

# Solutions Driven™ TECHNOLOGY ENABLED



## Solutions Guide – Summer 2007

### RF Components Short-range Radios & RFICs



### Wireless Mesh & Sensor Networking OEM Modules and Standalone Products



### Wireless Industrial Automation & Control Networking OEM Modules and Standalone Products



### Wireless LAN / WiFi™ Networking



# Wireless Device Networking

From Meters to Miles...Machine-to-Machine  
Connectivity Over the Internet

Industrial • Commercial • Consumer • Medical • Automotive • Military



# Enabling OEM design engineers to connect and network more devices, equipment, and processes than ever before.

Together, RF Monolithics, Inc. (RFM) and its subsidiary Cirronet, Inc. offer the broadest, most comprehensive selection of wireless communications and networking products of any wireless technology company in the world. Our products include RF communications components, modules and standalone devices for an extensive array of industrial, commercial and consumer applications.

Machine-to-machine (M2M) connectivity. When embedded into original equipment manufacturers (OEM) next-generation products, RFM and Cirronet products enable end-users to connect, communicate, control and monitor wireless-enabled OEM devices over the Internet.

For complete product offerings with detailed specifications, drawings, photographs, and technical information, please visit our online catalogs or request a printed catalog with CD from our company websites:

[www.rfm.com](http://www.rfm.com)  
[www.cirronet.com](http://www.cirronet.com)  
[www.aleier.com](http://www.aleier.com)

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Specifications in this Product Solutions Guide are subject to change without notice.

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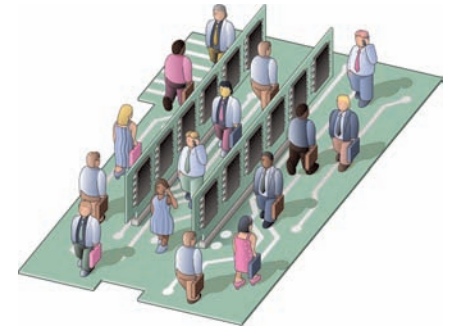
EOE / AAP Employer

RFM and Cirronet products reach the market through mature worldwide sales and distribution channels that provide industry-leading customer service. See back cover of this Product Solutions Guide to find a Distributor, Sales Rep or Stocking Rep near you.

Aleier reaches its markets directly through its in-house sales consultants and field application engineer teams.

## RFM

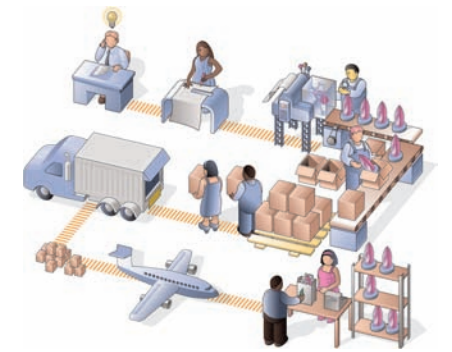
For over 27 years, RF Monolithics (RFM) has been known for its best-in-class radio frequency (RF) technology components that enable connectivity in ultra-low-power wireless applications for the automotive, consumer, industrial, medical and communications markets worldwide. RFM continues to innovate its ultra-low-power wireless components and short-range radio devices to customers to provide products and services that are both cost effective and superior in performance.



- RF Components
- Short-range Radio Devices

## Cirronet

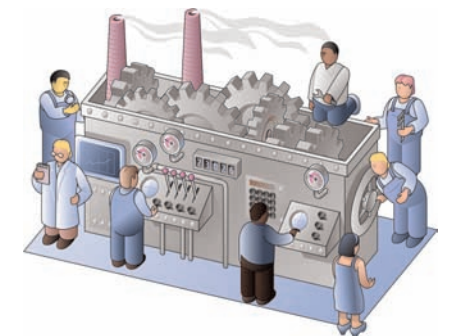
With 20 years experience in the manufacturing of industrial modules, Cirronet brings a module portfolio with unmatched diversity and reach. Cirronet has assembled a comprehensive OEM enablement portfolio complete with global standards and multiple proprietary offerings. Whether a system needs to be industrial strength for SCADA applications or commercial strength for asset condition monitoring, Cirronet offers a wide range of low-power wireless technologies that include ZigBee™, 802.15.4, Bluetooth®, proprietary MiniMESH™ or VersaMESH™, proprietary FHSS Wireless Industrial Telemetry (WIT), and customized solutions.



- Wireless Mesh and Sensor Networking
- Industrial Wireless Telemetry and Data Networking
- Wireless LAN Networking

## Aleier

Wireless access is essential for wide adoption of machine-to-machine (M2M) technology, but at the heart of M2M lies the challenge of turning collected data into actionable information, a mission RFM took on with its September 2006 acquisition of 16 year-old software company Aleier. Aleier's tried and trusted approach to providing best-in-class EAM (enterprise asset management) and CMMS (computerized maintenance management system) provides the platform many OEMs, integrators and endusers need to turn collected data into action.



- Enterprise Asset Management (EAM)
- Computerized Maintenance Management Systems (CMMS)
- Condition-based Maintenance



# Machine-to-Machine (M2M) Connectivity

RF Monolithics, a proven leader in low-power wireless solutions, is elevating M2M connectivity to new heights, providing customers with unprecedented, end-to-end M2M enablement solutions that range from an expansive array of wireless sensor and data networking options to its asset management and maintenance platform. The combination makes RF Monolithics a standout in the wireless communications world as the only company with a comprehensive portfolio of M2M-enabling solutions backed by home-grown, field tested technologies.

## Wireless Technology and the New Age of M2M

Advances in wireless communications technology and standards (like 802.15.4, ZigBee, WirelessHART, ISA100, Bluetooth and others) are enabling a new age of M2M connectivity. These advances enable billions more devices, processes and information systems to be connected to each other than ever before. Prior to these advances, many M2M applications were not logistically feasible for wire-based connectivity, nor cost-effective for power-hungry and expensive cellular and satellite M2M communications.

## RFM Companies Enabling Next Generation M2M Networking

RF Monolithics with its September 2006 acquisitions of Cirronet and Aleier offers more than 60 years of combined industry know-how and experience unrivaled by any other M2M enabling company. The diversity of the companies' offerings supplies a wide array of technologies for almost every M2M application requirement. Yet, if an application is so unique that nothing from its standard product lines is quite the perfect fit, RF Monolithics customizes designs to make certain customers receive the module, radio, or software system appropriate for their application.





# M2M Applications

## Transportation

- Mass Transit:** Condition-monitoring systems and notifications
- Intelligent Vehicle Highway Systems:** Traffic signal / signage systems and monitoring applications and real-time notifications
- Parking Control:** Remote monitoring / notification of vehicle space occupation

## Building Control / Automation

- Building Commissioning:** Installation verification and system testing
- HVAC Control / Automation:** Temperature system automation using motion / proximity / temperature sensors
- Lighting Control / Automation:** Commercial lighting system automation using motion sensors and actuation devices
- Facilities Equipment Monitoring:** Performance monitoring and networking for condition-based maintenance for elevators / escalators, roofing, doors, windows, and other equipment

- Structural Monitoring:** Measure / control noise in buildings and structures; measure strain, vibration and other indicators
- Energy / Utility Monitoring:** Sensor monitor energy and water consumption and waste
- Building Awareness / Security:** Sensor nodes monitor activity and deliver threshold violation alerts and environment safety alarms (fire, toxic fumes, structural safety)
- Server Room Monitoring:** Information technology asset monitoring and security

## Supply Chain Management

- Inventory Monitoring:** Consumables management by supply chain partners
- Container Tracking:** Location, identification, and security of shipments
- Cold-chain Monitoring:** Temperature monitoring of perishable goods in transit

## Energy / Utilities

- Automated Meter Reading:** Wireless mesh networking of meters in proximity
- Substation Integration / Distribution Automation:** Wireless monitoring power grid data flow to/from energy-management applications
- Utility Sub-metering:** Wireless leak detection / monitoring of multi-tenant facilities
- Oil / Gas Production Monitoring:** Data collection from multiple nodes for server backhaul

## Security / Public Safety

- Air Quality Monitoring:** Pollution monitoring and chemical agent detection
- First-responder Systems:** Monitor vital signs, responder location / communications (firemen, ETS, police, Guardsmen)
- Border / Perimeter Security:** Proximity / motion sensing for surveillance operations
- Hazardous Material Management:** Transportation / storage security for regulatory compliance
- Water Security Systems:** Bio-monitoring systems for detecting toxic conditions
- Wastewater Management:** Microbial sensors and electrochemical analysis
- Situational Awareness:** Tactical-force protection using remote sensing applications to detect and triangulate on hostile activity
- Personal Safety Devices:** Location tracking and consumer self defense applications
- Security & Alarm Systems:** Networked sensors for threshold monitoring and alarms

## Manufacturing / Industrial

- Plant Operations / Safety:** Air-quality, pressure, structure, environmental / radiation monitoring
- Instrument Calibration:** Sensor monitor precision instrumentation performance
- Machine Health Monitoring:** Condition-based monitoring and preventive maintenance
- Process Control and Automation:** Condition-based sensor monitoring on plant floors
- Maintenance:** Condition-based maintenance based on real-time operations data from sensor monitoring



# Huge RF Performance in Tiny Packages

## RF Components

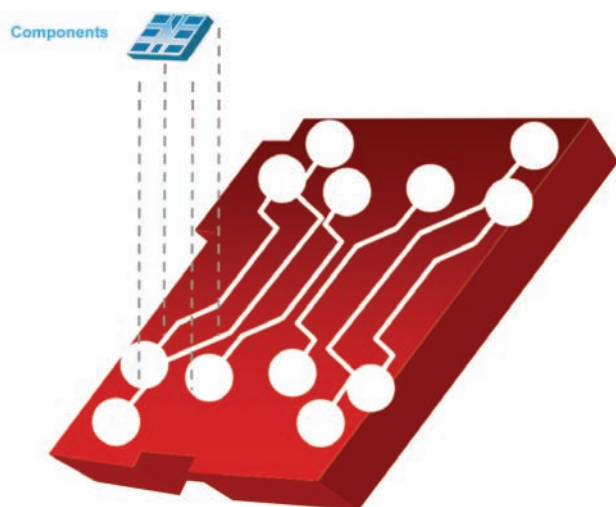
Since 1979, RFM has supplied high performance wireless components that are an integral part of implementing wireless communications. RFM wireless components include surface acoustic wave (SAW) based components, frequency control products and crystal-based products to meet

market demands for highly reliable RF performance within tiny sized packages with ultra-low-power consumption and very low cost.

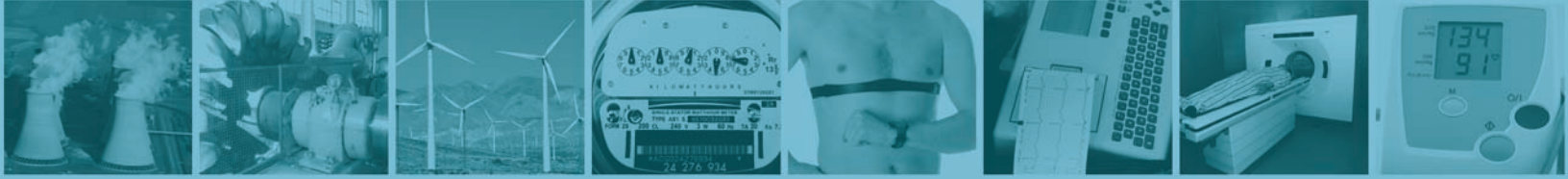
RFM components are primarily embedded in automotive, telecom, industrial and consumer markets for applications such as, remote keyless entry, tire pressure monitoring, residential and commercial security systems, RFID, satellite digital audio radio (SDAR), mobile BTS, global positioning systems (GPS), synchronous optical networking (SONET) and high performance computing (HPC) and wireless headsets.

In 1994, RFM introduced the amplifier-sequenced hybrid (ASH) receiver, and in 2006 introduced the third generation Virtual Wire line of short-range radios comprised of RF transceivers, receivers and transmitters.

Virtual Wire and RFIC products are embedded in automated meter reading, global positioning systems, industrial and environmental controls, RFID, home and industrial automation, medical monitoring, and security systems. The dramatic increase in the deployment of wireless communications in the following applications drives RFM product innovation of RF components for unlicensed communications equipment.



**RFM**  
RF Monolithics, Inc.®



# RF Components Embedded into M2M Applications



- Automotive keyless entry
- Tire pressure monitoring
- GPS locating systems



- Wireless point-of-sale terminals
- Data link equipment
- Peripherals



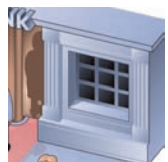
- Remote bar code data entry
- Bar code readers
- Identification tags



- Satellite digital audio radio (SDAR)
- Synchronous optical network (SONET)



- Global positioning systems (GPS)
- Wireless local area network (WLAN)
- CATV Infrastructure
- Higher performance computing (HPC)



- Home automation
- Door and gate openers
- Personal and home security
- Automated meter reading
- Consumer sports



- Medical monitoring systems
- Medical pendants
- Pacemakers / defibrillators
- Insulin pumps



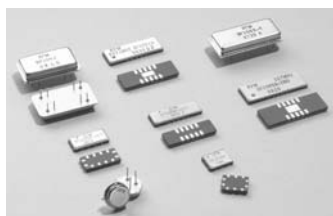
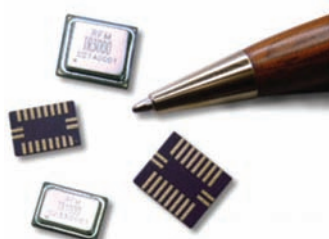
- Cellular subscriber terminals, base stations, and repeaters for:
- GSM
  - TD-SCDMA
  - CDMA
  - TDMA
  - W-CDMA
  - Wireless Local Loop
- Cellular Digital Packet Data (CDPD) modems

Components	Short-range Radio Devices and RFICs
<b>SAW Resonators</b> <b>SAW Narrowband Filters</b> <b>SAW RF &amp; IF Filters</b> <b>Frequency Control</b>	<b>Virtual Wire</b> <b>RFICs</b>
<b>SAW Resonators</b> <b>SAW Narrowband Filters</b> <b>SAW RF &amp; IF Filters</b> <b>Frequency Control</b>	<b>Virtual Wire</b> <b>RFICs</b>
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<b>SAW RF &amp; IF Filters</b> <b>Frequency Control</b>	



### SAW Components and Frequency Control

High performance wireless components integral to enabling wireless connections and communications; embedded into a wide range of products that require ultra-low-power and long-battery life.

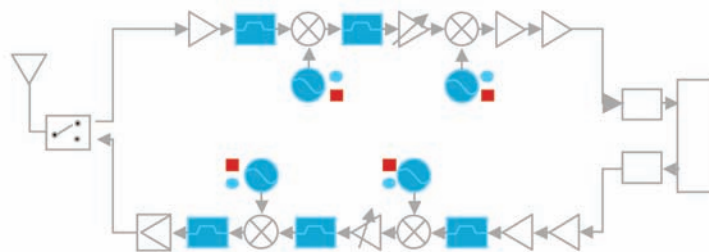


#### Products

- SAW Resonators
- SAW Narrowband Filters
- SAW RF & IF Filters
- High performance Frequency Control
  - Oscillators
  - SAW-stabilized Optical Timing and Diff-Sine Wave Clocks
  - Crystal-based Products

#### Features

- 6 MHz – 2.6 GHz
- Small Size
- Low Cost
- Low Power Consumption



**SAW Resonators** Low-power SAW resonators are used as frequency control elements in transmitter and receiver LO circuits. These components are essential to the miniature radio frequency transmitters and receivers that enable a variety of wireless consumer, automotive, industrial, medical and commercial applications. RFM manufactures reliable, high performance, low-cost components in a variety of small surface-mount packages as well as the traditional TO-30 “metal can” package.

**SAW Narrowband Filters** The use of narrowband SAW filters has become a necessity in a variety of wireless links. RFM SAW coupled resonators filter components are used as narrowband front-end filters for receivers to reject strong out of band signals. RFM has an extensive offering of low-cost, rugged, narrowband SAW front-end filters in a broad range of frequencies and a variety of small packages. These low-cost front-end filters exhibit excellent rejection characteristics, low insertion loss and superior temperature stability.

**SAW RF/IF Filters** RFM filter products includes a variety of standard and custom bandpass filters for radio frequency (RF), intermediate frequency (IF) and other applications. The operating frequencies of these filters range from 40 MHz to 2.6 GHz. These filters are available in a variety of leaded and surface-mount packages. RFM also custom designs and manufactures SAW delay lines and notch filters.

**Frequency Control** RFM Frequency Control products include a broad array of devices:

- SAW-stabilized Optical Timing Clocks and Diff-Sine Wave Clocks and Oscillators in a wide range of operating frequencies between 200 MHz and 1.8 GHz. They have tolerances of 100 ppm basic stability or the ability to tune to lock to a more stable system clock.
- A variety of tiny, high performance Crystal-based devices used in both time and frequency domain applications.





# RFI™ RF Monolithics, Inc.

Components and Short-Range Radio Devices

## Short-range Radio Devices Virtual Wire and RFICs

The Virtual Wire short-range and RFIC radio products are attractive to OEMs that wish to embed RF capabilities and communications within their products. These OEMs also typically possess RF engineering and networking expertise that enables them to incorporate low-power sensor networking capabilities as a feature within their product offerings, often to connect the devices they manufacture to each other and the Internet.

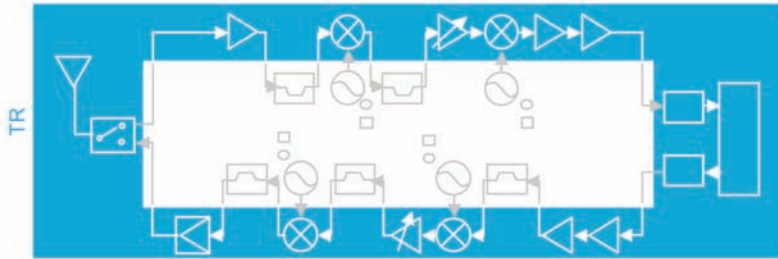
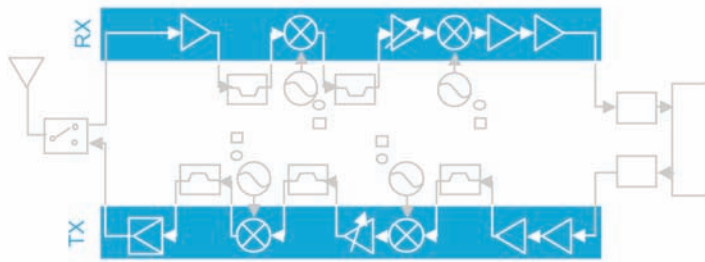


### Products

- 3G Virtual Wire Transceivers
- 2G Virtual Wire Transceivers
- RF IC Transmitters
- RF IC Receivers

### Features

- 300-1000 MHz
- Data Rates up to 1Mbps
- SAW & Crystal-based
- OOK/ASK & FSK Modulation



**RFM Virtual Wire Short-range Radio Devices** include RFM 2G and 3G Virtual Wire transceivers, transmitters, receivers, are based on RFM ultra low power, proprietary amplifier-sequenced hybrid (ASH) radio architecture, and offer the following features:

- Integrated PLL, IF, Baseband Circuitry, thus minimizing external component count and simplifying and speeding design-ins
- Support for single- and multiple-channel applications
- Wide frequency range
- Wide operating supply voltage
- Frequency Hopping Spread Spectrum capability
- Very few external components required
- Small size plastic packages
- Integrated RF IC with quartz SAW filtering and frequency control components in a single hybrid greatly simplifying and speeding up the RF design task
- High data rates for data, control and digitized voice transmissions
- Stable, sensitive receiver technology with excellent “channel capture” performance

**RFM RFIC Short-range Radio Devices** include PLL-based, single or multi-channel transceivers, transmitters and receivers, evaluation boards and RF Design Assistant Software, servicing varied wireless applications in the marketplace and provide the following features:

- Ultra low current consumption for operation from small 3 V batteries
- Very small, low-profile package to make “watch size” applications practical
- Rugged, self-shielding, metal-ceramic hybrid package
- Wide operating temperature range for industrial and outdoor applications
- Easy to optimize for a wide range of application requirements
- Easy certification to stringent short-range radio regulatory requirements
- No external RF filters, IF filters, resonators or crystals are required



# Developer Kits, Evaluation Boards, and Evaluation Modules

Evaluation boards and samples of the RFM SAW-based RF / IF filters and RFM frequency control components are available from RFM distributors by their respective component part numbers. See RFM Product Selection Guide or go to [www.rfm.com](http://www.rfm.com) for detail listing and technical specifications from which to select your products.

RFM also offers Developer Kits, Evaluation Boards and Evaluation Modules for its short-range radio devices, also available through authorized distributors. They contain everything RF design engineers need to quickly get your application up and running and are listed below.

## Virtual Wire Short-Range Radio Devices

Virtual Wire



### 2G Developer Kits

- DR1200-DK 6.5MHz 2G Development Kit
- DR1200A-DK 16.5MHz 2G Development Kit
- DR1201-DK 868.35MHz 2G Development Kit
- DR1201A-DK 868.35MHz 2G Development Kit
- DR1300-DK 433.92MHz 2G Development Kit
- DR1300A-DK 433.92MHz 2G Development Kit
- DR2000-DK 916.5MHz 2G Development Kit

### 3G Developer Kits

- DR8100-DK 916.5MHz 3G Development Kit
- DR8000-DK 916.5MHz 3G Development Kit
- DR8001-DK 868.35MHz 3G Development Kit
- DR7000-DK 433.92MHz 3G Development Kit
- DR7001-DK 315MHz 3G Development Kit
- DR7002-DK 418MHz 3G Development Kit
- DR7003-DK 303.825MHz 3G Development Kit

### Evaluation Module

- DR7000-EV 433.92MHz 3G Transceiver Evaluation Module
- DR8000-EV 916.50MHz 3G Transceiver Evaluation Module
- DR8001-EV 868.35MHz 3G Transceiver Evaluation Module
- DR8100-EV 916.50MHz 3G Transceiver Evaluation Module



## RF ICs Short-Range Radio Devices

RF ICs

### Developer Kits

- DR-TXC101-315-DK 315MHz Transmitter
- DR-TXC102-433-DK 433.92MHz Transmitter
- DR-TXC102-868-915-DK 868MHz and 915MHz Transmitter
- DR-TRC101-315-DK 315MHz Transceiver
- DR-TRC101-433-DK 433.92MHz Transceiver
- DR-TRC101-868-915-DK 868MHz and 915MHz Transceiver
- DR-TRC102-433-DK 433.92MHz Transceiver
- DR-TRC102-868-915-DK 868MHz and 915MHz Transceiver
- DR-RXC101-315-DK 315MHz Receiver
- DR-RXC101-433-DK 433.92MHz Receiver
- DR-RXC101-868-915-DK 868MHz and 915MHz Receiver



### Evaluation Boards

Evaluation Boards allow for evaluation of the RF performance of their respective transmitter, receiver, or transceiver. The board is designed to serve as a standalone evaluation tool or a simple code development platform.

- DR-TXC100-315 315MHz Transmitter Evaluation Board
- DR-TXC100-433 433.92MHz Transmitter Evaluation Board



- DR-TXC101-315 315MHz Transmitter Evaluation Board
- DR-TXC102-433 433.92MHz Transmitter Evaluation Board
- DR-TXC102-868-915 868MHz and 915MHz Transmitter Evaluation Board
- DR-TRC101-315 315MHz Transceiver Evaluation Board
- DR-TRC101-433 433.92MHz Transceiver Evaluation Board
- DR-TRC101-868-915 868MHz and 915MHz Transceiver Evaluation Board
- DR-TRC102-433 433.92MHz Transceiver Evaluation Board
- DR-TRC102-868-915 868MHz and 915MHz Transceiver Evaluation Board
- DR-RXC101-315 315MHz Receiver Evaluation Board
- DR-RXC101-433 433.92MHz Receiver Evaluation Board
- DR-RXC101-868-915 868MHz and 915MHz Receiver Evaluation Board



# Cirronet OEM Modules for Custom Designs Plus Standalone Ready-to-Use Devices for Systems Integration

In every industrial and commercial setting, communications links carry vital information between assets and machinery, and control and monitoring devices. From periodic updates to ongoing process and management, reliable data flow is critical to operations of factories, supply chains, energy and utilities, security and public safety, and public transportation.

For 20 years, Cirronet has been enabling wireless data communications in industrial and commercial settings. The company remains at the forefront of wireless communications innovation to meet a broad range of next-generation M2M applications.

## Breadth – Open Standards and Proprietary Technologies

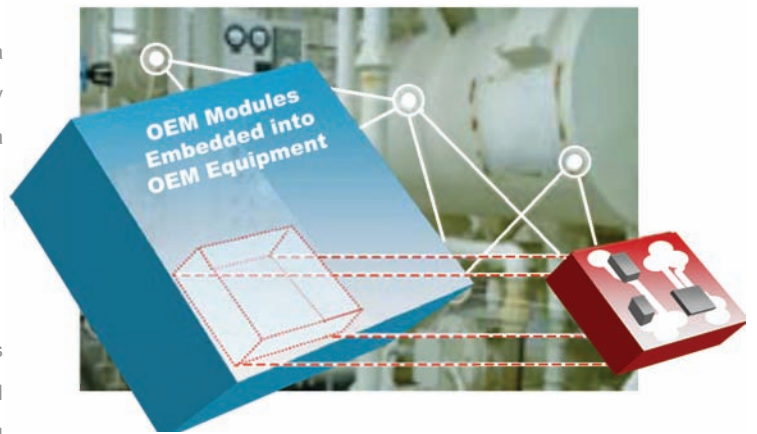
Unlike the many start-ups offering only the latest fad in wireless networking, Cirronet is a well established company offering a broad selection of wireless data communications from both open standards and several tried-and-true proprietary technologies.

## Depth – OEM Modules and Standalone Devices

Cirronet offers both OEM modules for embedded designs and complementary standalone “boxed” devices that are ready-to-use in systems integration.

**OEM Modules.** Product managers, design engineers, and others desiring to add wireless connectivity in their new or existing OEM products look to Cirronet OEM modules for rapid, low-cost deployment of wireless data communications. All Cirronet OEM modules meet US FCC and/or European ETSI standards.

**Standalone Devices.** Cirronet standalone devices complement their companion OEM modules and are frequently used to deliver a complete wireless communications system. They consist of serial to Ethernet access points, Ethernet bridges, Serial modems, I/O modems and Modbus and Ethernet gateways. In that they are ready-to-use boxed devices, systems integrators implement Cirronet standalone products as the platform for wireless replacement of cable-networked systems.





# Low-Power Reliable Self-Healing Mesh

## Wireless Mesh Sensor Networking for Applications Requiring Low to Medium Data Rates for Equipment Monitoring

While Ethernet and Bluetooth have brought expanded communications connectivity to a broad array of assets and devices, many more machines remain under-connected or not connected at all. Technology platform costs and their inconvenient power consumption for these higher data rate technologies often far outweigh the benefits of connectivity. Many other assets remain unconnected because they reside in hostile environments. The result is reduced life-time value of assets and lower resource utilization than if real-time asset performance and operating condition information were available and used to take maintenance action in real-time to optimize performance.

However, recent advances in new low-power wireless technologies support sophisticated connections to sensors, machines, and controllers — making available an unprecedented amount of information about machinery, equipment, and structures than ever before.

Cirronet offers Wireless Mesh and Sensor Networking product lines based on open standards – ZigBee and 802.15.4 – and Cirronet proprietary technology – MiniMESH and VersaMESH.

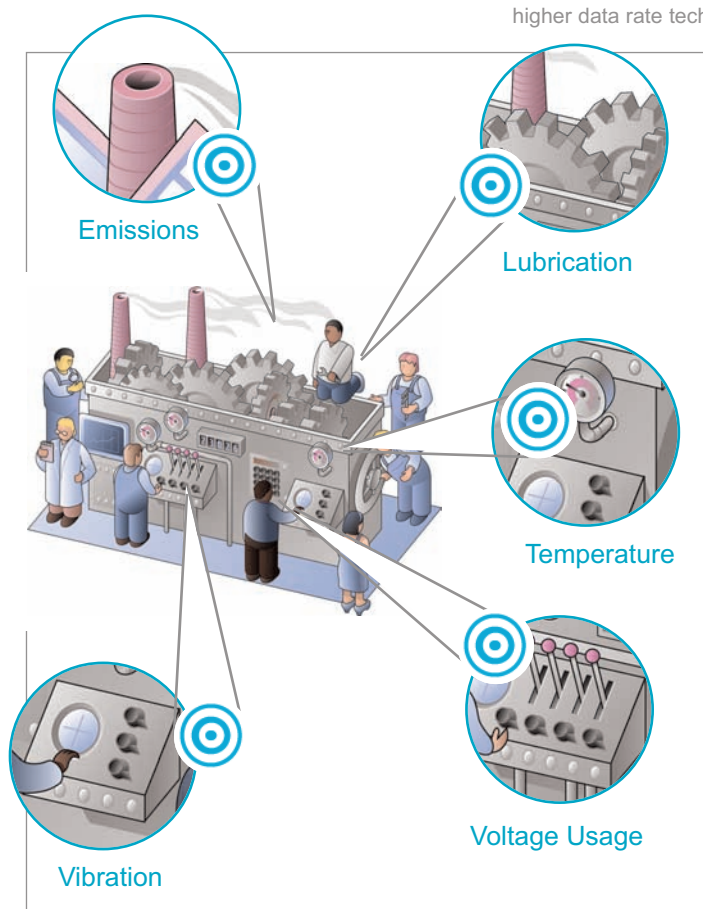
### Self-healing Mesh Networking

Cirronet ZigBee, MiniMESH and VersaMESH networks feature a “self healing” mesh topology. If data cannot reach its destination through an intended link, the network dynamically routes that data to make delivery through an alternate path. These technologies create infrastructure that is decentralized and inexpensive, as each node need transmit only as far as the next node. Nodes act as repeaters to transmit data from nearby nodes to peers that are too far away to reach, resulting in a network that can span a large distance, especially over rough or difficult terrain. Extra capacity can be installed by simply adding more nodes, and these products may be used with either fixed or mobile devices. For applications that need cost

and power savings but do not require mesh networking and its attendant overhead, Cirronet 802.15.4 LPR products provide excellent peer-to-peer and star topology wireless networking.

### Sensor Monitoring

Cirronet ZigBee conditioning boards provide all the electronics needed to add wireless mesh networking functions to any 4-20mA sensors. These Class I Div 2 certified boards are designed for industrial sensing applications. Provision is also made to add a temperature sensor without using one of the four current loop inputs.





# Long-Range Wireless Data Networks



## Wireless Industrial Telemetry for SCADA and Other Applications Requiring High Data Through Put in Challenging or Remote RF Environments

Wireless networking in industrial and factory environments require radio transmission that is far more resistant to electrical noise and interference, jamming and multipath fading than conventional radio transmission. Frequency Hopping Spread Spectrum (FHSS), originally developed for military applications, is widely utilized for industrial and manufacturing applications because it employs a technique to spread a signal over multiple frequencies to ensure reliable over-the-air transmission in any conditions.

Cirronet offers four series of proprietary FHSS products that incorporate five Cirronet patents and that have been tested in field applications for over ten years – **WIT**, **SNAP**, **SEM**, and **HopNet**.

### Industrial Automation and Process Control

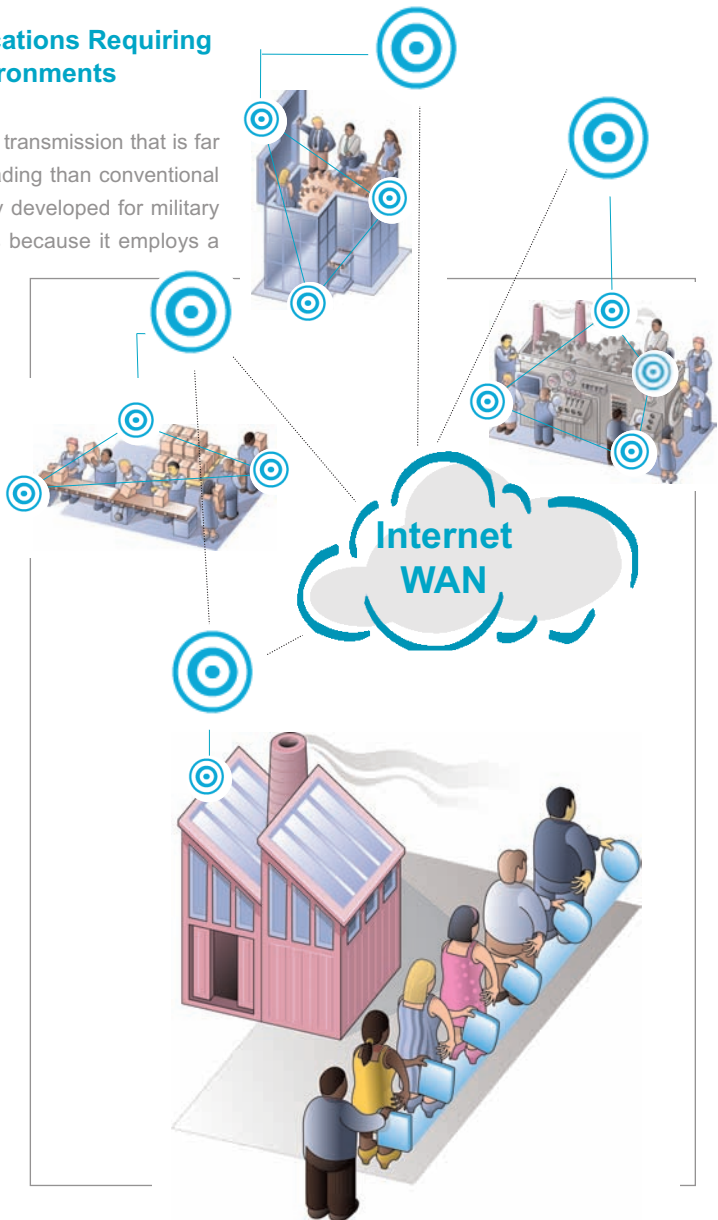
For decades, industrial automation – the operation of manufacturing processes under the control of computers or programmable controllers (PLCs) – has used direct wire connections between sensors, actuators and controlling computers. Today, Cirronet FHSS-based Wireless Industrial Telemetry (WIT) products enable industrial automation to both discrete and continuous manufacturing process.

**Indoor.** The radio transmission in Cirronet FHSS products “hops” randomly and extremely quickly through multiple channels, changing transmission frequency every few milliseconds. 24-bit cyclic redundancy check (CRC) and an automatic repeat-request (ARQ) mechanism detect when interference has blocked a channel, and immediately retransmit associated data over other channels to ensure error-free delivery.

**Outdoor.** Industrial and manufacturing environments often include expansive outdoor operations. For outdoor industrial and SCADA (supervisory control and data acquisition industrial automation systems), FHSS provides greater transmission range than is afforded by such protocols as 802.11. FHSS networking useful in outdoor applications where nodes may be separated by several miles, while ensuring fast, error-free delivery of data of up to 20 miles.

## Wireless Data Networking for VERY HIGH DATA THROUGH PUT to Leverage Existing Network Infrastructure (802.11 / Bluetooth)

Ethernet accommodates a wide range of application and has become universally supported by communications manufacturers in that it encapsulates industrial equipment protocols. Cirronet wireless Ethernet (based on IEEE 802.11) and Bluetooth networking provides an excellent means to both add wireless connectivity to devices for which cable-connections have been impractical, while leveraging existing Ethernet infrastructure that promotes office LAN interoperability.



Wireless Modules and Networking



**CIRRONET**

An RF Monolithics Company

Standard
Network Topology*
Technology
Frequency
Data Rate
RF Power
Range Indoor
Range Outdoor
Size
Interface

\*P2P = Peer-to-Peer  
MP = Multipoint or Star

## Wireless Mesh and Sensor Networking to Meet LOW POWER with LOW TO MEDIUM DATA THROUGH PUT Application Requirements

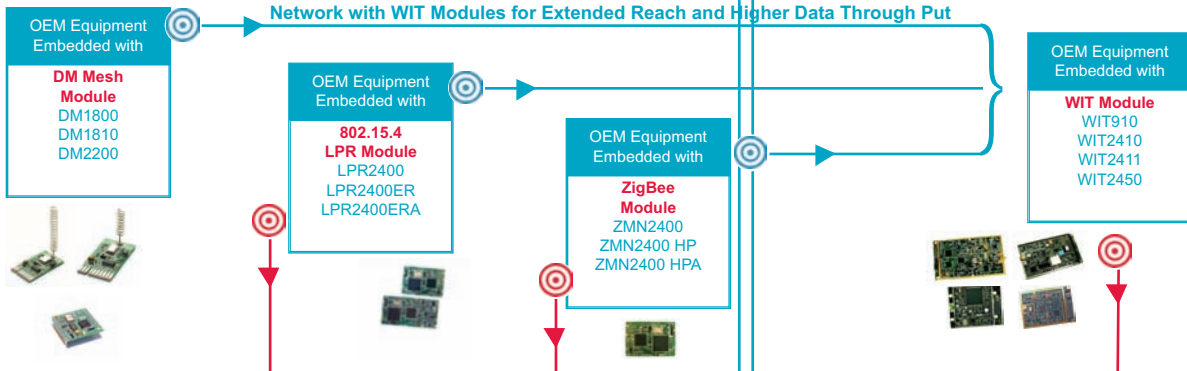
OEM MODULES • MODBUS & ETHERNET GATEWAYS • SERIAL MODEMS

Proprietary	802.15.4	ZigBee
Mesh	MP and P2P	Mesh
Narrowband	Narrowband / DSSS	DSSS
434MHz / 900MHz	2.4GHz	2.4GHz
4.8Kbps / 9.6Kbps	250Kbps	250Kbps
1MW / 10MW	1MW / 100MW	1MW / 100MW
100M	30M / 100M	30M / 100M
100M / 1,000M	100M / 1,000M	100M / 1,000M
<2 sq in / <6 sq in	<2 sq in	<2 sq in
I/O & UART	I/O & UART	I/O & UART

## Wireless LOW POWER

OEM MODULES • SERIAL TO

Proprietary
MP
FHSS
900MHz / 2.4GHz
172.8K – 1.22M
100MW – 1W
>100M
10,000M +
<6 sq in / >6 sq in
UART ONLY



Ready-to-Use (Boxed)  
and  
Standalone Devices for  
Systems Integration

**802.15.4 Wireless replacement for R-232 cable 802.15.4 Serial Modem**  
ZN-241G  
ZN-241GSK  
ZN-241GI  
ZN-241GU

**ZigBee**

**Add wireless mesh function to wireless sensor network**

ZigBee Sensor Conditioning Board ZB2401

Wireless Sensor Modem ZN-9001 ZN-2401 ZN-241Z

**Connect to ModBus PLC or Ethernet Automation Network**

Ethernet or Modbus Gateway Functions as ZigBee network coordinator / takeout point ZG-2400E ZG-2400M

ZN-241Z  
ZN-241ZI  
ZN-241ZU

**HOPNET Wireless Serial Modems**

Long-range SCADA Serial Modem for 900 MHz WIT Modules

Indoor / Outdoor HN-291 HN-291D

Indoor / Desktop HN-591

Indust Control Serial 2.4 GHz

Indoo H H H I H H O H H H

Fully Compatible Wireless Network

Wireless Modules and Networking



## Industrial Telemetry to Meet SCADA and Other MEDIUM RANGE or HIGH DATA THROUGH PUT Application Requirements

ETHERNET ACCESS POINTS • ETHERNET BRIDGES • SERIAL MODEMS • I/O MODEMS

Integrate with **SNAP, HNIO, or SEM** for highly complex networks and extended coverage in SCADA, PLC, and industrial automation applications

Connect SCADA, PLC, and industrial automation applications quickly via **HOPNET** modems designed for WIT modules

Industrial Remote and SCADA Modems for WIT Modules

Indoor / Outdoor  
SN-210  
SN-210D  
SN-211  
SN-250

Indoor  
SN-510  
SN-550  
SN-1510

Outdoor  
SN-1010  
SN-2010  
SN-3010



**SNAP Wireless Serial to Ethernet Access Points**  
Serves as base station for WIT Modules and HOPNET Modems



SNAP910 D / X / DX  
SNAP2400 D / X / DX  
SNAP2411 D / X / DX

Eliminates need for remote devices to handle the TCP/IP protocol

**HNIO Wireless Analog / Relay I/O Modems**  
Connection for WIT Modules and HOPNET Modems



Analog / Digital I/O Modems relay key levels of sensor data  
HNIO-091 A  
HNIO-0241 A

Relay I/O Modems control state of equipment  
HNIO-091 R  
HNIO-0241 R

**SEM Wireless Spread Spectrum Ethernet Bridge**  
Combine P2P MP with Cirronet repeaters to extend coverage



SEM910 D / X / DX  
SEM910-HL  
SEM2400 D / X / DX  
SEM2410 D / X / DX  
SEM2411 D / X / LC  
SEM5811 D / X / DX

HS bridge between two 10/100BaseT Ethernet networks

Connect Ethernet base station and multiple Ethernet remote modems

## Wireless Data Networking to Meet VERY HIGH DATA THROUGH PUT to Leverage Existing LAN Infrastructure

OEM MODULES • MODEMS • ACCESS SERVER

802.11
MP & P2P
DSSS

Bluetooth
MP & P2P
FHSS

2.4GHz
54M
100MW

2.4GHz
4M
10MW / 100MW

100M
1,000M
<6 sq in

30M / 100M
30M / 100M
<2 sq in

UART ONLY
-----------

I/O & UART
------------

OEM Equipment Embedded with

**Airborne™ Technologies**  
802.11 Wireless LAN Module



OEM Equipment Embedded with

**BlueGiga™ Bluetooth Module**  
WT11

WT12

WRAP THOR 2022

WRAP THOR 2022B2B



**HOPNET 802.11 Wireless Ethernet Data Modem**  
Combine with 802.11 Wireless LAN Module for a "Drop-in" Web-enabled WIFI Solution



**WRAP THOR Wireless Access Server**  
Network Bluetooth end devices into non-Bluetooth networks



RFM Systems WIT, HOPNET, SNAP, HNIO, SEM

Wireless Modules and Networking



# Developer Kits / Evaluation Kits

Cirronet Developer Kits come in a variety of sizes providing from as few as two nodes up to 10 nodes so you only pay for what your application needs. All Cirronet development kits include unlimited technical support at no extra charge. All development contain everything you need to get "on the air" within minutes of opening the kit.

- Simple to set-up and configure to accelerate the integration process
- Unlimited technical support included with purchase
- Allows development of the interface to your system and your control software
- Complete with all the pieces to put a system "on the air" (battery and AC powered development boards and wireless nodes, AC power adapters and cords, patch antennas, serial cables, RF cables, omni antennas, batteries, integration guides and utility software)

## Wireless Sensor Networking **LOW TO MEDIUM DATA THROUGH PUT**

ZigBee



- **ZMN240HPDK-B** 2.4 GHz Basic development kit for the ZMN2400HP module including one RS-232 serial modem, one development board, demonstration software, power supplies, antennas, and batteries
- **ZMN2400HPDK** Development kit for the ZMN2400HP module including two development boards, demonstration software, power supplies, antennas and batteries
- **ZMN2400HPDK EG** Development kit for the ZMN2400HP module including four remote boards and one Ethernet gateway, demonstration software, power supplies, antennas and batteries
- **ZMN2400HPDKPro** Development kit for the ZMN2400HP module with four remote boards and one serial gateway board, demonstration software, power supplies, antennas and batteries
- **ZMN2400HPADK** Development kit for the ZMN2400HPA module including two development boards, demonstration software, power supplies, antennas and batteries
- **ZMN2400HPADK-B** Basic development kit for the ZMN2400HPA module including one RS-232 serial modem, one development board, demonstration software, power supplies, antennas, and batteries
- **ZMN2400HPADK EG** Development kit for the ZMN2400HPA module including four remote boards and one Ethernet gateway, demonstration software, power supplies, antennas and batteries
- **ZMN2400DK** Development kit for the ZMN2400 module including two development boards, demonstration software, power supplies, antennas and batteries
- **ZMN2400DKPro** Development kit for the ZMN2400 module with four remote boards and one serial gateway board, demonstration software, power supplies, antennas and batteries
- **ZMN2400DK EG** Development kit for the ZMN2400 module including four remote boards and one Ethernet gateway, demonstration software, power supplies, antennas and batteries

802.15.4 LPR



- **LPR2400DK** Development kit for the LPR2400 module including one RS-232 serial modem, one development board, demonstration software, power supplies, antennas, and batteries
- **LPR2400DK Pro** Development kit for the LPR2400 module with four remote boards and one RS-232 serial modem, demonstration software, power supplies, antennas and batteries
- **LPR2400ERDK-B** Basic development kit for the LPR2400 module including two RS-232 serial modems, one development board, demonstration software, power supplies, and antennas
- **LPR2400ERDK** Development kit for the LPR2400ER module including one RS-232 serial modem, one development board, demonstration software, power supplies, antennas, and batteries
- **LPR2400ERDK Pro** Development kit for the LPR2400ER module including one RS-232 serial modem, one development board, demonstration software, power supplies, antennas, and batteries
- **LPR2400ERADK** Development kit for the LPR2400ERA module including one RS-232 serial modem, one development board, demonstration software, power supplies, antennas, and batteries
- **LPR2400ERADK Pro** Development kit for the LPR2400ERA module with four remote boards and one RS-232 serial modem, demonstration software, power supplies, antennas and batteries
- **LPR2400DB** Additional development board for the LPR2400 module including power supply, antennas, and cables
- **LPR2400HPDB** Additional development board for the LPR2400HP module including power supply, antennas, and cables
- **LPR2400HPADB** Additional development board for the LPR2400HPA module including power supply, antennas, and cables

VersaMESH



DM2200-916-DK

- **DM2200-916-DK** Development Kit for the DM2200-916VM module with 1 Base Station module, 3 Field Node modules, 4 IM2200 interface boards, cables, demonstration software, 4 battery packs and 4 power supplies.

Wireless Modules and Networking





## Wireless Sensor Networking **LOW TO MEDIUM DATA THROUGH PUT** (Continued)

MiniMESH



**DM1800-434-DK**  
**DM1800-916-DK**

- **DM1800-434-DK** Development kit for the DM1800-434M module with 1 Base Station and 5 Field Node modules, 5 Router modules, and 3 IM1800 interface boards, cables, demonstration software, 5 battery packs and 5 power supplies.
- **DM1800-434-QK** "Quick" development kit for the DM1800-434M module with 1 Base Station module, 1 Router module, 2 Field Node modules, 1 IM1800 interface board, and demonstration software
- **DM1800-916-DK** Development kit for the DM1800-916M module with 1 Base Station and 5 Field Node modules, 5 Router modules, and 3 IM1800 interface boards, cables, demonstration software, 5 battery packs and 5 power supplies.
- **DM1800-916-QK** "Quick" development kit for the DM1800-916M module with 1 Base Station module, 1 Router module, 2 Field Node modules, 1 IM1800 interface board, and demonstration software



**DM1810-434-DK**  
**DM1810-916-DK**

- **DM1810-434-DK** Development kit for the DM1810-434M module with 1 Base Station and 5 Field Node modules, 5 Router modules, and 3 IM1800 interface boards, cables, demonstration software, 5 battery packs and 5 power supplies.
- **DM1810-434-QK** "Quick" development kit for the DM1810-434M module with 1 Base Station module, 1 Router module, 2 Field Node modules, 1 IM1810 interface board, and demonstration software
- **DM1810-916-DK** Development kit for the DM1810-916M module with 1 Base Station and 5 Field Node modules, 5 Router modules, and 3 IM1800 interface boards, cables, demonstration software, 5 battery packs and 5 power supplies.
- **DM1810-916-QK** "Quick" development kit for the DM1810-916M module with 1 Base Station module, 1 Router module, 2 Field Node modules, 1 IM1810 interface board, and demonstration software

## Wireless Industrial Telemetry **HIGH DATA THROUGH PUT**

Frequency Hopping Spread Spectrum (FHSS)



- **WIT910DK** Containing 2 WIT910E standalone units with flow control indicators, RS-232 interface, battery pack, power supply, dipole antenna, 2 WIT910M modules, RF cables, antennas and programming software
- **WIT910SDK** Containing 2 WIT910E standalone units with flow control indicators, RS-232 interface, battery, dipole antenna, 1 SNAP910 10/100BaseT access point, 2 WIT910 modules, RF cables, antennas and programming software
- **WIT2410DK** Containing 2 WIT2410E standalone units with flow control indicators, RS-232 interface, battery pack, power supply, dipole antenna, 2 WIT2410M modules, RF cables, antennas and programming software
- **WIT2410SDK** Containing 2 WIT2410E standalone units with flow control indicators, RS-232 interface, battery, dipole antenna, 1 SNAP2410 10BaseT access point, 2 WIT2410 modules, RF cable, antennas and programming software
- **WIT2411DK** Containing 2 WIT2411E standalone units with flow control indicators, RS-232 and USB interfaces, battery, dipole antenna, 2 WIT2411 modules, and programming software
- **WIT2411SDK** Containing 2 WIT2411E standalone units with flow control indicators, RS-232 and USB interfaces, battery, dipole antenna, 1 SNAP2411 10/100BaseT access point, 2 WIT2411 modules, RF cables and dipole antennas and programming software
- **WIT2450DK** Containing 2 HN-550 standalone units with flow control indicators, RS-232 interface, battery pack, power supply, dipole antenna, 2 WIT2450 modules, RF cables, antennas and programming software
- **WIT2492DK** Containing 2 WIT2492E standalone units with flow control indicators, RS-232 interface, battery pack, power supply, dipole antenna, 2 WIT2492M modules, RF cables, antennas and programming software

## Wireless Data Networking **VERY HIGH DATA THROUGH PUT (WIFI, Bluetooth)**

802.11

### Cirronet-enhanced Airborne Wireless LAN Node Module Developer Kit



- **WLNG-EK-DP001** WLN Module Evaluation Kit containing development/prototyping board with module, 802.11 access point w/antenna, 2dB dipole antenna, power supplies and utility software
- **WLNG-EK-DP003** WLN Module Evaluation Kit without access point containing development/prototyping board with module, 2dB dipole antenna, power supplies and utility software

### Cirronet-enhanced Airborne Direct Serial Bridge Developer Kit



- **ABEB-SE-DP101** Airborne Direct™ Serial Evaluation Kit
- **ABEB-SE-DP102** Airborne Direct™ Serial Evaluation Kit without access point
- **ABEB-ET-DP101** Airborne Direct™ Ethernet Evaluation Kit
- **ABEB-ET-DP102** Airborne Direct™ Ethernet Evaluation Kit without access point

Bluetooth



- **EKWT12-A** WT12 Evaluation Kit with 2 eval boards and Onboard Installation Kit
- **EKWT11-A** WT11 Evaluation Kit with 2 eval boards and Onboard Installation Kit
- **EKWT11-E** WT11 Evaluation Kit with 2 eval boards antenna cables, antennas, and Onboard Installation Kit
- **EKWT12-A** WT12 Evaluation Board
- **EKWT11-A** WT11 Evaluation Board
- **EKWT11-E** WT11 with U.FL connector Evaluation Board
- **EKWT1X** Development environment for in-module programming including BlueLab Professional Development environment CD for PC and an EKWT12

Wireless Modules and Networking



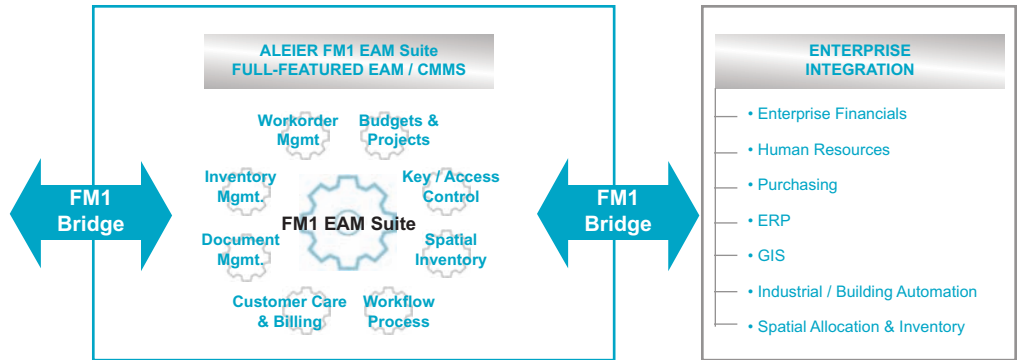
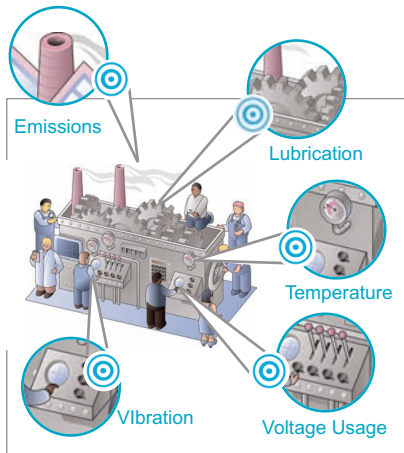
# Condition-based Maintenance

As an RFM company, Aleier leads in condition-based asset maintenance by forging beyond traditional, labor-intensive data collection methods to offer M2M maintenance management solutions. When integrated with RFM companies' wireless sensor networking, Aleier's flagship CMMS / EAM software – the FM1™ EAM Suite – enables companies to conduct condition-based maintenance based on real-time asset condition data.

**More than great software,  
we improve maintenance!**

Companies can then perform more timely predictive maintenance to service equipment when it is needed based on its operating characteristics. Predictive maintenance based on operating parameters yields highly reliable operations while minimizing maintenance costs from excessive scheduled preventive maintenance or emergency reaction to equipment failures.

The FM1 EAM Suite interfaces with building control systems, fleet tracking devices and monitoring systems, production and manufacturing assets, and a myriad of other devices via its FM1 Bridge interface. FM1 Bridge enables FM1 to receive real-time asset condition information that is

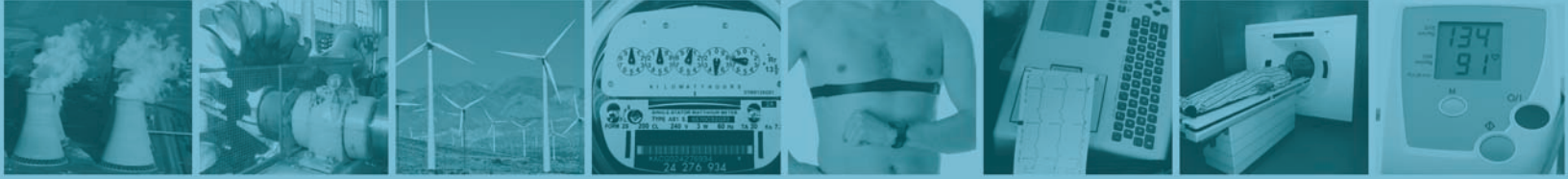


then used to take maintenance action in real time to optimize asset performance. FM1 Bridge also enables FM1 to communicate bi-directionally with assets, PCS systems, and service management crews via traditional connectivity methods (such as wired LANs/WANs or cellular to satellite) as well as through the latest generation of low-power wireless telemetry and sensor networking.

## Wireless Sensor Networking for Real-time Asset Monitoring

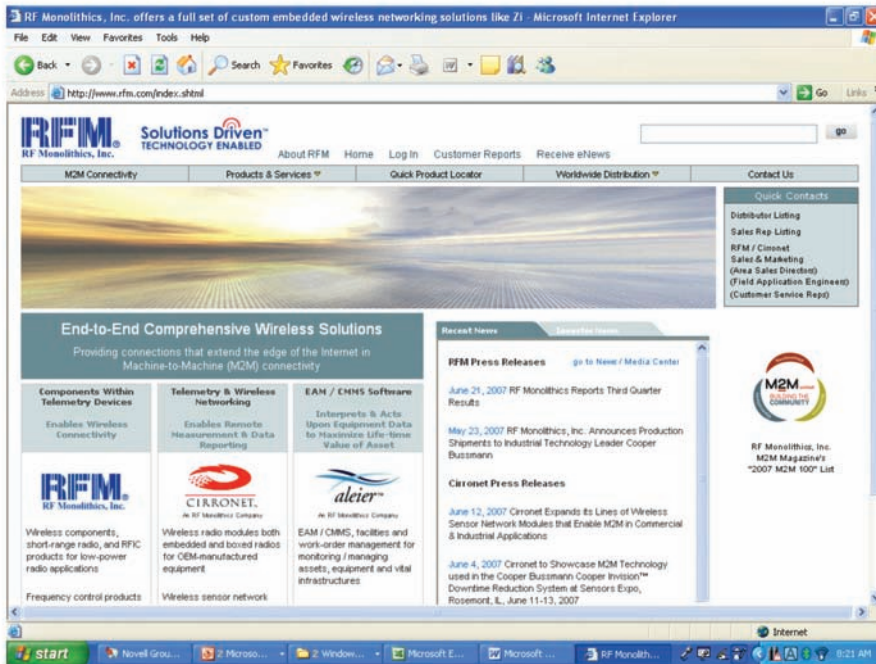
Aleier consultants work in concert with the wireless networking experts from RFM and Cirronet to design and implement wireless sensor networking to meet specific goals for condition-based asset maintenance.

Aleier solutions may include affixing low-power wireless sensors to motors, HVAC systems, and a wide-variety of equipment in order to acquire data about its real-time operating condition. This approach includes transmitting operating condition data to the EAM / CMMS system where it is then compared to pre-determined failure-models. The EAM / CMMS system then ensures that maintenance is scheduled for assets with deteriorating performance to improve the asset's availability and reliability.



# Access RFM, Cirronet and Aleier Through a Single M2M Portal

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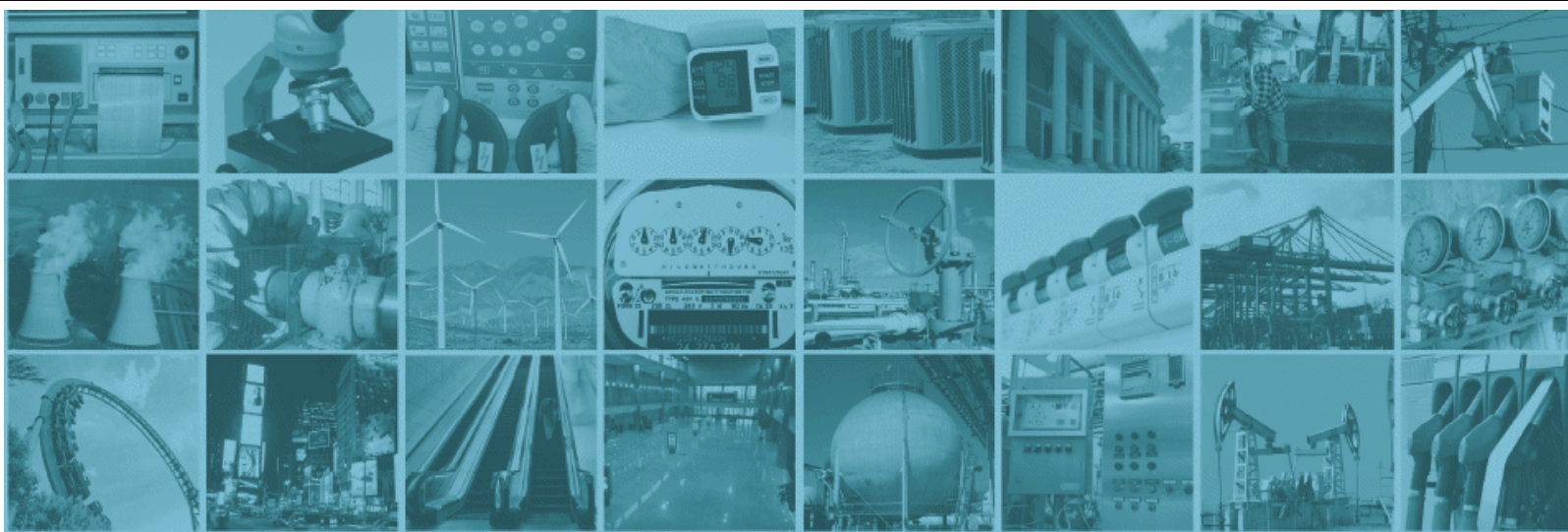
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development  
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