\_dir>/build/<board>/make.
  - Application makefiles are located in <example\_dir>/build/make/<board>.

For instructions on setting up development tools, including installing processor support patches, see Section 4 “Other Notes”.

## 1.2 System requirements

The system requirements are defined by the development tool requirements. There are no special host system requirements for the Freescale MQX RTOS distribution.

## 1.3 Target requirements

The FRDM-K22F120M package was tested with the following hardware configuration:

- FRDM-K22F120M development platform Rev. C with a PK22FN512VLM12 processor

## 2 Features

### 2.1 Key features

This package provides support for the FRDM-K22F120M development platform with a PK22FN512VLM12 processor and a standard set of features and example applications.

This section describes the major changes and new features implemented in this release.

- Core clock: 120 MHz (High Speed Run mode, default)
- Bus clock: 60 MHz (High Speed Run mode, default)
- BSP Timer: SysTick
- Default console: ttyb (OpenSDA)

The package supports these features:

- PSP support for the PK22FN512VLM12 Microcontroller
- BSP for the FRDM-K22F120M development platform with a PK22FN512VLM12 processor
- Standard set of I/O drivers supporting the FRDM-K22F120M peripherals including:
  - LWGPIO driver
  - Serial interrupt and polled driver
  - DMI SPI driver
  - I2C interrupt and polled driver
  - ADC
  - LWADC
  - Flash Driver
  - RTC Driver
  - PIT Timer
  - LPT Timer
  - RNGA
  - SAI
  - SD Card based SPI driver
- USB Device, Host and OTG drivers and stacks
- Example and demo applications demonstrating the Freescale MQX RTOS, USB and MFS usage
- MFS file system

- RTCS Library
- Shell command line interface

## 2.2 Limitations

This release does not support this feature:

- CodeWarrior v10

## 2.3 Example applications

This package contains applications demonstrating kernel, peripheral, and file system on the FRDM-K22F120M development platform. The applications can be found at the following locations:

- <install\_dir>/mqx/examples: standard set of examples for kernel features and basic peripheral drivers
- <install\_dir>/usb\_v2/example: examples demonstrating USB stack features and class drivers
- <install\_dir>/mfs/examples: example applications demonstrating the MFS file system features

## 2.4 Release contents

This section provides an overview of the release content.

Deliverable	Location
<b>MQX PSP Source Code and Examples</b>	<install_dir>/mqx/...
MQX PSP source code for Kinetis	.../mqx/source/psp/cortex_m
MQX PSP build projects	.../mqx/build/<compiler>/psp_frdmk22f120m/...
MQX example applications	.../mqx/examples/...
<b>MQX BSP Source Code</b>	<install_dir>/mqx/...
MQX BSP source code for FRDM-K22F120M board	.../mqx/source/bsp/frdmk22f120m
MQX BSP build projects	.../mqx/build/<compiler>/bsp_frdmk22f120m/...
<b>USB Host Drivers Source Code and Examples</b>	<install_dir>/usb_v2/usb_core/host/...
USB Host source code and class drivers	.../usb_v2/usb_core/host/source
HUB Class Driver	.../usb_v2/usb_core/host/source/classes/hub
Human Interface Device (HID) Class Driver	.../usb_v2/usb_core/host/source/classes/hid
Mass Storage (MSD) Class Driver	.../usb_v2/usb_core/host/source/classes/msd
Communications Device Class (CDC) Class Driver	.../usb_v2/usb_core/host/source/classes/cdc
USB Host build projects	.../usb_v2/usb_core/host/build/<compiler>/usbh_mqx_frdmk22f120m
USB Host example applications	.../usb_v2/example/host
<b>USB Device Drivers Source Code and Examples</b>	<install_dir>/usb_v2/usb_core/device/...
USB Device source code	.../usb_v2/usb_core/device/source
USB Device build projects	.../usb_v2/usb_core/device/build/<compiler>/usbd_mqx_frdmk22f120m
USB Device example applications	.../usb_v2/example/device
<b>USB OTG Drivers Source Code and Examples</b>	<install_dir>/usb_v2/usb_core/otg/...
USB OTG source code	.../usb_v2/usb_core/otg/source
USB OTG build projects	.../usb_v2/usb_core/otg/build/<compiler>/usbd_mqx_frdmk22f120m
USB OTG example applications	.../usb_v2/example/otg
<b>RTCS Library Source Code</b>	<install_dir>/rtcs/...
RTCS source code	.../rtcs/source
RTCS build projects	.../rtcs/build/<compiler>/rtcs_frdmk22f120m
<b>Shell Library Source Code</b>	<install_dir>/shell/...
Shell source code	.../shell/source
Shell build projects	.../shell/build/<compiler>/shell_frdmk22f120m
<b>PC Host Tools</b>	<install_dir>/tools
TFS Make Utility	.../tools/mktfs.exe
Check for Latest Version tool	.../tools/webchk.exe
<b>Documentation</b>	<install_dir>/doc
User Guides and Reference Manuals for MQX RTOS, MFS, IO Drivers, RTCS, USB, etc.	.../doc

## 3 Installation Instructions

### 3.1 Installation guide

Run the FRDM-K22F120M package installer and proceed according to instructions. This package can be used independently of the current MQX 4.1.0 folder.

#### 3.1.1 Build procedure

For build procedures, see the *Getting Started with Freescale MQX™ RTOS (MQXGSRTOS)*.

#### 3.1.2 Default jumper settings

These are the default jumper settings for the FRDM-K22F120M standalone operation:

- J22 J15 J19 J10 J13 on
- J9 on position 1-2

#### 3.1.3 Board-specific build targets

Internal Flash (Debug and Release): These targets enable building applications suitable for booting the system from the Internal Flash memory. After reset, the code is executed from the Internal Flash.

## 4 Other Notes

### 4.1 Keil (Uv4) patch

Because the Keil version 5.00 does not support the PK22FN512VLM12 device, a patch is required for this device. Select the J-LINK/J-Trace Cortex as the debug tool on the **Debug** tab of the **Options for Target** window.

1. Add the target MKxxN 512kB Prog Flash to the J\_LINK/J-Trace driver setting.
2. In the **Operating system** text box of the **Target** tab, select **Freescale MQX**, and then click **OK**.

### 4.2 IAR 6.70.1 patch

Because the IAR version 6.70.1 does not support the PK22FN512VLM12 device, a patch is required for this device.

1. Unzip the patch at the following location:  
`<install_dir>\tools\iar_extensions\Embedded Workbench 6.701_Patch_k22fn512.zip`
2. Copy the ARM folder to the installation directory of IAR:  
`C:\Program Files\IAR Systems\Embedded Workbench x.x`

### 4.3 Lwgpio example

The lwgpio example has been moved to the gpio directory. The old POSIX IO GPIO example was removed, because the driver is no longer supported.

### 4.4 RTCS Library

RTCS files from the /rtcs/source directory are built into a static library. For instance, when the SPI based Wi-Fi solution is used, the RTCS library enables the application to provide and consume network services of the TCP/IP protocol family.

## 5 Known Issues

- Because of the insufficient clock accuracy of CSTCE8M00G55-R0 on the FRDM-K22F120M board, there are noises when the audio example (including USB audio example) is running.
- Because the SPI driver speed is not high enough, there are noises when the `record` command with high baud rate in “`sai_dma_demo`” is running.
- The `sai_dma_demo` may not work properly with the `play` command in some configurations due to the memory alignment issue. This will be fixed in an upcoming version.
- USB
  - The installation folder of the GCC Tool Chain needs to be modified to the correct path manually by the customer. Otherwise, the GCC tool chain cannot work.
  - The GCC Tool Chain is only verified on the Windows 7 system, not verified on any other systems.
  - All the examples on Keil only have the Flash target version, and no RAM target version is provided.
  - External power supply of HUB must be provided before it can be used.
  - The installation folder name of the release package does not contain blank spaces. Otherwise, any change to add space to the path, the GCC Tool chain will fail to get the correct path of source files and fail to compile.
  - There is a post build for USB library generation, which intends to copy the header files and binary library file to the OUTPUT folder. If the USB stack is installed to a folder with a long pathname, this copy operation may fail because of the 260 characters limitation of command line on Windows, and then you get a build error. Please keep the root folder name of USB stack as short as possible to avoid this issue.
  - Parsing HID report descriptor is not implemented in all the HID examples of the USB Host. The key mapping of some HID devices may not be correct and the key mapping for Audio volume control of some Audio devices may not be correct.



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