

MCF5441X

MCU peripherals with
MPU performance

 **freescale**[™]
semiconductor

Get to know the TWR-MCF5441x



TWR-MCF5441X-KIT Freescale Tower System

The TWR-MCF5441X module is part of the Freescale Tower System, a modular development platform that enables rapid prototyping and tool re-use through reconfigurable hardware. Take your design to the next level and begin constructing your Tower System today.

Introduction

The MCF5441X offers MCU peripherals with MPU performance, including integrated analog, an L2 switch and dual Ethernet. Add Linux® and MQX™ RTOS, plus Eclipse-based CodeWarrior IDE and you've got a powerful development package for network-connected industrial applications.

MPU module features:

- MCF5441X V4 ColdFire processor with MMU and EMAC
- Dual Ethernet with L2 Switch
- High-Speed dual-role USB
- Access to DDR2, NAND, serial memories
- Extensive I/Os available up to:
 - 2x SPIs
 - 1x SSI
 - 5x UARTs
 - 1x CAN
 - 2x I²Cs
 - 6x PWMs
 - 1x eSDHC

Enablement support includes:

- Freescale Linux BSP
- Eclipse based CodeWarrior for Microcontrollers v10.0
- Complimentary Freescale MQX RTOS
- VoIP support through audio codec
- IEEE® 1588 Support

How to build your Tower

**STEP
1**

Locate the Elevator Modules

Each elevator module is identifiable by its four card edge connectors.

**STEP
2**

Identify the Elevator Modules

Each elevator module is either Primary or Secondary. They are identifiable as follows:

- Primary Elevator:
written on inside top and denoted by white card edge connectors
- Secondary Elevator:
written on inside bottom

**STEP
3**

Locate Additional Modules

Gather any additional modules that will be used to assemble your desired Tower System configuration.

**STEP
4**

Identify the Primary and Secondary Card Edges

For each module, the words Primary and Secondary are written along the card edges. The primary edge is also denoted by a white stripe.

**STEP
5**

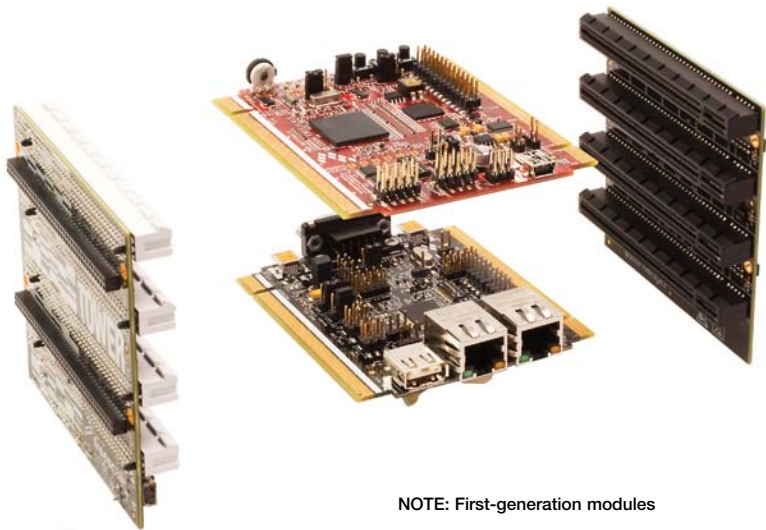
Plug in Primary Card Edge

Match the white stripe on the edge of each module to any available connector on the Primary Elevator and plug it in.

**STEP
6**

Attach Secondary Elevator

With all desired modules connected to the Primary Elevator, carefully attach the Secondary Elevator onto to the secondary card edges of each module.

**STEP
7**

Make Additional Connections

Plug in necessary cables and power sources.

NOTE: First-generation modules

If using the first generation of TWR-ELEV modules, the board labeled Functional Elevator is equivalent to the Primary Elevator as described in the instructions above. The board labeled Dummy Elevator is different than the Secondary Elevator, but will work with most assembled Tower Systems.

If using first-generation peripheral and MCU/MPU modules, the white stripe along the outer edge of the board will not be present.

Step-by-step installation instructions

In this Quick Start Guide, you will learn how to set up the TWR-MCF5441X module and run the Linux and MQX shell demonstrations.

**STEP
1**

Assemble the Required Tower System Modules

The Linux and MQX demonstrations that come pre-installed on the TWR-MCF5441X require the use of the TWR-SER2. Please assemble the TWR-MCF5441X and the TWR-SER2 together using the TWR-ELEV as described in the “How to build your Tower” section of this Quick Start Guide.

**STEP
2**

Connect the Serial Cable

Attach the header end of the provided DB9 adapter cable to UART0 (J1) of the TWR-MCF5441X. Attach the DB9 end to a serial cable connected to the host computer. Open a terminal window on the host computer. Use the appropriate COM port to establish a serial connection with the TWR-MCF5441X.

Use the following connection settings:
Bits per second: 115200, Data bits: 8,
Parity: None, Stop bit: 1, Flow control:
None.

**STEP
3**

Connect the USB Cable

Attach the provided USB A-to-Mini-B cable between the host computer (or a USB wall adapter) and the Mini-B (J9) receptacle on the TWR-MCF5441X. The USB cable will supply power to the TWR-MCF5441X and additional Tower System modules via the TWR-ELEV. The connected terminal window on the host computer should indicate that U-Boot initialization has started.

**STEP
4****Setting the Default OS**

The TWR-MCF5441X comes preloaded with a Linux kernel and a basic MQX shell. The Linux kernel is the default application that U-Boot will load.

To change the default OS press any key within the connected terminal window on the host computer within the first few seconds of U-Boot initialization.

The terminal will present the user with a U-Boot prompt.

Setting the default OS to the MQX shell:

- Type “**set bootcmd run mqxboot**” and press “Enter.” Then type “**save**” and press “Enter” to save this change to the U-Boot environment variable to NAND.
- Press the reset button (SW3) on the TWR-MCF5441X to restart U-Boot and automatically enter the MQX shell.

Setting the default OS to the Linux kernel:

- Type “**set bootcmd run jffs2boot**” and press “Enter.” Then type “**save**” and press “Enter” to save this change to the U-Boot environment variable to NAND.
- Press the reset button (SW3) on the TWR-MCF5441X to restart U-Boot and automatically enter the Linux kernel.

**STEP
5****Linux Prompt Option**

Refer back to Step 4 if required to set the default OS.

U-Boot will initialize and automatically load the preinstalled configuration of Linux from NAND. Once the Linux boot has completed the user is presented with a Linux prompt. At the prompt use the “help” command to explore available commands.

STEP
6

MQX Shell Option

Refer back to Step 4 if required to set the default OS.

U-Boot will initialize and automatically load the precompiled basic MQX shell from NAND. Once the MQX shell has completely loaded the user is presented with an MQX prompt. At the prompt use to “help” command to explore available commands.

STEP
7

Install Additional Software and Tools

- Install CodeWarrior Development Studio for Microcontrollers v10.0 (Professional Edition—30 day license)
- Visit freescale.com/codewarrior for any additional updates or patches
- Install Freescale MQX RTOS v3.6
- Visit freescale.com/mqx for the required v3.6.x patch to support TWR-MCF5441X

STEP
8

Learn More About the MCF5441X, MQX, and the MCF5441X Linux BSP Software

Read the release notes and documentation located on the provided DVD. Visit freescale.com/tower for additional and updated documents, labs and demonstration videos, including demonstrations featuring **IEEE 1588 precise time synchronization and motor control applications**.

Refer to the following labs for more hands-on experience with the TWR-MCF5441X (note some labs require the use of the TWR-SER2):

- **Lab 1:** MQX—Dual Web Server using Freescale MQX RTOS
- **Lab 2:** MQX—Telnet to Serial Bridge Using Optional UART Ports
- **Lab 3:** Linux—Web Server Using Linux OS
- **Lab 4:** Linux—Getting Started with RTC and Telnet

STEP
9

Explore Additional Linux BSP Features

Refer to the included Linux BSP release included on the provided DVD for additional Linux configurations and instructions on recompiling and loading the Linux kernel.

Visit freescale.com/tower for any additional updates/patches to the TWR-MCF5441X Linux BSP.

STEP
10

Explore Additional MQX Projects

The included lab tutorials represent completed end applications utilizing many of the microcontroller resources. To begin your application, there are simple MQX templates located under “**C:\Program Files\Freescale\Freescale MQX 3.6\mqx\examples**”

For more information on Tower System controllers and peripheral modules, visit freescale.com/tower. To become a member of the online Tower Geeks community, visit towergeeks.org.

TWR-MCF5441X Jumper Options

The following is a list of all the jumper options. The ***default*** installed jumper settings are shown in bold with asterisks.

Jumper	Option	Setting	Description
SW1	RCON Settings	DIP 1 FB_AD0	*On* Boot from NAND Flash
			Off Boot from External Memory Bus (Flexbus)
		DIP 2 FB_AD1	*On* PLL Disabled
			Off PLL Enabled
		DIP 3 FB_AD2	*On* Crystal Oscillator Mode
			Off Oscillator Bypass Mode
		DIP 4 FB_AD3	*On* External Memory Bus implements select as FB_ALE
			Off External Memory Bus implements select as FB_TS_b
		DIP 5/6 FB_AD[5:4]	On/On Boot Port Size: 32-bit data (32-bit muxed address)
			On/Off Boot Port Size: 8-bit (24-bit non-muxed address)
			Off/xx Boot Port Size: 16-bit (16-bit non-muxed address)
		DIP 7/8 FB_AD[3:2]	*On/On* PLL Multiplier: Fvco = 10 x Fref
			On/Off PLL Multiplier: Fvco = 15 x Fref
			Off/On PLL Multiplier: Fvco = 16 x Fref
Off/Off PLL Multiplier: Fvco = 20 x Fref			
J2	Clock Select	*1-2* Select external clock source (Required for RMII)	
		2-3 Select on-board 25 MHz clock source	

Jumper	Option	Setting	Description
J5	Boot Mode	*3-4*	Shunt for BOOTMOD[1]=0 / Un-shunt for BOOTMOD[1]=1
		1-2	Shunt for BOOTMOD[0]=0 / Un-shunt for BOOTMOD[0]=1
	BOOTMOD[1:0]	00	Boot from External Memory Bus (Flexbus) using default settings
		01	Override default settings and use RCON (SW1) to decide boot source
		1x	Override default settings and boot from serial boot facility with option to load to and boot from RAM. If not booting from RAM, RCON decides boot source.
J6	JTAG/BDM Select	1-2	Shunt to enable BDM / Un-shunt to enable JTAG
J8	Debug Clock Select	*1-2*	Selects BDM PSTCLK
		2-3	Selects JTAG TCLK
J10	JM60 BootMode	1-2	Shunt to enable optional boot mode of MC9S08JM60

For additional configurations using Cut-Trace pads refer to the TWR-MCF5441X User Manual

Learn more at freescale.com/tower.

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