Raven XE

Product Specification Document

SIERRA WIRELESS

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Because of the nature of wireless communications, transmission and reception of data can never be guaranteed. Data may be delayed, corrupted (i.e., have errors) or be totally lost. Although significant delays or losses of data are rare when wireless devices such as the Sierra Wireless device are used in a normal manner with a well-constructed network, the Sierra Wireless device should not be used in situations where failure to transmit or receive data could result in damage of any kind to the user or any other party, including but not limited to personal injury, death, or loss of property. Sierra Wireless accepts no responsibility for damages of any kind resulting from delays or errors in data transmitted or received using the Sierra Wireless device, or for failure of the Sierra Wireless device to transmit or receive such data.

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5,515,013	5,629,960	5,845,216	5,847,553	5,878,234
5,890,057	5,929,815	6,169,884	6,191,741	6,199,168
6,339,405	6,359,591	6,400,336	6,516,204	6,561,851
6,643,501	6,653,979	6,697,030	6,785,830	6,845,249
6,847,830	6,876,697	6,879,585	6,886,049	6,968,171
6,985,757	7,023,878	7,145,267	7,200,512	7,287,162
7,295,171	D442,170	D459,303	D559,256	D560,911

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Contact information

Support Desk:	Phone:	**1-877-231-1144**
	Hours:	5:00 AM to 5:00 PM Pacific Time, **Monday to Friday, except US Holidays**
	E-mail:	support@sierrawireless.com
Sales Desk:	Phone:	1-510-624-4200 **1-604-232-1488**
	Hours:	**8:00 AM to 5:00 PM Pacific Time**
	E-mail:	MobileandM2Msales@sierrawireless.com
Post:	Sierra Wireless America 39677 Eureka Drive Newark, CA USA 94560	
Fax:	1-510-624-4299 **1-604-231-1109**	
Web:	www.sierrawireless.com	

For up-to-date product descriptions, documentation, application notes, upgrades, troubleshooting tips, and press releases, consult our website: www.sierrawireless.com.

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1. Introduction

The Sierra Wireless data terminal provides standards-based wireless data connectivity for point-of-sale devices, telemetry, telematics, and other machine-to-machine fixed and mobile applications. The wireless data terminal is part of a family of products spanning a number of air interface technologies and wide area networking protocols. The purpose of this document is to describe the features and specifications of the data terminal and to provide our partners/customers with the information required to integrate the wireless data terminal into their applications.

Note: You can view this guide online or print it to keep on hand. If you're viewing it online, simply click a topic in the Table of Contents, or any page reference or section reference. (Most text that is blue is a clickable link.) The PDF automatically displays the appropriate page.

1.1. Revision History

Table 1: Revision history

Version	Summary of changes
1.0 June 2009	Initial release
1.9 April 2010	Significant revision

2. Electrical Specifications

2.1.   Power Connector

Below is the pin-out for the I/O Connector

Table 2: Raven XE I/O connector pin-out

Name	Pin	Description	Type
VCC	1	Main supply for device	PWR
BOARD_GND	2	Main device GND for reference	PWR
DIN1	3	Digital input, #1	I
DIN2	4	Digital input, #2	I

Table 3: Power supply specifications

Name	Pins	Specification	Parameter	Min	Typ.	Max	Units
VCC	1	Voltage range	VCC	7	12	28	V
		Ripple voltage		-	-	100	mVpp
GND_EARTH	2	Voltage		-	0	-	V

Table 4: Digital inputs specifications

Name	Pins	Specification	Param	Min	Typ.	Max	Units
DIN[1,2]	3, 4	Input low state voltage range	VIL	-0.3	0	1.5	V
		Input high state voltage range	VIH	2.0	----	VCC+1	V
		Input leakage current (3.3VDC IN)	IIN	----	350	----	µA

2.1.1.   USB Connector

The USB connector is a USB Mini-B receptacle.

The USB interface is compliant to Version 2.0 of the USB standard for full speed operation.

Table 5: USB connector pin-out

Name	Pin	Description	Type
VBUS	1	USB power (Used for detection only)	PWR
D-	2	USB data	USB
D+	3	USB data	USB
ID	4	No Connect	NC
GND	5	Main GND. Connected internally to BOARD_GND	GND
Shield	6	Connector shield. Connected internally to GND_EARTH	Shield

2.1.2.   Primary SIM socket (HSPA SKUs only)

The primary SIM socket is a 6-pin socket operated at 3.3V.

This interface is compliant with the applicable 3GPP standards for USIM.

2.2.   Antenna Ports

The Raven XE has 2 antenna ports:

- Main antenna port: this is the transmit and receive port for the radio. It is an SMA female bulkhead connector.

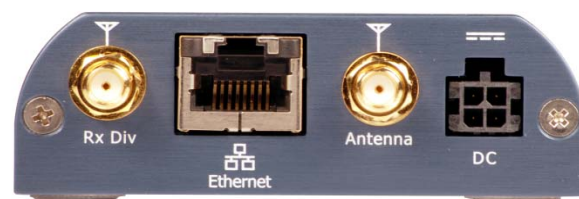- Rx Diversity: this is the receive diversity port for the radio. It is an SMA female bulkhead connector.

Figure 1: Location of connectors

Table 6: Main antenna requirements

Parameter	Min	Typ	Max	Units	Notes
Impedance	-	50	-	Ω	Antenna load impedance
VSWR	-	-	2.5:1		Maximum allowed VSWR of antenna
Gain	-	-	5	dBi	Low band, including cable loss (for FCC and CE compliance)
	-	-	4	dBi	High band, including cable loss (for FCC and CE compliance)

Table 7: Rx diversity antenna requirements

Parameter	Min	Typ	Max	Units	Notes
Impedance	-	50	-	Ω	Antenna load impedance
VSWR	-	-	2.5:1		Maximum allowed VSWR of antenna

CDMA-SKU RF performance and frequency bands

Band	Parameter	
BC0 (US Cellular)	TX frequency band	824 – 849 MHz
	RX frequency band	869 – 894MHz
	Radio performance	Class III
BC1 (US PCS)	TX frequency band	1850 – 1910 MHz
	RX frequency band	1930 – 1990MHz
	Radio performance	Class II

HSPA SKU - HSPA RF performance

Band	Parameter	
Band I WCDMA 2100	TX frequency band	1920 - 1980 MHz
	RX frequency band	2110 – 2170 MHz
	Radio performance	Class 3
Band II WCDMA 1900	TX frequency band	1850 – 1910 MHz
	RX frequency band	1930 - 1990 MHz
	Radio performance	Class 3
Band V WCDMA 850	TX frequency band	824 – 849 MHz
	RX frequency band	869 – 894 MHz
	Radio performance	Class 3
Band VI WCDMA 800	TX frequency band	830 - 840 MHz
	RX frequency band	875 – 885 MHz
	Radio performance	Class 3
Band VIII* WCDMA 900	TX frequency band	880 - 915 MHz
	RX frequency band	925 – 960 MHz
	Radio performance	Class 3

*: MC8795 SKU only

HSPA SKU - GSM/GPRS/EGPRS RF performance

Band	Parameter	
GSM 850	TX frequency band	824 – 849 MHz
	RX frequency band	869 – 894MHz
	Radio performance	GPRS Class 4, EGPRS Class E2
GSM 900	TX frequency band	880 – 915MHz
	RX frequency band	925 – 960MHz
	Radio performance	GPRS Class 4, EGPRS Class E2
GSM 1800	TX frequency band	1710 – 1785MHz
	RX frequency band	1805 - 1880MHz
	Radio performance	GPRS Class 1, EGPRS Class E2
GSM 1900	TX frequency band	1850 – 1910MHz
	RX frequency band	1930 - 1990MHz
	Radio performance	GPRS Class 1, EGPRS Class E2

2.3.   Power Consumption

The tables below summarize the Raven XE gateway's DC power consumption in various modes.

Table 8: CDMA-SKU power consumption

Description	Typ	Max	Units	Notes & configuration
Standby currents[1]				
Hybrid mode	55	----	mA	SCI=2, PCH = full rate, Registration rate = 30 min, Sector power -75 dBm. Neighbor list on. QPCH on. Device idling on both IS-2000 and 1xEV-DO networks.
Typical data transmission currents[2]				
EVDOrA, data call	120	----	mA	1.8 Mbps UL/3.1 Mbps DL, 0dBm Tx
Peak currents				
EVDOrA data call[3] (12V room temp) (7V over temp)	----	230	mA	1.8 Mbps UL/3.1 Mbps DL, +24dBm TX
		700	mA	

Table 9: HSPA-SKU power consumption

Description	Typ	Max	Units	Notes & configuration
Standby currents[1]				
GSM/GPRS/EGPRS	90	----	mA	MFRM = 5 (1.175s)
UMTS/HSPA	90	----	mA	
Typical data transmission currents[2]				
EGPRS Class E2	150	----	mA	+10 dBm Tx, Class 12 (4 slots)
EGPRS Class E2	280	----	mA	+33 dBm Tx, Class 10 (2 slots)
HSUPA Category 6	140	----	mA	0dBm Tx
Max currents (abs peak)				
GSM/GPRS/EDGE (12V room temp) (7V over temp)	----	900	mA	GSM850/ 900, Class 10, +33dBm (GSM/GPRS Class 4), EDGE Class E2
	----	1500	mA	
HSUPA Category 6 (12V room temp) (7V over temp)	----	280	mA	+24dBm Tx
	-----	660	mA	

Note: All numbers are based on a 12V input voltage

[1] Standby current averaged over 5 seconds

[2] Data current averaged over 1 second, at nominal temperature, nominal voltage, 50Ω Antenna with VSWR <2:1.

[3] Max current averaged over 10ms

3. Hardware Interfaces

3.1. USB Interface

The Raven XE contains a USB device interface. This interface supports communication with a PC running Windows.

The USB interface can be dynamically configured to operate in one of two modes:

- **Virtual Ethernet Port** — The Raven XE behaves as if the PC were connected via an Ethernet port, which allows access to the Internet and the internal Raven XE web server. This mode is the default setting for the Raven XE.
- **Virtual Serial Port** — The Raven XE behaves as if connected via a standard serial port. The primary use of this interface is for AT command line interface of ALEOS, and for diagnostic access of the radio module.

A Windows driver must be installed on the PC in order to support the USB interface.

The User Manual contains the details of the USB mode configuration and driver installation.

3.2. Ethernet Interface

The RJ-45 connector is a standard Ethernet port which can be used to connect any Ethernet-enabled device. It is the main connection to the internal web server to show/modify device configuration and monitor status.

3.3. Discrete Signal Interface

The 4 pin power connector contains 2 digital input lines. The configuration of these lines is described in the User Manual.

3.4.   Cellular Interface

The cellular radio provides an IP level interface which connects this device to the Internet. It may also function as an Internet gateway for a PC connected to the USB device port.

The Raven XE may be managed remotely using one of the following:

- Embedded ACEmanager web server
- AT commands using the remote telnet server
- The ACEnet fleet management tool

4. Mechanical and Environmental Specifications

The Raven XE gateway complies with the mechanical and environmental specifications in this section.

Table 10: Environmental specifications

Temperature	Operational	MIL-STD-810F, 501.4, 502.4 -30ºC to +70ºC
	Non-operational	MIL-STD-810F, 501.4, 502.4 -40ºC to +85ºC
Relative Humidity	Non-operational	MIL-STD-810F, 507.4 95% RH
Restrained Cargo	Non-operational	ASTN D-4169
Vibration (loose cargo)	Non-operational	MIL-STD-810F, 514.5 Category 5
Shock Fragility	Operational	MIL-STD-810F, 516.5C
	Non-operational	MIL-STD-810F, 516.5C
Shock Drop	Non-operational	MIL-STD-810F, 516.5D
Electrostatic Discharge	Operational	EN301 489-1 Clause 9.3.2 and EN61000-4-2 Air Discharge (±2kV, ±4kV, ±8kV) Level 3 Contact Discharge (±2kV, ±4kV, ±6kV) Level 3 **No disruption requiring user intervention**
	Non-operational	EN301 489-1 Clause 9.3.2 and EN61000-4-2 Air Discharge ((±2kV, ±4kV, ±8kV) Level 3 Contact Discharge (±2kV, ±4kV, ±6kV) Level 3 **No permanent device damage**
Transport	Operational	MIL-STD-810F, 514.5 Category 4

Table 11: Mechanical specifications

Dimensions	Length:	3.68 in (93.5mm)
	Width	2.97 in (75.4mm)
	Height	1.04 in (26.4mm)
	Weight	0.2kg (0.45 lbs)

Table 12: Reliability information

Model	Temp (C)	MTBF (yrs)
Raven XE CDMA	25	19.1
Raven XE HSPA	25	27.4

MTBF calculations are performed per Telecordia "Reliability Prediction Procedure for Electronic Equipment", document number SR-332, Issue 1. Method I (parts count) is used.

4.1.   Labeling

Figure 2: Raven XE gateway unit label (19.4 x 28.2mm)

The Raven XE gateway label is non-removable and contains:

- Sierra Wireless logo and product name (Raven XE)
- ESN or MEID
- SKU number (when required)
- Factory serial number in alphanumeric format
- Batch revision number in hexadecimal format
- Manufacturing date code
- Licensed vendor logo

Note: *The Raven XE gateway supports OEM partner specific label requirements.*

5. Appendix A: References

5.1. Sierra Wireless documents

- User Guide (for specific model) – www.sierrawireless.com/support

- Carrier Quick Start Guide - www.sierrawireless.com/support

- Various Application Notes - www.sierrawireless.com/support

5.2. Regulatory standards

The Raven XE meets or exceeds the following standards:

1. FCC 47 CFR - Parts 2, 15, 22, 24.
2. Industry Canada ICES-003.
3. Industry Canada RSS-132.
4. Industry Canada RSS-133.
5. R&TTE Directive 1999/5/EC
    a. EMC standards
        i. EN 301 489-1
        ii. EN 301 489-7
        iii. EN 301 489-24
    b. Radio Spectrum standards
        i. EN 301 908-1
        ii. EN 301 908-2
        iii. EN 301 511
    c. Safety
        i. IEC 60950-1:2005 +Al:2009
        ii. EN60950-1:2006 +All:2009
    d. RoHS
6. PTCRB
7. Hazardous Locations – Class 1, Div 2
    a. ISA 12.12.01 "Nonincendive Electrical Equipment for Use in Class I and II, Division 2, and Class III, Divisions 1 and 2 Hazardous (Classified) Locations – Formerly ANSI/ISA-S12.12-1994

CSA C22.2#213 "Nonincendive Electrical Equipment for Use in Class I, Division 2 Hazardous Locations

6. Appendix B: Acronyms

Table 12: Acronyms

Acronym or term	Definition
1xEV-DO	Single Carrier (1X) EVolution – Data Only. A high-speed standard for cellular packet data communications. Supports Internet connections with data rates up to 3.1 Mbps (downlink from the network) and 1.8 Mbps (uplink to the network). Average data rates are roughly: for Rev. A: 600-1300 kbps (downlink from the network) and 300-400 kbps (uplink to the network); for Rev. 0: 400-700 kbps (downlink from the network) and 40-80 kbps (uplink to the network). Actual speed depends on the network conditions. Compare to 1X.
1X	Single Carrier (1X) Radio Transmission Technology. A high-speed standard for cellular packet data communications. Supports Internet connections with data rates up to 153 kbps (simultaneously in each direction—downlink and uplink). Actual speed depends on the network conditions. Compare to 1xEV-DO.
API	Application Programming Interface
AT	A set of device commands, preceded by "AT," originally developed by Hayes, Inc. for their devices. The structure (but not the specific commands, which vary greatly from manufacturer to manufacturer) is a de facto device industry standard.
CDG	CDMA Development Group
CDMA	Code Division Multiple Access. A wideband spread spectrum technique used in digital cellular, personal communications services, and other wireless networks. Wide channels (1.25 MHz) are obtained through spread spectrum transmissions, thus allowing many active users to share the same channel. Each user is assigned a unique digital code, which differentiates the individual conversations on the same channel.
cdmaOne	The IS-95 CDMA standard developed by QUALCOMM Inc.
CnS	Sierra Wireless proprietary Control and Status language interface
DCE	Data Communications Equipment
EIA	Electronics Industry Association
EMC	ElectroMagnetic Compatibility
EMI	ElectroMagnetic Interference
EU	European Union Organization of European countries
ERP	Effective Radiated Power
ESN	Electronic Serial Number—The unique first-generation serial number assigned to the Raven XE gateway for use on the wireless network. Compare to MEID.
FCC	Federal Communications Commission. The U.S. federal agency that is responsible for interstate and foreign communications. The FCC regulates commercial and private radio spectrum management, sets rates for communications services, determines standards for equipment, and controls broadcast licensing. Consult www.fcc.gov.
FW	Firmware: Software stored in ROM or EEPROM; essential programs that remain even when the system is turned off. Firmware is easier to change than hardware but more permanent than software stored on disk.
GPS	Global Positioning System A system that uses a series of 24 geosynchronous satellites to provide navigational data.
IEC	International Electrotechnical Commission

Acronym or term	Definition
IOTA	Internet Over The Air—an automated feature, supported by some service providers, to perform account setup for you by making a connection to the CDMA network and using a secure Internet connection to download account parameters to your device.
IS	Interim Standard. After receiving industry consensus, the TIA forwards the standard to ANSI for approval.
kbps	kilobits per second – Actually 1000, not 1024, as used in computer memory size measurements of kilobytes.
LED	Light Emitting Diode. A semiconductor diode that emits visible or infrared light.
Mbps	Millions of bits per second, or Megabits per second.
MEID	Mobile Equipment IDentifier—The unique second-generation serial number assigned to the device for use on the wireless network. Compare to ESN.
NAM	Number Assignment Module Semi-permanent information stored in the device's non-volatile memory, including the device's Mobile Identification Number, the station class mark, carrier code, and other cellular identifiers. Essentially the phone number, it should be treated as confidential information and should not be disclosed to anyone other than the cellular service provider.
NV	Non-Volatile (memory)
OEM	Original Equipment Manufacturer A company that manufactures a product and sells it to a reseller.
OTAPA	Over the Air Parameter Administration
OTASP	Over the Air Service Provisioning
PCS	Personal Communications Services A cellular communication infrastructure that uses a different frequency range than AMPS.
PPP	Point to Point Protocol. An alternative communications protocol used between computers, or between computers and routers on the Internet. PPP is an enhanced SLIP.
PRI	Product Release Instructions—a file that contains the settings used to configure devices for a particular service provider, customer, or purpose.
RF	Radio Frequency
RoHS	Restriction ofuse of Hazardous substances. EU Directive 2002/95
Rx	Receive
SKU	Stock Keeping Unit—identifies an inventory item: a unique code, consisting of numbers or letters and numbers, assigned to a product by a retailer for purposes of identification and inventory control.
SMS	Short Message Service. A feature that allows users of a wireless device on a wireless network to receive or transmit short electronic alphanumeric messages (up to 160 characters, depending on the service provider).
TIA/EIA	Telecommunications Industry Association / Electronics Industry Association. Telecommunications Industry Association – A standards setting trade organization, whose members provide communications and information technology products, systems, distribution services and professional services in the United States and around the world. Consult www.tiaonline.org.
Tx	Transmit

Acronym or term	Definition
USB	Universal Serial Bus

7. Appendix C: Specifications at a glance

This section outlines the critical high-level features of the Raven XE (9200) Sierra Wireless data terminal.

7.1.1. Regulatory, radio frequency and electrical specifications

7.1.2. Raven XE / MC8790

Approvals & compliance	FCC Industry Canada A-tick PTCRB R&TTE Directive 1999/5/EC (CE, RoHS, Safety, Radio, EMC) MIL-810F Hazardous Locations (ISA and CSA)
Network compliance	GSM, GPRS, EDGE, UMTS HSDPA up to Category 8 (see notes 1,2) HSUPA up to Category 6 (see notes 1,3)
Voltage range	7−28 VDC
Operating Temperature	-25°C to +60°C full 3GPP RF compliance +60°C to +70°C reduced RF performance
Reverse polarity protection	Compliant
GSM/GPRS EDGE bands	GSM 850, EGSM 900, DCS 1800, PCS 1900
UMTS/HSPA bands	Band I (2100/IMT), Band II (1900/PCS), Band V (850/CLR), Band VI (800)

7.1.3. Raven XE / MC8795

Approvals & compliance	A-tick PTCRB R&TTE Directives (CE, RoHS, Safety, Radio, EMC) MIL-810F
Network compliance	GSM, GPRS, EDGE, UMTS HSDPA up to Category 8 (see note 1) HSUPA up to Category 6 (see note 1)
Voltage range	7−28 VDC
Operating Temperature	-25°C to +60°C full 3GPP RF compliance

	+60°C to +70°C reduced RF performance
Reverse polarity protection	Compliant
GSM/GPRS EDGE bands	GSM 850, EGSM 900, DCS 1800, PCS 1900
UMTS/HSPA bands	Band I (2100/IMT), Band II (1900/PCS), Band V (850/CLR), Band VI (800), Band VIII (900)

7.1.4. Raven XE / MC5727

Approvals	FCC Industry Canada EU RoHS MIL-810F Hazardous Locations (ISA and CSA)
Network compliance	CDMA 1xRTT, CDMA 1xEVDOr0, CDMA 1xEVDOrA
Voltage range	7 – 28 VDC
Operating Temperature	-30°C to +60°C full RF compliance +60°C to +70°C reduced RF performance
Reverse polarity protection	Compliant
CDMA/EVDO bands	Band Classes 0 (North American Cellular) and 1 (North American PCS)

Notes:

1: Device capability only. Actual field operation is dependent on network support

2: For K2 radio module firmware. K1 radio module firmware up to category 6 only

3: For K2 radio module firmware. K1 radio module firmware up to category 5 only

Most Raven XE units shipped after 2Q 2010 include modules with K2 firmware. Most units shipped in Q2 2010 or earlier include modules with K2 firmware

7.1.5. Host Interfaces

Power	One 4 Pin connector — Power, Ground and 2 Digital inputs
USB	One — USB Mini-B , USB 1.1/2.0 compliant (Full Speed)
Ethernet	One — RJ45 at 100/10

7.1.6. Other interfaces

Network antenna	Two — SMA female (Main + Diversity)
Reset	One — Manual reset button
SIM socket (HSPA only)	Accessible via front plate removal
LEDs	4 green LEDs: Network, Signal, Activity, Power

7.1.7. Support Features

The Raven XE Gateway offers:

- Standard 1-year warranty
- Extended warranties of 2 additional years available

7.1.8. Supporting Documents

See "Appendix A: References" on page 20.

7.1.9. Accessories Available

- AC/DC Power supply adapter cable
- Antennas (RF main and Rx diversity)
- USB cable
- Combo I/0
- Power Cable

7.2.   Ordering Information

All orders can be made by contacting the Sierra Wireless Sales
Desk at +1 (604) 232-1488 between 8 AM and 5 PM Pacific Time.

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