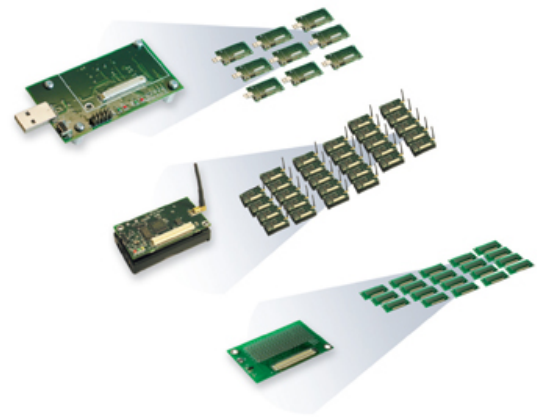
CLASSROOM KIT

FOR WIRELESS SENSOR NETWORKS

Classsroom Kit



- Wireless Sensor Network Kit Designed Specifically for the Classroom or Teaching Lab
- Hardware & Software for Fast Lab Setup and Application Development
- Comprehensive Set of Teaching Materials
- MoteWorks™ Sensor Network Software Platform Based on TinyOS
- Reliable Networking Software for Self-healing, Self-forming Mesh Network (XMesh)
- Windows Based User Interface (MoteView)
- Easy Classroom Deployment
- Low-cost Introduction to Next Generation Technology

MEMSIC actively supports academic programs in wireless and sensor technologies. Instructors in multiple departments are teaching various courses for wireless sensor technology based on MEMSIC products.

Wireless sensor hardware and modules, in conjunction with the MoteWorks™ TinyOS based software platform, are ideal for the classroom. Classroom kits allow students to easily develop and build prototype sensor networks individually or in groups.

MEMSIC's IRIS, MICAz and MICA2 motes are the hardware platform of choice for a large number of wireless sensor network research papers published globally, as well as large-scale testbed deployments.

The kit also provides access to in-depth teaching materials, based on MEMSIC's world-renowned training program, which is proven with thousands of MEMSIC's customers globally.

This integrated approach of hardware, mesh networking software and training materials allow educators to quickly develop and set up a comprehensive class and lab for leading edge wireless sensor network technology.

The classroom kits are beneficial for the typical teaching lab or sensor class project, getting students up and running quickly and economically. Students will benefit from comprehensive hands-on training involving all aspects of both the hardware and software applications.

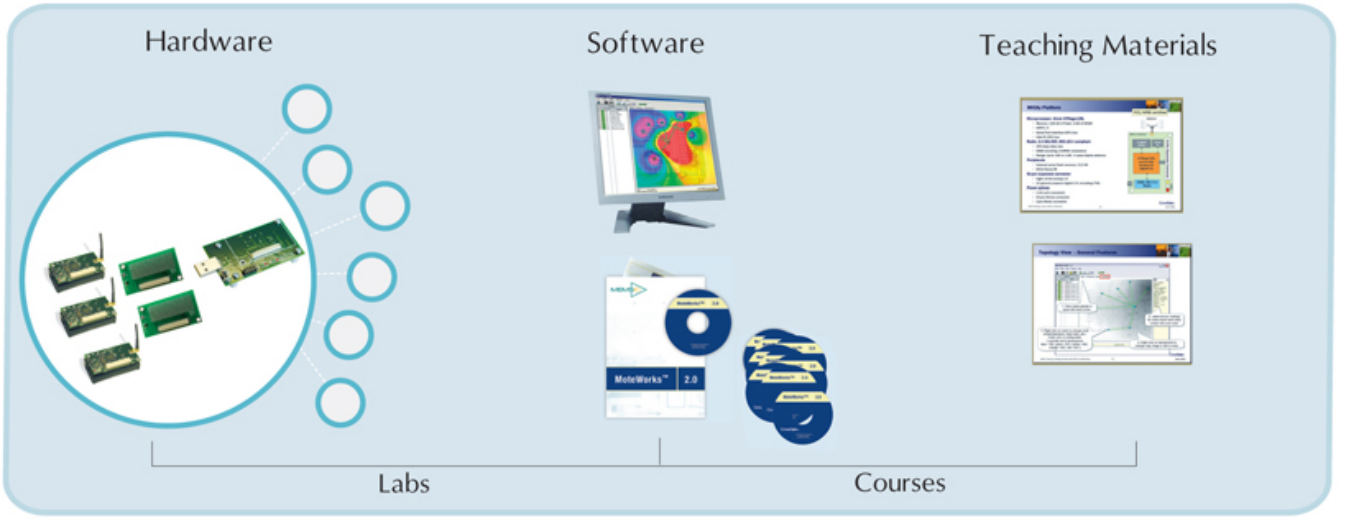
In addition to these standard kits, a variety of custom configurations are also available. Please contact MEMSIC for additional details. Information on several prominent Universities which have programs dedicated to WSN is available at: http://memsic.com/solutions/research.html

Ordering Information

Model	Description
WSN-EDU2400CA	MICAz Classroom Kit - 2.4 GHz
WSN-EDU2110CA	IRIS Classroom Kit - 2.4 GHz

Phone: 408.964.9700 | Fax: 408.854.7702 | E-mail: salesca@memsic.com | www.memsic.com

Classroom Kit Architecture



Hardware

Lab Station Equipment

a. Processor/Radio Board:
IRIS/MICA modules enable the low-power wireless sensor network measurement system, available in 2.4 GHz.

b. Sensor Board:
MDA100 sensor and data acquisition board includes a precision thermistor, a light sensor/photocell and provides a general prototyping area.

c. USB PC Interface Board:
MIB520 Gateway provides a USB Interface for data communications.

Kit Contents
10 Lab Stations Include:
• 30 Processor/Radio Boards
• 20 Sensor Boards
• 10 Gateways
• 10 Seats MoteWorks License
• 1 Teaching Materials CD-ROM

Software

MoteWorks™

Development of custom sensor applications is enabled through MEMSIC's MoteWorks™ software platform, included in the classroom kit.

Sensor Devices: Network stack (XMesh) and operating system, standards support (802.15.4), over-the-air-programming and cross development tools.

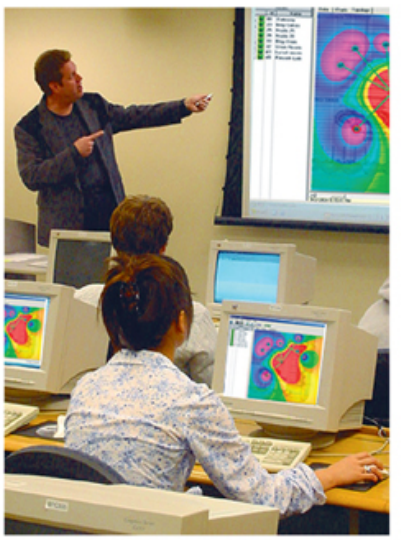
Server Gateways: Middleware for connecting wireless sensor networks to enterprise information and management systems (XServe).

User Interface: Client application for remote analysis and monitoring, management and configuration of the sensor network.

Teaching Materials

Curriculum Tools

Included in each classroom kit is a CD-ROM containing the files for the presentations used in our world-renowned training courses. These materials may be modified and integrated into lectures and labs as the course curriculum requires.



IRIS

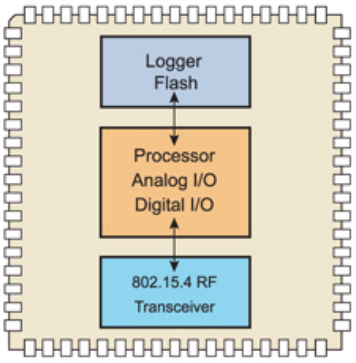
WIRELESS MEASUREMENT SYSTEM

- 2.4 GHz IEEE 802.15.4, Tiny Wireless Measurement System
- Designed Specifically for Deeply Embedded Sensor Networks
- 250 kbps, High Data Rate Radio
- Wireless Communications with Every Node as Router Capability
- Expansion Connector for Light, Temperature, RH, Barometric Pressure, Acceleration/Seismic, Acoustic, Magnetic and other MEMSIC Sensor Boards

Applications

- Indoor Building Monitoring and Security
- Acoustic, Video, Vibration and Other High Speed Sensor Data
- Large Scale Sensor Networks (1000+ Points)

ZigBee™Alliance



XM2110CA Block Diagram

IRIS

The IRIS is a 2.4 GHz Mote module used for enabling low-power, wireless sensor networks. The IRIS Mote features several new capabilities that enhance the overall functionality of MEMSIC's wireless sensor networking products.

Product features include:

- Up to three times improved radio range and twice the program memory over previous MICA Motes
- Outdoor line-of-sight tests have yeilded ranges as far as 500 meters between nodes without amplification
- IEEE 802.15.4 compliant RF transceiver
- 2.4 to 2.48 GHz, a globally compatible ISM band
- Direct sequence spread spectrum radio which is resistant to RF interference and provides inherent data security
- 250 kbps data rate
- Supported by MoteWorks™ wireless sensor network platform for reliable, ad-hoc mesh networking
- Plug and play with MEMSIC's sensor boards, data acquisition boards, gateways, and software

MoteWorks™ enables the development of custom sensor applications and is specifically optimized for low-power, battery-operated networks. MoteWorks is based on the open-source TinyOS operating system and provides reliable, ad-hoc mesh networking, over-the-air-programming capabilities, cross development tools, server middleware for enterprise network integration and client user interface for analysis and configuration.

Processor & Radio Platform

The XM2110CA is based on the Atmel ATmega1281. The ATmega1281 is a low-power microcontroller which runs MoteWorks from its internal flash memory. A single processor board (XM2110) can be configured to run your sensor application/processing and the network/radio communications stack simultaneously. The IRIS 51-pin expansion connector supports Analog Inputs, Digital I/O, I2C, SPI and UART interfaces. These interfaces make it easy to connect to a wide variety of external peripherals.

Sensor Boards

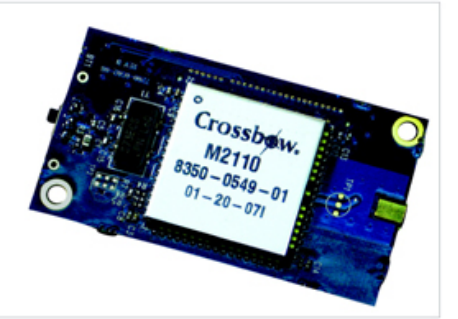
MEMSIC offers a variety of sensor and data acquisition boards for the IRIS Mote. All of these boards connect to the IRIS via the standard 51-pin expansion connector. Custom sensor and data acquisition boards are also available. Please contact MEMSIC for additional information.

Phone: 408.964.9700 | Fax: 408.324.4841 | E-mail: infoca@memsic.com | www.memsic.com

Processor/Radio Board	XM2110CA	Remarks
Processor Performance		
Program Flash Memory	128K bytes	
Measurement (Serial) Flash	512K bytes	> 100,000 Measurements
RAM	8K bytes	
Configuration EEPROM	4K bytes	
Serial Communications	UART	0-3V transmission levels
Analog to Digital Converter	10 bit ADC	8 channel, 0-3V input
Other Interfaces	Digital I/O,I2C,SPI	
Current Draw	8 mA	Active mode
	8 µA	Sleep mode (total)
RF Transceiver		
Frequency band[1]	2405 MHz to 2480 MHz	ISM band, programmable in 1 MHz steps
Transmit (TX) data rate	250 kbps	
RF power	3 dBm (typ)	
Receive Sensitivity	-101 dBm (typ)	
Adjacent channel rejection	36 dB	+ 5 MHz channel spacing
	34 dB	- 5 MHz channel spacing
Outdoor Range	> 300 m	1/4 wave dipole antenna, LOS
Indoor Range	> 50 m	1/4 wave dipole antenna, LOS
Current Draw	16 mA	Receive mode
	10 mA	TX, -17 dBm
	13 mA	TX, -3 dBm
	17 mA	TX, 3 dBm
Electromechanical		
Battery	2X AA batteries	Attached pack
External Power	2.7 V - 3.3 V	Molex connector provided
User Interface	3 LEDs	Red, green and yellow
Size (in)	2.25 x 1.25 x 0.25	Excluding battery pack
(mm)	58 x 32 x 7	Excluding battery pack
Weight (oz)	0.7	Excluding batteries
(grams)	18	Excluding batteries
Expansion Connector	51-pin	All major I/O signals

Notes

[1]5 MHz steps for compliance with IEEE 802.15.4/D18-2003.
Specifications subject to change without notice



IRIS Mote (bottom view)

MIB520CA Mote Interface Board

Base Stations

A base station allows the aggregation of sensor network data onto a PC or other computer platform. Any IRIS Mote can function as a base station when it is connected to a standard PC interface or gateway board. The MIB510 or MIB520 provides a serial/USB interface for both programming and data communications. MEMSIC also offers a stand-alone gateway solution, the MIB600 for TCP/IP-based Ethernet networks.

Ordering Information

Model	Description
XM2110CA	2.4 GHz IRIS OEM Reference Board

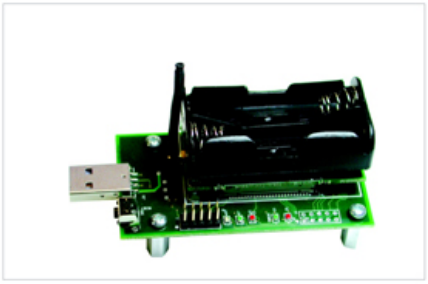
MIB520

USB INTERFACE BOARD

- Base Station for Wireless Sensor Networks
- USB Port Programming for IRIS/MICAz/MICA2 Hardware Platforms
- Supports JTAG code debugging
- USB Bus Power

Applications

- USB Interface
- Testbed Deployments
- In-System Programming



MIB520CB with attached Mote

MIB520CB

The MIB520CB provides USB connectivity to the IRIS and MICA family of Motes for communication and in-system programming. Any IRIS/MICAz/MICA2 node can function as a base station when mated to the MIB520CB USB interface board. In addition to data transfer, the MIB520CB also provides a USB programming interface.

The MIB520CB offers two separate ports: one dedicated to in-system Mote programming and a second for data communication over USB.The MIB520CB has an on-board processor that programs Mote Processor Radio Boards. USB Bus power eliminates the need for an external power source.

Specifications

USB Interface

- Baud Rate: 57.6 K
- Male to Female USB cable (included with unit)

Mote Interface

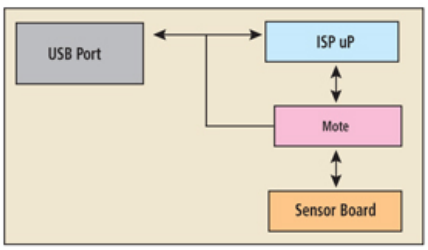
- Connectors:
  - 51-pin
- Indicators:
  - Mote LED's: Red Green, Yellow

Programming Interface

- Indicators:
  - LEDs - Power Ok (Green), Programming in Progress (Red)
- Switch to reset the programming processor and Mote.

Jtag Interface

- Connector: 10-pin male header POWER
- USB Bus powered



MIB520CB Block Diagram

Ordering Information

Model	Description
MIB520CB	USB PC Interface Board

Document Part Number: 6020-0091-04 Rev A

Phone: 408.964.9700 | Fax: 408.854.7702 | E-mail: infoca@memsic.com | www.memsic.com

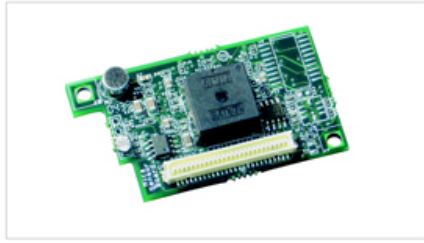
MTS/MDA

SENSOR, DATA ACQUISITION BOARDS

- Selection of 3 Standard Sensor/DAQ Boards
- MoteWorks™ Drivers Support Sensor Readings
- Supports IRIS, MICAz and MICA2 Motes
- Individual Power Control for Each Sensor

Applications

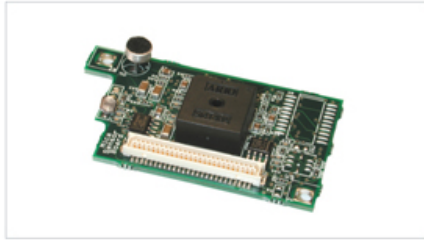
- Vibration and Magnetic Anomaly Detection
- External Sensor Connection
- Localization and Acoustic Tracking
- Robotics
- Wireless Sensor Networking



MTS310CB

MTS310

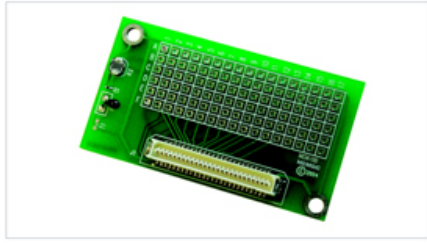
The MTS310 is a flexible sensor board with a variety of sensing modalities. These modalities include a Dual-Axis Accelerometer, Dual-Axis Magnetometer, Light, Temperature, Acoustic and Sounder. The MTS310 is for use with the IRIS, MICAz and MICA2 Motes.



MTS300CB

MTS300

The MTS300CB is a flexible sensor board with a variety of sensing modalities. These modalities include Light, Temperature, Acoustic and Sounder. The MTS300CB is for use with the IRIS, MICAz and MICA2 Motes.



MDA100CB

MDA100

The MDA100CB sensor and data acquisition board has a precision thermistor, a light sensor/photocell and general prototyping area. Designed for use with the IRIS, MICAz and MICA2 Motes, the prototyping area supports connection to all 51 pins on the expansion connector, and provides an additional 42 unconnected solder points for breadboarding.

Ordering Information

Model	Description
MTS310CB	Light, Temperature, Acoustic, Sounder, Dual-Axis Accel and Dual-Axis Mag Sensor Board
MTS300CB	Light, Temperature, Acoustic and Sounder Sensor Board
MDA100CB	Light, Temperature, Prototype Area Sensor/DAQ Board

Document Part Number: 6020-0047-04 Rev A

Phone: 408.964.9700 | Fax: 408.854.7702 | E-mail: infoca@memsic.com | www.memsic.com