



Release B

PS-01016486

Preliminary
Specifications subject to change

VESPA CDPD MODEM HARDWARE INTERFACE SPECIFICATION

FCC ID: NBZNRM-6832
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INTRODUCTION

This document describes the hardware interface for the Novatel Wireless Vespa CDPD Modem. The Vespa CDPD Modem is an OEM-module designed for integration into a host product to provide wireless data communication capability via the CDPD (Cellular Digital Packet Data) Network.

SCOPE

The scope of this document includes all pertinent information for describing the capabilities and operating requirements for the product in order to determine suitability for specific market applications. Internal design issues, detailed operating instructions and cost information is not included in this document.

REFERENCE DOCUMENTS

The following released documents provide additional, or more detailed information on the Vespa CDPD Modem:

TS-01016486	Technical Specification for the Vespa CDPD Modem
	Vespa AT Command Set Reference Guide
GM-01016486	Diagnostics User's Guide for the Vespa CDPD Modem
DA-01016486	Assembly Drawing for the Vespa CDPD Modem
DS-01016486	Schematic Diagram for the Vespa CDPD Modem
01016486	Bill of Materials for the Vespa CDPD Modem



PHYSICAL INTERFACE**DATA/POWER CONNECTION**

One connector is used to physically connect the power supply and 3 volt logic level Host communication interface signals to the Vespa CDPD modem.

Data/Power Connector Type

Description: 24-pin, 1.27 mm pitch, SMT, double row low profile socket type
 Samtec part number: CLP-112-02-F-D

Some interface connector options are provided here for reference. Contact Samtec for the latest connector mating options.

Surface Mount Mating Connector Options

Description: 24-pin, 1.27 mm pitch, SMT, double row, zero profile, pin type header
 Samtec part number: DIS5-112-52-F-D-VS
 NOTE: This connector provides the lowest profile interface solution.

Description: 24-pin, 1.27 mm pitch, SMT, double row, low profile, pin type header
 Samtec part number: FTS-112-03-F-DV

Through-Hole Mating Connector Options

Description: 24-pin, 1.27 mm pitch, T/H, double row, zero profile, pin type header
 Samtec part number: DIS5-112-52-F-D

Description: 24-pin, 1.27 mm pitch, T/H, double row, low profile, pin type header
 Samtec part number: FTS-112-03-F-D

RF ANTENNA CONNECTOR TYPE

Vespa CDPD Modem antenna connector:

Description	-	MMCX Coaxial Connector
Manufacturer	-	Huber and Suhner
Part Number	-	82MMCX-S50-0-2

NOTE: An equivalent connector by the same or another manufacturer may be used.

Impedance - 50 ohm

Vespa CDPD Modem mating antenna connector:

Mating connector: - AEP 8905-1521-003 or equivalent with RG316 cable.



PIN DESCRIPTIONS

Pin #	Name	Direction	Power on Reset	Description
13, 14	Vcc1	POWER		POWER SUPPLY CONNECTION TO THE MODEM FOR ALL CIRCUITRY EXCEPT FOR THE RF POWER AMPLIFIER.
15, 16	Vcc2	POWER		POWER SUPPLY CONNECTION TO THE MODEM FOR THE RF POWER AMPLIFIER ONLY
1,2 & 23,24	GND	POWER		MODEM GROUND
3	PWR_IND	OUTPUT		POWER INDICATOR: HI: INDICATES THAT THE MODEM IS ON LO INDICATES THAT THE MODEM IS OFF
5	SM_IND	OUTPUT		SLEEP MODE INDICATOR: HI: INDICATES THAT THE MODEM IS IN SLEEP MODE LO INDICATES THAT THE MODEM IS NOT IN SLEEP MODE
4	WKUP	INPUT		WAKE UP INPUT: (ACTIVE HI PULSE) A PULSE APPLIED TO THIS PIN WILL TURN ON THE MODEM IF THE MODEM IS OFF, OR WAKE UP THE MODEM IF THE MODEM IS IN SLEEP MODE. REFER TO THE APPLICATIONS INFORMATION SECTION FOR MORE DETAILS ON USING THE WAKE UP PIN.
6	DTM	INPUT		DATA TO MODEM: (3.3 VOLT LOGIC LEVEL) IN RS232 TERMS, THIS IS CALLED "TXD".
7	DFM	OUTPUT		DATA FROM MODEM: (3.3 VOLT LOGIC LEVEL) IN RS232 TERMS, THIS IS CALLED "RXD".
11	RTS	INPUT		READY TO SEND: (3.3 VOLT LOGIC LEVEL)
10	CTS	OUTPUT		CLEAR TO SEND: (3.3 VOLT LOGIC LEVEL)
8	DTR	INPUT		DTE READY: (3.3 VOLT LOGIC LEVEL)
9	DSR	OUTPUT		DCE READY: (3.3 VOLT LOGIC LEVEL)
12	GPIO 1	OUTPUT	INPUT WITH PULLUP	GENERAL PURPOSE CONFIGURABLE INPUT OR OUTPUT: REFER TO THE AT COMMAND SET FOR THE DEFAULT STATE.
17	GPIO2	OUTPUT	INPUT WITH PULLUP	GENERAL PURPOSE CONFIGURABLE INPUT OR OUTPUT: REFER TO THE AT COMMAND SET FOR THE DEFAULT STATE.
18	GPIO3	OUTPUT	INPUT WITH PULLDOWN	GENERAL PURPOSE CONFIGURABLE INPUT OR OUTPUT: REFER TO THE AT COMMAND SET FOR THE DEFAULT STATE.
19	GPIO4	OUTPUT	INPUT WITH PULLUP	GENERAL PURPOSE CONFIGURABLE INPUT OR OUTPUT: REFER TO THE AT COMMAND SET FOR THE DEFAULT STATE.
20	GPIO5	OUTPUT	INPUT WITH PULLDOWN	GENERAL PURPOSE CONFIGURABLE INPUT OR OUTPUT: REFER TO THE AT COMMAND SET FOR THE DEFAULT STATE.
22	GPIO6	INPUT	INPUT WITH PULLUP	GENERAL PURPOSE CONFIGURABLE INPUT OR OUTPUT: REFER TO THE AT COMMAND SET FOR THE DEFAULT STATE.
21	ADC_IN		ADC INPUT	ADC INPUT: THIS PIN IS CONNECTED TO ONE CHANNEL OF AN 8-BIT ADC. REFER TO THE AT COMMAND SET ON HOW TO READ THIS ADC VALUE.

Note - To avoid possible problems with the modem, VCC must be applied before any other signal can be asserted. During sleep mode, Inputs must be kept low to avoid powering the unit through the signal lines.



Pin Layout Description:

Board Outline	
1	2
3	4
5	6
7	8
9	10
11	12
13	14
15	16
17	18
19	20
21	22
23	24
Connector Side	

HOST INTERFACE SPECIFICATIONS

SERIAL DATA RATE AND FORMAT

The VESPA supports asynchronous data transmission of the following rate and format:

Baud Rate (bits/second)	1200, 2400, 4800, 9600, 19200
Data bits	7, 8
Parity	Even, None, Odd Mark
Stop Bits	1, 2

RADIO SPECIFICATIONS

AIRLINK DATA RATE

Rate - 19200 bits per second

Error correction - Reed Solomon (63,47)

Transmission standard (CDPD System Specification Part 401, Section 4.5.)

RECOMMENDED ANTENNA TYPE

Type	-	Half-Wave Dipole
Impedance	-	50 ohm nominal
VSWR	-	1.5:1 nominal, 2.0:1 maximum

Note that the module is aligned assuming a 1.2 dB antenna gain (cable loss included in antenna gain).

FREQUENCY RANGE

Mode	Frequency Range
Transmit	824 MHz - 849 MHz
Receive	869 MHz - 894 MHz

DUPLEX MODE

Full-Duplex
(CDPD System Specification Version 1.1 part 409, paragraph 4.2)

RF POWER CLASS

Class III (0.6 Watt ERP)
(CDPD System Specification Version 1.1 part 409, paragraph 4.3)



ELECTRICAL SPECIFICATIONS

OPERATING CHARACTERISTICS

7SYMBOL	PARAMETER : CONDITIONS	MIN	TYPICAL	MAX	UNITS
VCC1	MODEM SUPPLY VOLTAGE * THIS MUST BE VERIFIED IN THE LAB	3.35	3.6	4.5	V
VCC2	RF POWER AMPLIFIER SUPPLY VOLTAGE * THIS MAY INCREASE, LORNE TO VERIFY 4.5V	3.3	3.6	4.5	V
ICC1	MODEM OFF VCC1 = 3.6V		5		µA
	SLEEP MODE VCC1 = 3.6V		7		mA
	RECEIVE MODE VCC1 = 3.6V		140		mA
	TRANSMIT MODE VCC1 = 3.6V		180		mA
ICC2	MODEM OFF VCC2 = 3.6V		5		µA
	SLEEP MODE VCC2 = 3.6V		5		µA
	RECEIVE MODE VCC2 = 3.6V		5		µA
	TRANSMIT MODE VCC2 = 3.6V		850		mA
TWAKEUP	WAKE-UP PULSE WIDTH FROM SLEEP MODE FROM POWER UP	10			mSec
TPDN	POWER DOWN RESPONSE TIME MODEM IS NOT REGISTERED Non Sleeping Long Sleep Mode ZZ=1 Short Sleep Mode ZZ=2		1 7 30 5		Sec
VIL1(NOTE 1)	INPUT VOLTAGE - LOW EXCEPT FOR WKUP	-0.5	0	0.8	V
VIH1(NOTE 1)	INPUT VOLTAGE - HIGH (EXCEPT FOR WKUP) MODEM ON MODEM OFF	2.0	3.3	3.6	V
VIL2(NOTE 2)	INPUT VOLTAGE - LOW WKUP ONLY	-0.5	0	0.5	V
VIH2(NOTE 2)	INPUT VOLTAGE - HIGH WKUP ONLY	3.0		VCC1 + 0.5V	V
VOL(NOTE 1)	OUTPUT VOLTAGE - LOW			0.45	V
VOH(NOTE 1)	OUTPUT VOLTAGE - HIGH	2.4	3.3	3.4	V
IOL(NOTE 1)	MAXIMUM SINK CURRENT			-1.5	mA
IOH(NOTE 1)	MAXIMUM SOURCE CURRENT * THE AM1868MLV DATA SHEET DOES NOT SPECIFY IOH ABOVE 200µA.			200	µA
VADC	ADC INPUT VOLTAGE MAXIMUM ADC READ VOLTAGE ABSOLUTE MAXIMUM INPUT VOLTAGE			5.9	V
RESADC	ADC RESOLUTION		8		BITS
REFADC	ADC REFERENCE VOLTAGE		2.048		V
DIVADC	ADC DIVIDER RATIO		1/3		V/V
ZADC	ADC INPUT IMPEDANCE		300k		OHMS
FSAMPLE (NOTE 3)	ADC SAMPLING RATE THIS IS THE SAMPLE RATE USED FOR SOFTWARE COMPARATOR VOLTAGE MONITORING.		1		Sample/ Sec

Note 1 - These specifications are based on the preliminary CPU data sheet and are subject to change. The specifications apply to all pins on the serial interface connector except for the following pins: GND, VCC1, VCC2 & ADC_IN.

Note 2 - The WKUP pin is not connected directly to the CPU, it is connected to the base of an NPN transistor.

NOTE 3 - While in sleep mode, the CPU will not sample the ADC. Therefore depending on whether or not sleep mode is used and which sleep mode is used (ZZ=1 or ZZ=2), the CPU may not sample the ADC (software comparator function) for up to 30 seconds. Refer to the AT command set for details on sleep mode settings.

MECHANICAL SPECIFICATIONS

DIMENSIONS

Approximately: 5.0 mm x 54.0 mm x 72.9 mm

WEIGHT

Approximately: TBD.

ENVIRONMENTAL SPECIFICATIONS

STANDARD CONDITIONS

Unless otherwise specified the standard conditions applicable to the specifications listed in section 6.9 are:

Temperature: +15C to +35C

Humidity: 45% to 85%

Air Pressure: 860 MilliBars - 1060 MilliBars

TEMPERATURE RANGE

The temperature is defined as per the CDPD System Specification Version 1.1 part 409, paragraph 5.2.1

Mode	Lower Limit	Upper Limit
Operating (Compliant)	0 Degrees C	+60 Degrees C
Operating (Non-compliant)	0 Degrees C	+70 Degrees C
Storage	-40 Degrees C	+85 Degrees C

STORAGE TEMPERATURE

-40C -> 12 hours

+80C -> 65% RH 12 hours (non-operational)

HUMIDITY

CDPD Part 409 paragraph 5.2.2

50 degrees C

40% RH

8 hours



SHOCK STABILITY

CDPD Part 409 paragraph 5.2.3.1
Half sine wave, 20g peak acceleration, 7 to 11 ms
3 impact on each of 6 faces

VIBRATION STABILITY

CDPD Part 409 par. 5.2.3.2 (non-operational)
Sinusoidal vibration at 1.5g acceleration swept through 5Hz to 500Hz, 0.1 octave/second

REGULATORY COMPLIANCE

FCC title 47, parts 15 (class B) and 22. Resubmission is not required for the changes made in this product, including the changes made to name and part number.

CDPD PART 409 COMPLIANCE

The module will meet the CDPD System Specification Part 409, Small Form-Factor Devices.

CDPD Part 409	Specification Parameter	Condition	Upper Limit	Lower limit
7.1.2.2	RX sensitivity in AWGN (Note a: small form factor M-ES)	less than 5% block error rate	-111 dBm	
7.1.2.3	RX sensitivity in Raleigh fading (Note b: small form factor M-ES)	-8 km/hr, 1% ber -50 km/hr, 1% ber -100 km/hr, 1% ber	-98 dBm -100 dBm -101 dBm	
7.2.3	Co-channel interference rejection and delay	8 us delay		17 dB rejection
7.3.3	Adjacent/Alternate channel selectivity	+/-30 kHz from carrier +/-60 kHz from carrier		16 dB 60 dB
7.4.3	Intermodulation spurious response			57 dB
7.5.3	RSSI		+ 6 dB absolute + 3 dB relative	- 6 dB absolute - 3 dB relative
7.6.1.2	Radiated spurious emissions	25 - 70 MHz 70 - 130 MHz 130 - 174 MHz 174 - 260 MHz 260 - 470 MHz 470 - 1000 MHz	-45 dBm -41 dBm -41 to -32 dBm -32 dBm -32 to -26 dBm -21 dBm	
7.6.2.2	Conducted spurious emissions	450 kHz - 2600 MHz 869.01 - 893.07 MHz 824.01 - 848.97 MHz	-47 dBm -80 dBm -60 dBm	
8.1.3	Frequency stability		+2.5 PPM	- 2.5 PPM
8.2.3	Phase noise	1 kHz 10 kHz	-55 dBc/Hz -75 dBc/Hz	
8.3.3	Emission spectrum	adjacent channel alternate channel second alternate channel	-26 dBc -45 dBc -60 dBc / - 23dBm (whichever is lower)	
8.4.3	Channel switching time		40 ms	
8.5.3.3	Power stability (PA power levels)		+2 dBm	-4 dBm
8.5.4.3	Switching time requirements – on to off		2 ms	
8.5.5.3	Release time requirements		2 ms	
8.6.1.3	Modulation type		0.5 + 5% 19.2kbps + 50ppm	0.5 – 5% 19.2kbps – 50ppm
8.7.1.3	Radiated harmonic and spurious emissions			43 + 10 log(mean output power in Watts) dB
8.7.2.3	Conducted harmonic and spurious emissions			43 + 10 log(mean output power in Watts) dB



PACKAGING REQUIREMENTS

SHIPPING PACKAGING

Packaging shall be appropriate for the shipping method.
If the modem is to leave the ESD controlled environment, it should be packaged in an antistatic bag.

LABELING

The modem labeling shall include:
Product Label with FCC ID, country of origin, serial number, part number, and FCC compliance statement.



