OEM Data Sheet

September 2001

orinoco™

World PC Card (Integrated)

Introduction

The ORiNOCO PC Card is an 11 Mbit/s wireless networking card with a range of up to 550 m (1750 ft); ideally suited to operation in the enterprise, ISP, public access, home and SOHO environments.

With its PC Card type-II form factor; low power consumption; power management; rugged design (with no protruding antenna); the ORiNOCO PC Card is ideally suited for integration into mobile and handheld platforms.

The ORiNOCO PC Card uses Direct Sequence Spread Spectrum (DSSS) technology, and implements DBPSK, DQPSK and CCK modulation, as defined in the IEEE802.11b standard. This gives a very robust radio channel, which is made even better by the excellent receiver sensitivity and delay spread robustness.

In an environment with radio interference, the ORiNOCO PC Card, because of its 'acknowledgment protocol' and its option to be tuned to another frequency channel, keeps on running.

Superior 'echo path management' makes it suitable for areas with a large delay spread, for example, warehouses. This reduces the number of cells required and therefore reduces the total cost of ownership.

Security against eavesdropping is provided for by either Wired Equivalent Privacy, using a 64-bit key, or by RC4, using a 128-bit key.

The ORiNOCO PC Card is complemented by drivers and networking tools for most popular operating systems, including Windows, Apple, Novell Client and Linux.

Agere provides extensive technical documentation on integration issues, such as: antenna design, customizing drivers, and management software.



Features

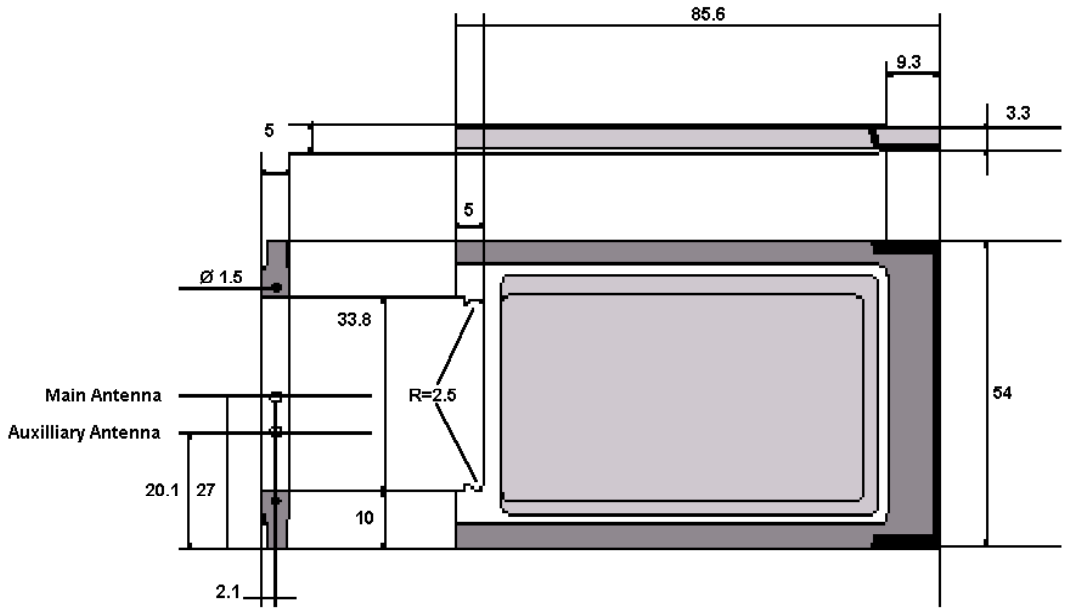
- Automatic fall-back: 11 Mbit/s, 5.5 Mbit/s, 2 Mbit/s or 1 Mbit/s
- Low power consumption
- Automatic power management to reduce battery use
- Software held in upgradeable flash memory
- Easy integration into mobile and handheld platforms, with freedom of design and antenna placement
- Supports internal and external antenna diversity
- 16-bit I/O card
- Can be customized with OEM identifying information and MAC addresses
- Conforms to IEEE802.11 and IEEE802.11b specification
- Interoperable with other IEEE802.11b compliant systems
- Conforms to industry-standard PC Card Type-II form factor specification
- Compatible with Windows, Apple, and Linux systems
- WHQL certification for Windows operating systems

Physical Dimensions/Packaging

The PC Card has been designed to conform to the PCMCIA standard, February 1995, for type-II PC cards as defined in *PC Card Standard Volume 3: Physical Specification, Section 3: Card Dimensions*.

All dimensions in this section have a tolerance as permitted in *PC Card Standard Volume 3*.

Dimensions:	85.6 mm x 54 mm x 5 mm
Weight:	55 g



The card has two mechanically-unique coax connectors for external antennas.

Shock and Vibration Resilience

The PC Card meets all the requirements specified in *PC Card Standard Volume 3* as regards resilience to shock and vibration.

Reliability

MTTF 150,000 hours, based on workload of 2040 hours/year within operating conditions.

Operating Conditions

Operating temperature range	0 °C to 55 °C ambient temperature
Relative humidity when operational	95% maximum (non condensing)
Barometric pressure	740 hPa to 1050 hPa

Absolute Maximum Ratings

Storage temperature range	–20 °C to 75 °C ambient temperature
Relative humidity during storage	95% maximum (non condensing)
Barometric pressure	740 hPa to 1050 hPa

Electrical Specification

Supply voltage	3.3 V or 5 V DC from host (±0.2 V)
Ripple tolerance of supply voltage	120 mV ripple (measured peak-to-peak) with fundamental frequency ≤ 150 kHz
Load capacitance of supply voltage	≤ 150 µF
Power-on start-up time	≤ 600 ms after switching power supply on. (This includes a delay of max 500 ms for the Flash ROM power up sequence.)
Doze to Receive mode start-up time	≤ 0.75 ms. (Transmissions are not allowed during this period.)

Power consumption	Doze mode	Receive mode	Transmit mode
Typical for PC Card	9 mA	185 mA	285 mA
Max for PC Card	15 mA	240 mA	330 mA

RF Specification

Frequency Range	2400 MHz to 2462 MHz
Frequency stability	within 25 kHz of nominal value
Transmitter output power	15 dBm ±2 dB
Over-driving levels	tolerated up to +17 dBm at the antenna connector
Nominal antenna port impedance	50 Ω
Media Access Protocol	CSMA/CA with ACK
Modulation technique	Direct Sequence Spread Spectrum
	CCK (11 Mbit/s and 5.5 Mbit/s)
	DQPSK (2 Mbit/s)
	DBPSK (1 Mbit/s)
Spreading	11-chip Barker sequence

Data Rate	Receiver sensitivity (Bit Error Rate < 10^{-5})	Delay spread robustness (FER < 1%)
11 Mbit/s	-82 dBm	65 ns
5.5 Mbit/s	-87 dBm	225 ns
2 Mbit/s	-91 dBm	400 ns
1 Mbit/s	-94 dBm	500 ns

Antenna Specification

The antenna function of the PC Card provides two connectors for external antennas. These antenna connectors, referred to as MAIN (in the centre) and AUX (towards the side), are used for both reception and transmission (MAIN) and reception only (AUX). The connectors are mechanically unique such that no off-the-shelf connector will fit (FCC requirement).

There are two possibilities for antenna connection.

Two passive antennas

When passive antennas are connected to both ports, one is used for transmission, and the DSP selects which of the two to use for reception, based on signal strength.

External diversity antenna

When an external diversity antenna is connected to the MAIN port, this antenna will be used for both reception and transmission. The switching circuit of the external diversity antenna is not activated unless the LSB of MMI register 3Fh is set via the Modem Management Interface. Antenna selection is then achieved through 3.3 V CMOS bias voltages on the MAIN connector, as follows:

High (V_{CC}=3.3 V nominal)	transmit/receive mode using main antenna of external diversity antenna
Low (V_{CC} = 0 V nominal)	receive mode using auxiliary antenna of external diversity antenna

Activity LED

The signal for an external activity indicator is available on the AUX connector. If there is also a passive antenna connected to AUX, then the RF signal and the DC LED control signal must be split by the implementer. In such a case the antenna must also be DC open.

Security

WEP64: 40-bit key plus 24-bit Initialization Vector

RC4-128: 104-bit key plus 24-bit Initialization Vector

Performance

Characteristics at different rates

The typical ranges in this section are given for a bit error rate better than 10^{-5}, and assume an adequate antenna design by the OEM.

	11 Mbit/s	**5.5 Mbit/s**	**2 Mbit/s**	**1 Mbit/s**
Typical range in open environment	160 m (525 ft)	270 m (885 ft)	400 m (1300 ft)	550 m (1750 ft)
Typical range in semi-open environment	50 m (165 ft)	70 m (230 ft)	90 m (300 ft)	115 m (375 ft)
Typical range in closed environment	25 m (80 ft)	35 m (115 ft)	40 m (130 ft)	50 m (165 ft)
Typical throughput (excluding headers, etc.) using TCP/IP	5.04 Mbit/s	3.44 Mbit/s	1.59 Mbit/s	0.82 Mbit/s

PC Card Connections

The PC Card is connected to the host through the PC Card type-II interface bus. The interface lines are defined in *PC Card Standard Volume 2: Electrical Specification*.

Power is supplied by the host through both V_{CC} lines. The V_{PP}[1::2] lines are not used.

All four ground lines are directly connected to the card's ground plane.

The following signal lines are used:

HA[0::9]	The lower ten bits of the 26-bit address bus.
HD[0::15]	The 16-bit data bus.
HCE[1::2]_	Card Enable 1 and Card Enable 2.
HOE_	Output enable.
HWE_	Write enable.
HIORD_	I/O read (if I/O card).
HIOWR_	I/O write (if I/O card).
HIREQ_ / HREADY	Interrupt request (if I/O card) / Card Ready (if memory-only card).
HWAIT_	Extend bus cycle.
HINPACK_	Input acknowledge (if I/O card), may be used for DMA request.
HREG_	Register select line for attribute memory access (if low).
HSTSCHG_	Card status change (if I/O card).
HRESET	Hardware Reset command from the host (a 100 kΩ pull-up resistor is recommended).

The following lines are used for a 32K/128Kx8 BootROM:

HA[0::14/16]	The lower 15 address lines.
HD[0::7]	The lower 8 bits of the data bus.
HOE_	Output enable.
HWE_	Write enable.
BOOTCS_	= not**(HREG_)** + **HCE1_ . HCE2_**

The following lines are used for hardware configuration:

HCD*[1::2]	Card Detect 1 and Card Detect 2. These lines are connected to ground.	
HIOIS16_	16-bit I/O operation capability, connected to ground.	
HVS[1::2]	Voltage Select are connected as below:	
		3.3/5 V card
	HVS1	Ground
	HVS2	Open
	Socket	5 V key

International Channel Frequencies

The PC Card uses frequencies in the 2.4 to 2.5 GHz ISM band, as defined by IEEE802.11.

Channel numbers 1 to 11 are available as standard and can be used world-wide.

Channel Number	1	2	3	4	5	6	7	8	9	10	11
Frequencies (MHz)	2412	2417	2422	2427	2432	2437	2442	2447	2452	2457	2462

OEM Customizations

The appearance of the card can be made to OEM requirements in terms of the top of the card and the labeling on the back.

Two items in the CIS can be configured with OEM information: the Manufacturer's Name and the Product Name.

MAC addresses and serial numbers which conform to OEM requirements can be used during production.

In addition, installation software can be configured with OEM-defined data, such as splash screens, installation directories, etc.

System Requirements

The PC Card cannot be used simultaneously with any other ORiNOCO wireless card in the same system.

Operating System Compatibility

Drivers are available for the following operating systems:

Windows 95

With Windows95 the NDIS 3 Miniport Driver is used. Windows built-in networking software provides network support.

Windows 98, 98SE, Millennium Edition

For these versions of Windows the NDIS 5 Miniport Driver is used. Windows built-in networking software provides network support.

Windows 2000 (Service Pack 1)

For Windows 2000 the NDIS 5 Miniport Driver is used. Windows built-in networking software provides network support.

Windows XP

For Windows XP the NDIS 5.1 Miniport Driver is used. Windows built-in networking software provides network support.

Windows/NT

The ORiNOCO PC Card is supported under Windows/NT versions v3.51 and v4 with Service Pack 4 or later - Service Pack 6 is recommended.

The NDIS 4 Miniport Driver is used.

Windows CE

Details of which versions of Windows CE running on which processors are supported for use with ORiNOCO PC Cards are given below, together with the form factor to which that OS version applies.

OS version	Form Factor [2]	Processors Supported by ORiNOCO [3]
2.00 [1]	HPC	i486, R3000, R4000, SH3
2.10 [1]	HPC	i486, R3000, R4000, SH3
2.11	HPC Pro	ARM, R4100, SH3, SH4
2.12	Generic	ARM, i486, i586, R3000, R4100, SH3, SH4
3.00	HPC Pro	ARM, R4100, SH3, SH4
3.00	PPC	ARM, R4100, SH3
3.00	Generic	ARM, i486, i586, R3000, R4100, SH3, SH4
Not Supported		
2.10	PPC	not supported
2.11	PPC	not supported

[1] Driver only - no client software

[2] HPC: Handheld PC
HPC: Handheld PC Pro
PPC: Palm/Pocket PC
Generic: independent of form factor

[3] ARM: Intel StrongARM SA11XX
i486/i586: Intel 486/586
R3000: MIPS R3000
R4100: MIPS R4100
SH3: Hitachi SH3
SH4: Hitachi SH4
VR4111: NEC VR4111

All these versions of the Window CE operating system use the NDIS 4 Miniport Driver.

Windows 3.x and MS-DOS

To able to use an ORiNOCO PC Card with a PC running DOS or Windows 3.x, the PC must also be running Network Software (for example Novell Client or Windows Networking).

The PC Card slot must be controlled by an Intel 82365 PCIC, or the PC must support Card & Socket Services.

Two card-specific network drivers are provided, called the Packet Driver and DOS ODI Driver.

MacOS

There are two ORiNOCO PC Card drivers available:

1. The Classical Network Driver is applicable to Apple PowerBooks G3, 3400 Series,1400 Series, 5300 and 190 Series.
2. The Open Transport Driver is applicable to Apple PowerBooks G3, 2400 Series, 3400 Series,1400 Series, 5300 and 190 Series.

In both cases MacOS releases 7.5.2, 7.5.3, 7.5.5, 7.6, 7.6.1, 8.0, 8.1, 8.5, 8.5.1, and 8.6 are supported.

Linux

The driver sources and a support library are supplied, which are compatible with Linux kernel versions 2.0.x to 2.2.x for the Intel architecture.

This includes the following Linux distributions, for example:

- Red Hat versions 5.2, 6.0, 6.1, 6.2 and 7.0
- Suse versions 6.1, 6.3 and 6.4

Regulatory Body Approvals/Compliance

Agere provides a device which complies to international regulations: approval is a matter for the OEM once the device is integrated into a host platform.

Electromagnetic Compatibility	USA	FCC CFR47 Part 15
	Europe	ETS 300 826 (1999/5/EC R&TTE Directive)
	Japan	Not Applicable - covered by radio regulations
Product Safety	USA	IEC 60950/UL1950, CB
	Europe	EN 60950 (1999/5/EC R&TTE Directive)
	International	IEC 60950, CB
Radio Regulations	USA	FCC CFR47 Part 15 C, para 15.247
	Europe	EN 300-328 (1999/5/EC R&TTE Directive)
	Japan	ARIB STD-T66
	Canada	IC RSS 210

Contact Agere Systems Inc for the current position as regards certification world-wide.

Related Products

- None

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September 2001
Document: 016159
Revision: C
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