



MCF51MM256

The industry's most complete solution
for portable medical applications



Get to Know the TWR-MCF51MM-KIT

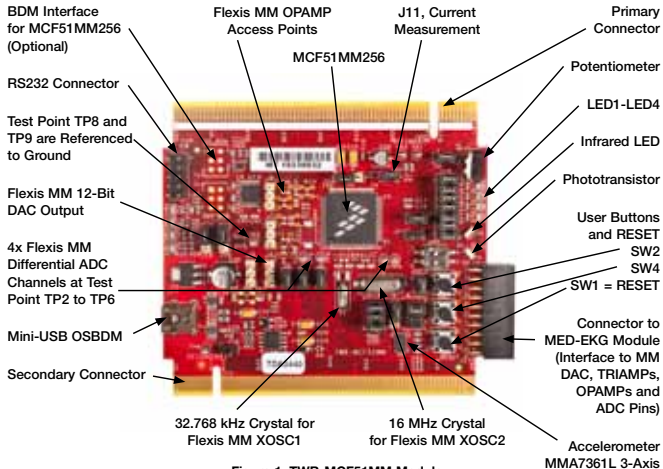
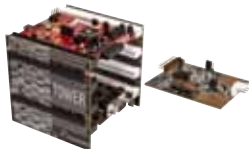


Figure 1: TWR-MCF51MM Module

TWR-MCF51MM-KIT Freescale Tower System

The TWR-MCF51MM 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 Flexis MM family provides ultra-low-power operation, USB connectivity, graphic display solutions and richly integrated analog peripherals. It is ideal for portable medical applications or any other application requiring a significant amount of precision analog such as instrumentation and industrial control. The TWR-MCF51MM-KIT features the 32-bit MCF51MM256 and consists of the following components:

- **TWR-MCF51MM**—Also referred to as the Tower System MCU module and features the MCF51MM256
- **TWR-SER**—Tower System Serial module that features Ethernet, USB, RS232/485 and CAN
- **TWR-ELEV**—Two Tower System Elevator modules (Primary module and Secondary module) that provide structural integrity, communications interfaces and power regulation circuitry with standardized bus
- **MED-EKG**—Electrocardiograph development kit that showcases an EKG demonstration using the Flexis MM on-chip operational amplifiers and analog modules
- **DVD**—Includes six lab tutorials, software projects, application notes, board schematics and supporting resources
- **Six Lab Demonstrations**—Lab 1 is printed and included in the MED-EKG box of the TWR-MCF51MM KIT. Digital copies of all six labs are included in the DVD in the “Software” tab, under the “Labs” section
- **Two mini-USB Cables**—One for TWR-SER and one for TWR-MCF51MM
- **Quick Start Guide**

In this Quick Start Guide, you will learn how to build a Tower System, download code to the Flexis MM device and debug using CodeWarrior IDE.

Step-by-Step Installation Instructions

In this Quick Start Guide, you will learn how to set up the TWR-MCF51MM-KIT.

**STEP
1**

Install Software and Tools

- Install CodeWarrior Development Studio for Microcontrollers V6.3 (Evaluation Version)
- Install CodeWarrior for Microcontrollers V6.3.1 Patch
- Processor Expert V3.09 (Graphical Code Generator)
- Install Service Pack for MCF51MM
- Install Flexis MM USB Bootloader GUI (Required for Lab 6)
- Install Freescale USB Stack with PHDC v2.5 (USB demos and codes are optional components, but are not needed for labs)
- Install Embedded Multilink Toolkit (GUI required for labs)

Install in the order listed. These programs are included on the DVD. Look under the development tools tab in your DVD. For updates, please visit freescale.com/mcf51mm.

**STEP
2**

Configure the Hardware

1. Build the Tower System as shown in Figure 2, and make necessary configurations according to the notes that point to the component settings.

Primary edge of TWR-MCF51MM and TWR-SER must connect to this Primary elevator, which has components on the bottom of the board, including the mini-USB connector.

This mini-USB port is only used for OSBDM interface to program and debug the MCF51MM256. It does not connect to the MCF51MM256 USB ports.

Make sure this side is the Secondary elevator..

Set Jumper J16 on TWR-SER module to middle position connecting pins 3 and 4 as shown. This configures the module for USB device mode, which is required by the labs in this kit.

This mini-USB port on the TWR-SER powers the whole Tower System setup. It interfaces with the MCF51MM256 USB module. Users can test the MCF51MM256 USB via this mini-USB port.

This is the TWR-SER module.

This is the mini-USB from the Primary elevator. Connection to this is not needed in this kit.



Figure 2: Tower System Assembled

NOTE: Figure 2 is a Tower System without the optional MED-EKG assembly. For details on how to assemble the MED-EKG, please refer to Lab 1 on the DVD.

STEP
2*(continued from previous page)*

- Verify the default jumper settings for the TWR-MCF51MM module. Some labs require default settings, please refer to Table 1.



Figure 3: TWR-MCF51MM with Default Jumpers Used in Table 1

NOTE: Please see TWR-MCF51MM schematic for jumper labels and functions.

Jumper Name	Default Setting on TWR-MCF51MM Module
J16	1 and 2
J15	1 and 2
J12	Open
J3	Open
J8	Open
J7	Open
J5	Open
J6	1 and 2
J1	1 and 2
J2	1 and 2
J10	2 and 3
J19	1 and 2, 3 and 4, 5 and 6
J26	2 and 3
J25	6 and 5, nothing on pin 4, 3, 2, 1
J24	Open
J11	1 and 2
J9	1 and 2
J4	1 and 2
J18	1 and 2, 3 and 4, 5 and 6, 7 and 8, 9 and 10, 11 and 12, 13 and 14
SW3	Slider 1 at OFF (Position 1)
	Slider 2 at OFF (Position 2)

Table 1: Default Settings on TWR-MCF51MM Module

STEP
2*(continued from previous page)*

3. This step is only needed for the Lab 1 EKG demo.

Verify the MED-EKG module is configured to default settings. This is required to run the MED-EKG demo.



Figure 4: MED-EKG with Default Jumpers Used in Table 2

NOTE: Please see MED-EKG schematic for jumper labels and functions.

Jumper Name	Default Setting on TWR-MCF51MM Module
J2	1 and 2
J3	2 and 3
J4	2 and 3
J5	Open
J6	2 and 3
J7	2 and 3
J8	2 and 3
J9	2 and 3
J10	All open (J10 connects to DSC programmer. It is not needed for this demo.)
J11	2 and 3

Table 2: Default Settings on MED-EKG Module

STEP
3

Connect the Tower System to the Computer

The assembled Tower System now has three USB connectors:

1. The USB connector on TWR-SER connects to the USB peripheral of the MCF51MM256 MCU.
2. The USB connector on TWR-MCF51MM is used for programming and debugging the MCF51MM256 MCU. The debugger interface is the Freescale open-source background debug module (OSBDM).
3. The USB connector on the Primary elevator merely powers the Tower System. There is no data through this connector and is not used in this kit.

To power on an assembled Tower System, connect the PC to mini-USB port (J14) on the TWR-SER module. The MCF51MM256 is programmed with a blinking LED application, so you should see LED 1 to LED 3 blink the first time the board is powered. LED 1 to LED 3 are located near the potentiometer. When set up as an assembled Tower System, the power source is from the TWR-SER mini-

USB. The TWR-MCF51MM mini-USB acts only as an OSBDM function and should not be used to power the system. Be sure to connect TWR-SER USB before the TWR-MCF51MM USB. Do not connect TWR-MCF51MM USB without TWR-SER USB or damage could be caused.

NOTE: When the TWR-MCF51MM module is used stand-alone, USB port (J17) is both the power source and the debugger interface. When the TWR-MCF51MM module is assembled as a Tower System, the USB port (J17) is only a OSBDM.

LEDs 1 to 4 correspond to silk-screened labels D9 to D12 on the TWR-MCF51MM module.



STEP
4

Program MCF51MM256 and Debug Code

1. To program the MCF51MM256 with a different application, connect the USB from the PC to the TWR-SER, and then connect another USB from the PC to TWR-MCF51MM. If this is the first time you have connected the board, then a window may appear and ask about installing new hardware for the on-board OSBDM circuit. Install the driver to allow CodeWarrior debugging with OSBDM.


NOTE: If Windows cannot locate the driver automatically, please specify the following path: C:\Program Files\Freescale\CodeWarrior for Microcontrollers V6.3\Drivers\Osbdm-jm60.






STEP
4*(continued from previous page)*

1. Look for the “MCF51MM POT ADC” application in the DVD under the “Software” tab, “Labs” section. Copy the file to your working directory and unzip it.
2. Start CodeWarrior by selecting it from the Windows Start menu. Make sure you open Version 6.3 if you have multiple versions installed.
3. From the CodeWarrior main menu, choose File > Open and open the following file: d:\work\POT_ADC\MCF51MM_POT_ADC\POT_ADC.mcp.

This is the project you just created in number 1 above.

4. In CodeWarrior, click Debug.  This will activate the hiwave debugger which also displays the following message. Click OK and CodeWarrior will use the on-board OSBDM circuit to erase and program the MCF51MM256 internal flash.



5. In the True-Time Simulator and Real-Time Debugger window click (start and continue) to run the application. Rotate the potentiometer back and forth from the TWR-MCF51MM module. You will see that LED 1 to LED 4 will turn off and on sequentially depending upon the rotation of the potentiometer. 
6. In the same debugger window, you can click on this button  to halt the application. The source window will stop at the line of code where you halt the application.
7. These buttons  allow you to do Single Step, Step Over, Step Out and Assembly Step in your project.

STEP
5

Demonstrate the Labs

- **Lab 1: MED-EKG Development Board Demo**—Set up hardware and run software to read your electrocardiography
- **Lab 2: Interfacing with HealthLink and Google Health**—Send emulated health data to HealthLink and Google Health
- **Lab 3: Low-Power and Measurement Engine Demo**—Explore the energy savings capability of the MCF51MM256 and its powerful built-in analog modules such as OPAMP, DAC and ADC
- **Lab 4: Measurement Engine Demo Using MQX RTOS**—Run the measurement engine demo using MQX RTOS, a free RTOS that is complementary to customers
- **Lab 5: Accelerometer Demo**—Sample accelerometer outputs and display a GUI via the MCF51MM256 serial function
- **Lab 6: USB Bootloader**—Use a USB bootloader GUI tool to update firmware via the MCF51MM256 USB interface

NOTE: Lab 1 is printed and included in the MED-EKG box the TWR-MCF51MM KIT. Digital copies of all six labs are included in the DVD in the “Software” tab, “Labs” section.

TOWER SYSTEM

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To learn more about the **TWR-MCF51MM-KIT** and other Freescale medical products, please visit freescale.com/MCF51MM, freescale.com/medical and freescale.com/Tower.

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