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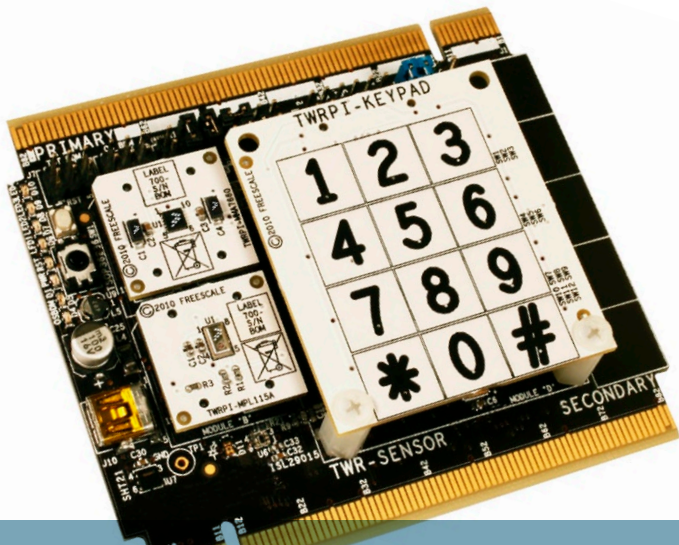
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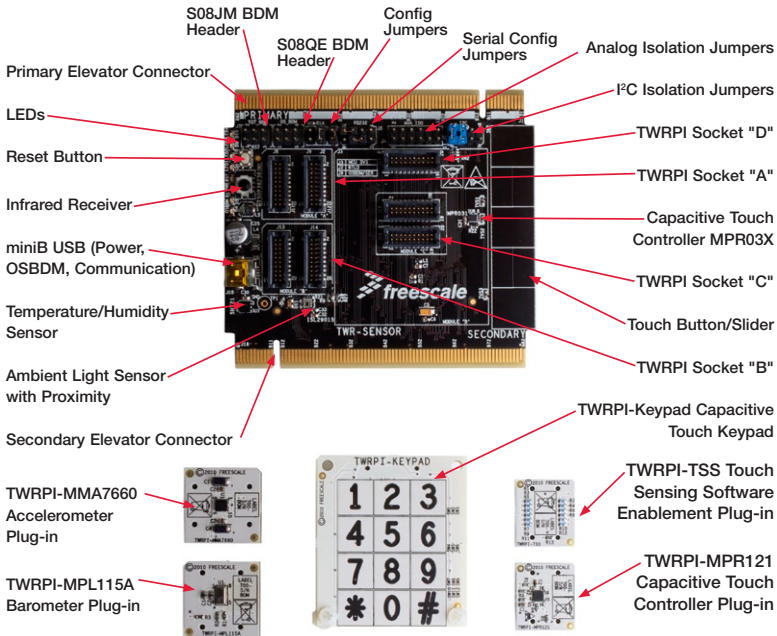


# TWR-SENSOR-PAK

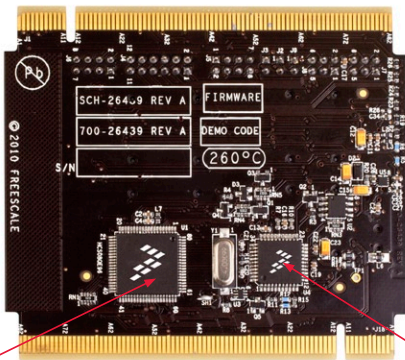
Swappable sensor module



# Get to know the TWR-SENSOR-PAK



# Get to know the TWR-SENSOR-PAK



MC9S08QE96CLK

MC9S08JM60CLD



## TWR-SENSOR-PAK Freescale Tower System

The TWR-SENSOR-PAK 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.

# How to assemble the TWR-SENSOR-PAK module

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**STEP 1**

Locate the TWR-SENSOR module and the five plug-ins included in the TWR-SENSOR-PAK.

- TWRPI-KEYPAD
- TWRPI-TSS
- TWRPI-MMA7660
- TWRPI-MPL115A
- TWRPI-MPR121

**STEP 2**

Identify the sensor plug-in modules that you plan to use and insert them into the appropriate sockets.

- Module “A” and “B” sockets are for use with the majority of Freescale Tower Plug-ins (TWRPIs) such as the included TWRPI-MMA7660 and TWRPI-MPL115A.

Module “C” is dedicated for touch sensing TWRPIs, such as the included TWRPI-MPR121 or TWRPI-TSS.

- Module “D” is dedicated for touch sensing electrode boards, such as the included TWRPI-KEYPAD.
- All TWRPI sockets are keyed and uniquely sized to only fit the appropriate plug-in with the correct orientation.

**STEP 3**

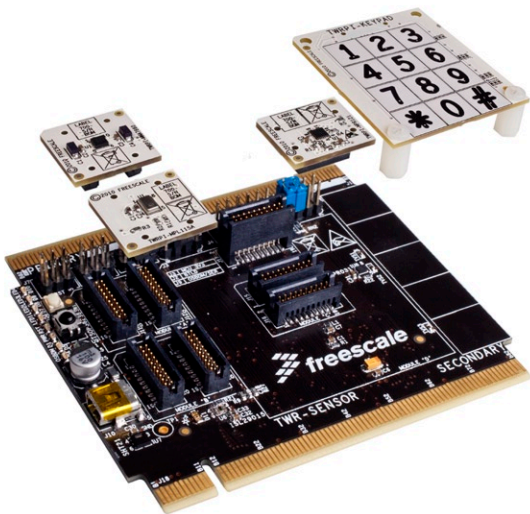
If assembling as part of a complete Tower System, proceed to the “How to build your Tower” section.

**STEP 4**

If using as a stand-alone development tool (not part of an assembled Tower System), proceed to the “Step-by-step installation instructions” section.

# How to assemble the TWR-SENSOR-PAK module

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# TWR-SENSOR-PAK features

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## **Swappable Freescale Sensor Modules**

- Touch sense controller (MPR121)
- Accelerometer (MMA7660)
- Pressure sensor (MPL115A)

## **Keypad Touch Pad Module**

### **On-Board Slider/Touch Pad**

- With dedicated touch sense controller (MPR032)

### **On-Board MCU (MC9S08QE96)**

- Stand-alone operation
- Slave MCU mode
- Tower MCU mode (with limited peripheral connectivity)
- Touch sense software evaluation

## **On-Board Third-Party Sensors**

- Sensirion SHT21 temperature/humidity
- Ambient Light/Proximity
- IR Receiver

## **OSBDM/Serial-to-USB**

- Onboard MC9S08JM60
- OSBDM support for MC9S08QE96
- Serial-to-USB support

# How to build your Tower

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**STEP  
1**

Ensure that the TWR-SENSOR module configuration and isolation jumpers are set for correct communication with the Tower System. Refer to TWR-SENSOR-PAK Jumper Options.

**STEP  
2**

Locate the Elevator modules, identifiable by the four card edge connectors on each.

**STEP  
3**

Identify each Elevator module as either “functional” or “dummy” (written on the outward facing side of the board).

**STEP  
4**

Locate the other modules you will use in your Tower System.

**STEP  
5**

Identify the “primary” and “secondary” card edges for each module (written along the edge).

**STEP  
6**

Plug the “primary” card edge of each module into the “functional” Elevator.

**STEP  
7**

Place the remaining “dummy” or “functional” Elevator module onto the “secondary” card edges.



# Step-by-step installation instructions

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In this Quick Start Guide, you will learn how to set up the TWR-SENSOR-PAK module and run the default FreeMASTER demonstration.

**STEP  
1**

## Install software and tools

- Install FreeMASTER Run-Time Debugging Tool from included DVD.
- If desired, install CodeWarrior Development Studio for Microcontroller v6.3 from included DVD.

**STEP  
2**

## Install the default Tower Sensor Plug-ins (TWRPIs)

The following TWRPIs are recommended to fully utilize the included FreeMASTER project file.

- Remove the TWRPI-KEYPAD and the TWRPI-TSS
- Install the TWRPI-MMA7660 (Accelerometer) into Module “A”
- Install the TWRPI-MPL115A (Barometer) into Module “B”
- Install the TWRPI-MPR121 (Proximity Touch) into Module “C”
- Re-install the TWRPI-KEYPAD into Module “D”

For additional details regarding the installation of the TWRPIs refer to the “How to assemble the TWR-SENSOR-PAK module.”

**STEP  
3**

## Connect the USB cable

Connect one end of the USB cable to the PC and the other end to the mini-B connector on the TWR-SENSOR. The TWR-SENSOR Virtual SCI driver is located on the included DVD.

**STEP  
4**

## Launch FreeMASTER

Launch the installed FreeMASTER application and open the "TWR-SENSOR.pmp" project. A link to the latest FreeMASTER Sensor Project is located on the DVD.

**STEP  
5**

## Interact

Interact with the TWR-SENSOR module sensors and view the associated graphs and display gauges within the FreeMASTER application.

**STEP  
6**

## Explore additional resources

Explore the additional documentation and software resources in the included DVD and on the TWR-SENSOR-PAK site at [www.freescale.com/tower](http://www.freescale.com/tower).

## TWR-SENSOR-PAK Jumper Options

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

Jumper	Name	Setting	Description
J2	BTLD	1-2	Shunt to enable Boot Loader Mode
J3	MCU 3V3	<b>*1-2*</b>	Connects 3V3 to MCU. Use to measure MCU current consumption
J4	ANA EN	1-2	Connects Analog Signal (MA_AN0) from Socket A to the Primary Tower Elevator signal ELEN_MA_AN0
		3-4	Connects Analog Signal (MA_AN1) from Socket A to the Primary Tower Elevator signal ELEN_MA_AN1
		5-6	Connects Analog Signal (MA_AN2) from Socket A to the Primary Tower Elevator signal ELEN_MA_AN2
		7-8	Connects Analog Signal (MB_AN0) from Socket B to the Primary Tower Elevator signal ELEN_MB_AN4
		9-10	Connects Analog Signal (MB_AN1) from Socket B to the Primary Tower Elevator signal ELEN_MB_AN5
		11-12	Connects Analog Signal (MB_AN2) from Socket B to the Primary Tower Elevator signal ELEN_MB_AN6
J5	SERIAL CFG	1-2	Shunt to enable Slave Mode Serial Connection to Tower Elevator UART 0 Connects MCU_RXD2 to ELE_TXD0
		3-4	Shunt to enable Slave Mode Serial Connection to Tower Elevator UART 0 Connects MCU_TXD2 to ELE_RXD0
		5-6	Shunt to enable Slave Mode Serial Connection to Tower Elevator UART 1 Connects MCU_RXD2 to ELE_TXD1
		7-8	Shunt to enable Slave Mode Serial Connection to Tower Elevator UART 1 Connects MCU_TXD2 to ELE_RXD1
		1-3	Shunt to enable Master Mode Serial Connection to Tower Elevator UART 0 Connects MCU_RXD2 to ELE_RXD0
		2-4	Shunt to enable Master Mode Serial Connection to Tower Elevator UART 0 Connects MCU_TXD2 to ELE_TXD0
		5-7	Shunt to enable Master Mode Serial Connection to Tower Elevator UART 1 Connects MCU_RXD2 to ELE_RXD1
		6-8	Shunt to enable Master Mode Serial Connection to Tower Elevator UART 1 Connects MCU_TXD2 to ELE_TXD1

Jumper	Name	Setting	Description
J6	I <sup>2</sup> C EN	1-2	Shunt to enable Sensor I <sup>2</sup> C Connection to Tower Elevator I <sup>2</sup> C 1 Connects SENS_SDA to ELE_SDA1
		*3-4*	Shunt to enable MCU I <sup>2</sup> C Connection to Tower Elevator I <sup>2</sup> C 0 Connects MCU_SDA to ELE_SDA0
		5-6	Shunt to enable Sensor I <sup>2</sup> C Connection to Tower Elevator I <sup>2</sup> C 1 Connects SENS_SCL to ELE_SCL1
		*7-8*	Shunt to enable MCU I <sup>2</sup> C Connection to Tower Elevator I <sup>2</sup> C 0 Connects MCU_SCL to ELE_SCL0
		1-3	Shunt to enable Sensor I <sup>2</sup> C Connection to Tower Elevator I <sup>2</sup> C 0 Connects SENS_SDA to ELE_SDA0
		2-4	Shunt to enable MCU I <sup>2</sup> C Connection to Tower Elevator I <sup>2</sup> C 1 Connects MCU_SDA to ELE_SDA1
		5-7	Shunt to enable Sensor I <sup>2</sup> C Connection to Tower Elevator I <sup>2</sup> C 0 Connects SENS_SCL to ELE_SCL0
		6-8	Shunt to enable MCU I <sup>2</sup> C Connection to Tower Elevator I <sup>2</sup> C 1 Connects MCU_SCL to ELE_SCL1
J9	OSBDM/SER	*1-2*	Shunt to enable Serial-to-USB Application Unshunt to enable OSBDM

To learn more about the TWR-SENSOR-PAK and other modules within the Tower System, visit [www.freescale.com/tower](http://www.freescale.com/tower). To become a member of the online Tower Geeks community, visit [www.towergeeks.org](http://www.towergeeks.org).

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Doc Number: TWRSNSRPKQSG REV 1  
Agile Number: 926-78452 REV B

