

# **H330 Mini PCIe Adapter Hardware User Manual**

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## Revision History

Version	Date	Remarks
V1.0.0	2012-09-07	Initial Version
V1.0.1	2012-12-24	Update product photo
V1.0.2	2013-01-09	Update the name of the document; add Reliability Features in specifications
V1.0.3	2013-05-02	Update the name of the document, upgrade the manual
V1.0.4	2013-05-27	Add Power Sequence description

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# 1 Preface

## 1.1 Scope

This manual provides the electrical characteristics, RF performance, Structure, Size and Application environment of the H330 Mini PCIe Adapter. This document helps developers quickly understand the performance of the H330 Mini PCIe Adapter and develop product.

## 1.2 Standards

*Mini PCI Express Card Electromechanical Specification Revision 1.0-2003*

## 2 Overview

### 2.1 Description

H330 Mini PCI Express Adapter is designed based on FIBOCOM 3G wireless communication module--H330 series, widely used in vehicle and security fields.

### 2.2 Specifications

Product Feature	Description
Power Supply Input	VCC: 3.3V ~ 4.2V (Recommended Voltage:3.5V)
Physical	Size: 30mm x 50.95 mm x 3.45mm
	Connector: Mini PCI Express Interface
	Weight: <10g
	Operating Temperature: -30°C to +85°C
	Storage Temperature: -40°C to +85°C
Antenna Interface	Supports 1 Antenna Interface
USB	USB2.0
UART	Two UART interfaces: 7-lines UART (no DSR) 2-lines UART (only support a few query functions)
Reset Signal	External reset signal
Audio Interface	1 x Micphone in 1 x Handset out
Other Interfaces	1 x W_DISABLE 1 x LPG

## 3 Interface Description

This chapter describes the external interface and antenna interface of H330 Mini PCIe Adapter.

### 3.1 General Mini PCI Express Interface

H330 Mini PCIe Adapter interface pins are defined as following:

Pin#	Name	I/O	Description
1	MICP	I	Audio channel -MIC signal input +
2	VCC	I	Power Input
3	MICN	I	Audio channel -MIC signal input -
4	GND	G	GND
5	EARP	O	Audio channel -EAR signal output +
6	NC		—
7	EARN	O	Audio channel -EAR signal output -
8	VSIM	I	USIM Card Power Output 1.8V/3V
9	GND	G	GND
10	SIMIO	I/O	USIM Signal Line
11	UART1_RX	I	UART1 Data Reception
12	SIMCLK	O	USIM Clock Signal
13	UART1_TX	O	UART1 Data Transmission
14	SIMRST	O	USIM Reset Signal
15	GND	G	GND
16	NC		—
17	UART1_RI	O	UART1 ring signal output
18	GND	G	GND
19	NC		—
20	W_DISABLE	I	Low effective, fight mode
21	GND	G	GND
22	RESET	I	External reset signal input
23	UART1_CTS	I	UART1 allow sending data signal input
24	NC		—
25	UART1_RFR	O	UART1 accept ready

26	GND	G	GND
27	GND	G	GND
28	NC		
29	GND	G	GND
30	NC		
31	UART1_DTR	O	UART1 terminal ready
32	NC		—
33	UART1_DCD	O	UART1 carrier detect output
34	GND	G	GND
35	GND	G	GND
36	USB_D-	I/O	USB Signal -
37	GND	G	GND
38	USB_D+	I/O	USB Signal +
39	VCC	I	Power Input 3.3V-4.2V
40	NC		—
41	VCC	I	Power Input 3.3V-4.2V
42	LPG	O	Network status signal output
43	GND	G	GND
44	UART2_RX	I	UART2 Data Reception
45	NC		—
46	UART2_TX	O	UART2 Data Transmission
47	NC		—
48	NC		—
49	NC		—
50	GND	G	GND
51	NC		—
52	VCC	I	Power Input 3.3V-4.2V



## 3.2 Antenna Interface

There is an antenna interface in H330 Mini PCIe Adapter which uses HIROSE U.FL-R-SMT(01) Connector. As shown in the following figure:

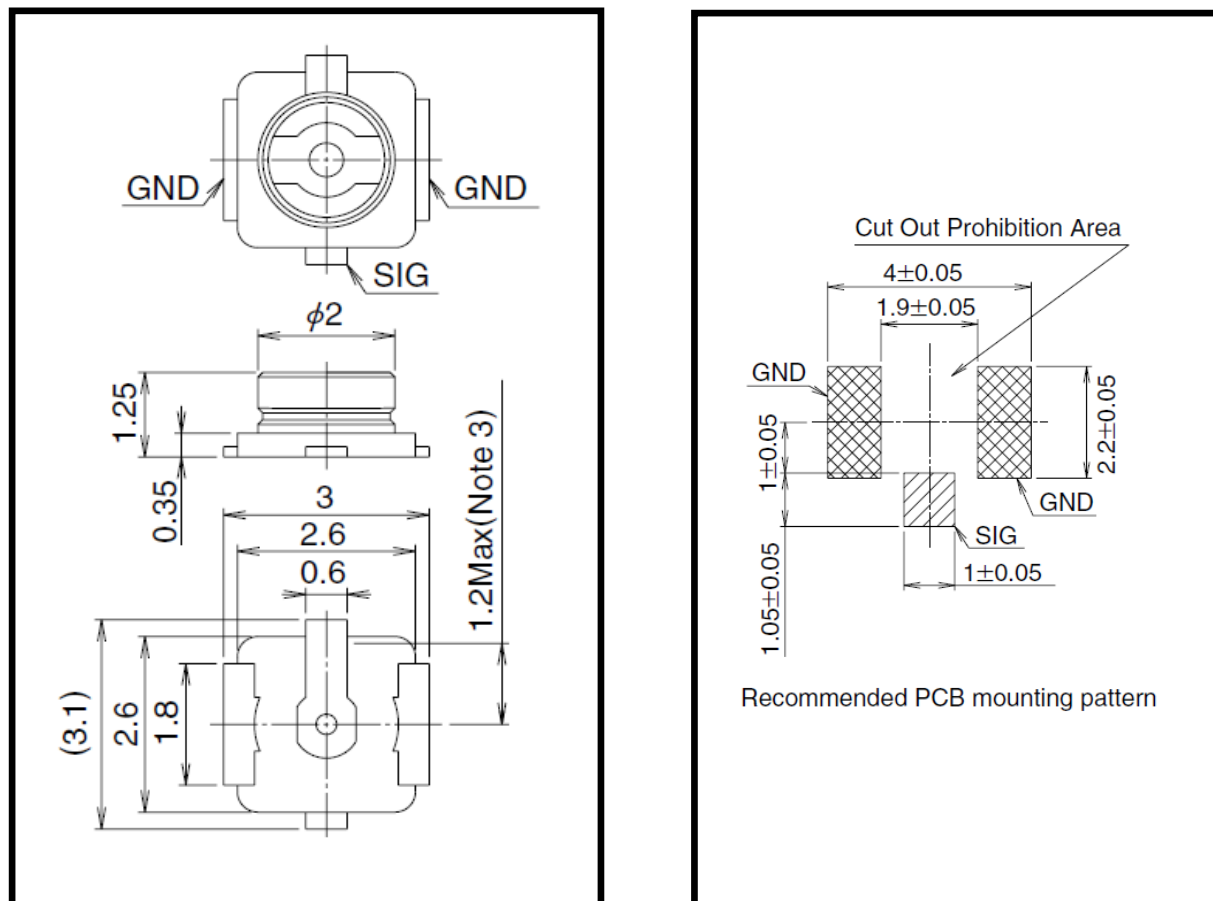


Figure 3-1

The following table shows the Antenna Performance:

Tx Power (Typical Value)	Class 4 (2W) : 850/900 MHz, GSM
	Class 1 (1W) :1800/1900 MHz, GSM
	Class E2 (0.5W) :850/900 MHz, EDGE
	Class E2 (0.4W) :1800/1900 MHz, EDGE
	Class 3 (0.25W) :850/900/1900/2100 MHz, WCDMA
Rx Sensitivity (Typical Value)	UMTS/HSPA:-109dBm
	GSM:-108dBm

## 4 Electrical Features

This chapter introduces the electrical features of H330 Mini PCIe Adapter.

### 4.1 Extreme Conditions

Parameter	Description	Minimum	Maximum	Unit
VCC	Module Input Voltage	0	4.2	V
VIN	IO Input Voltage	0	3.6	V

### 4.2 Environment Temperature

Parameter	Minimum	Maximum	Unit
Operating Temperature	-30	+85	°C
Storage Temperature	-40	+85	°C

### 4.3 Power Sequence Requirements

#### 4.3.1 Powered-up Time

The following figure shows the establish time of voltage when powered up:

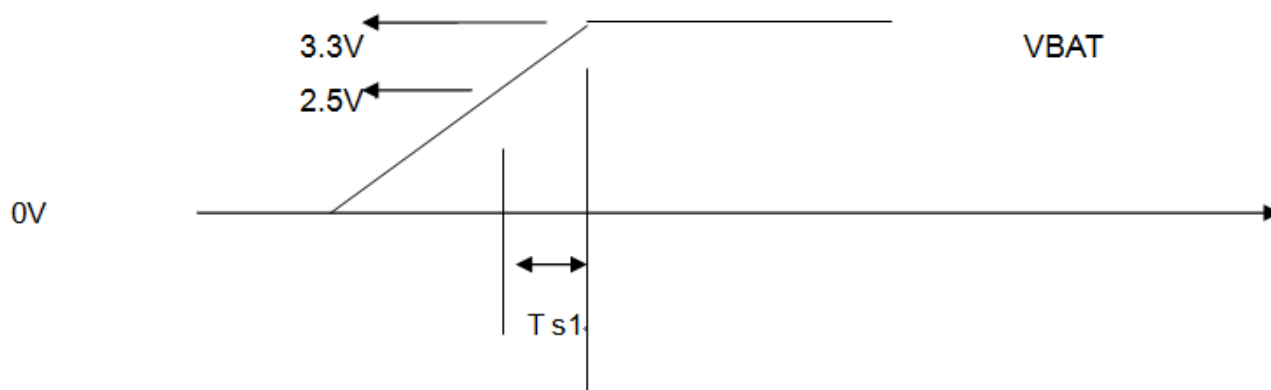


Figure 4-1

	Description	Requirements
T s1	The time for the power voltage to change from 2.5V to 3.3V	lower than 5ms

**Note:** If it takes too long to rise the power voltage, the module may fail to power up.

### 4.3.2 Fall Time

The power voltage drops and then rise again, corresponds to the power down time of the module.

The following figure shows the time requirements:

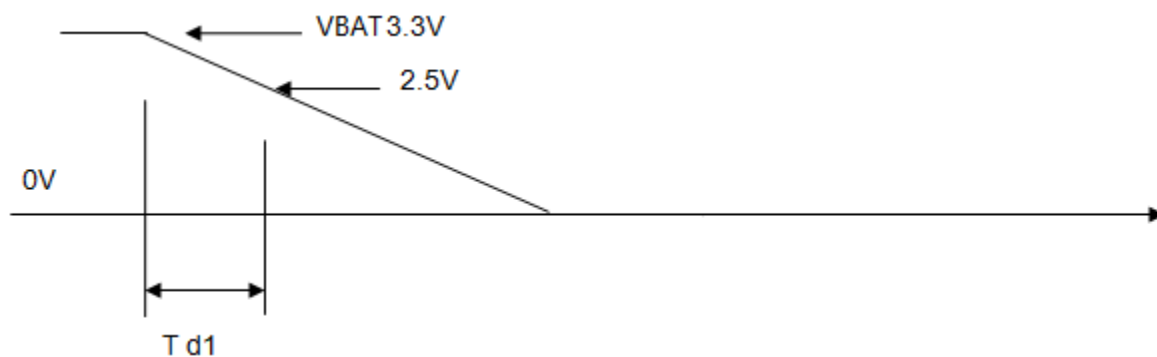


Figure 4-2

	Description	Requirements
T d1	The time for the power voltage to change from 3.3V to 2.5V	lower than 45ms

# 5 Interface Application Notes

## 5.1 USB Interface

### 5.1.1 USB Interface Description

H330 Mini PCIe Adapter supports USB2.0, compatible with USB1.1, please install the USB driver before you use the USB interface.

### 5.1.2 USB Interface Application

The following figure shows the reference circuit:

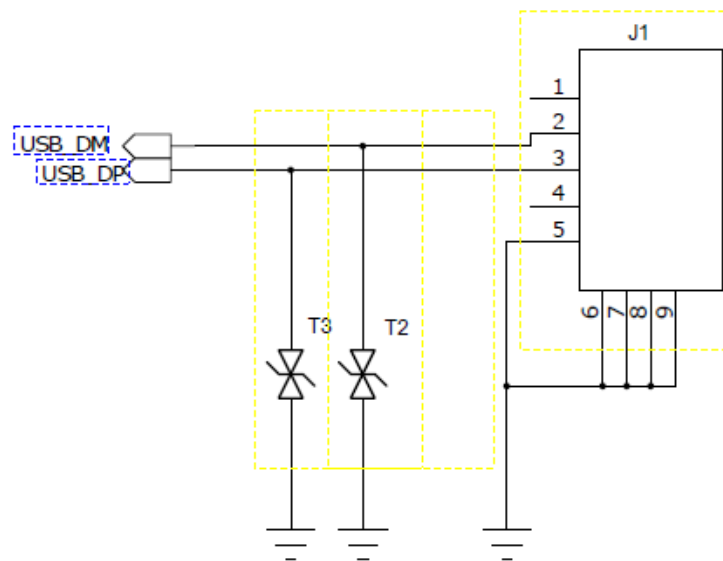


Figure 5-1

T2 and T3 requires the selected capacitance values lower than 1pF following TVS diode.

USB\_DP and USB\_DM for high-speed differential signal lines, the maximum transfer rate of 480 Mbps, PCB Layout must notice the following requirements:

USB\_DP and USB\_DM should be equal length and as short as possible

USB\_DP and USB\_DM need GND isolation

USB2.0 differential signal line fabric away from the strata nearest the signal layer

Good impedance matching, impedance requirement of 90 ohms

## 5.2 USIM Interface

### 5.2.1 USIM Signal Pin Definition

Pin#	Name	I/O	Function Description
8	USIM_VCC	O	USIM Power Supply Signal
14	USIM_RST	O	USIM Reset Signal
12	USIM_CLK	O	USIM Clock Signal
10	USIM_IO	I/O	USIM Data Signal

### 5.2.2 USIM Interface Application Notes

Recommended USIM Design:

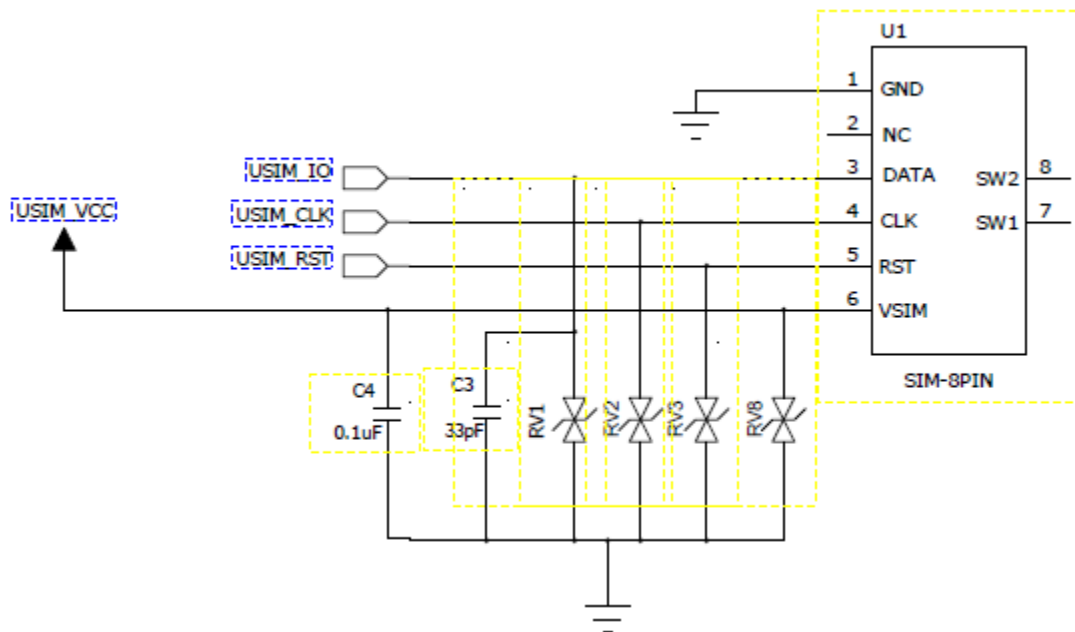


Figure 5-2

**Note:**

- To improve EMC performance, the SIM card holder should be close to the module.
- The SIM card signal filter capacitor should be close to the SIM card pin.
- SIM card signals the need to increase the ESD device (such as TVS diode) protection, ESD devices should be close to the SIM card pin placement.

## 5.3 Analog Audio Interface

### 5.3.1 Audio Interface Signals Definition

H330 Mini PCIe Adapter supports 1 input audio channel and 1 audio output channel.

Pin#	Name	I/O	Description
7	EAR-	O	Audio channel headphone signal output -
5	EAR+	O	Audio channel headphone signal output +
1	MIC+	I	Audio channel MIC input signal +
3	MIC-	I	Audio channel MIC input signal -

### 5.3.2 Audio Interface Application Note

Audio input and output signal is a differential signal, it has good resistance performance to RF interference, no external audio amplifier is needed when connecting to the handset.

The PCB traces requires of long, parallel to the length as short as possible, plus a package deal, best by GND aspects of isolation between the input and output signals. The best audio signal port and ESD protection.

### 5.3.3 Audio Channel Output Features

Differential audio Channel interface is used for handling calls.

Table I: MIC input interface level characteristics

Parameter	Test Condition	Minimum	Typical	Maximum	Units
Bias Voltage	Without Load		2.5	2.6	V
Gain	Programable steps 1dB	0		16	dB
Design Impedance			2.2		Kohm

Table II: The the EAR output interface level characteristics:

Parameter	Test Conditions	Minimum	Typical	Maximum	Units
Output Voltage	Without Load			1.4	Vpp
Design Load Impedance			32		ohm
DC Bias Voltage			1		V

## 5.4 UART

### 5.4.1 UART Interface Pin Definition

H330 Mini PCIe Adapter has UART ports: one is 7 wire serial bus interface, and then other is a 2 wire serial bus interface.

7 wire serial bus interface (UART1) supports flow control and all the AT commands, it does not support UART1\_DSR; users can download software or send/receive AT through UART1.








2 wire serial bus interface (UART2) only supports a few AT Commands.

UART1 and UART2 pin definition:

UART1			
Pin#	Pin Name	I/O	Description
17	UART1_RI	O	UART1 Ring Indicator
31	UART1_DTR	O	UART1 DCE Ready
33	UART1_DCD	O	UART1 Carrier Detect
23	UART1_CTS	I	UART1 Clear to send
25	UART1_RFR	O	UART1 Ready to accept
13	UART1_TXD	O	UART1 Transmitted Data
11	UART1_RXD	I	UART1 Received Data
UART2			
Pin#	Pin Name	I/O	Description
44	UART2_RXD	I	UART2 Received Data
46	UART2_TXD	O	UART2 Transmitted Data

## 5.4.2 UART Design

The following table shows the signal direction when H330 Mini PCIe Adapter (DCE) UART1 connects to PC (DTE):

Application MCU(DTE)	Signal Direction	H330 Mini PCIe Adapter (DCE)
RXD		UART1_TXD
TXD		UART1_RXD
RTS		UART1_CTS
RFR		UART1_RFR
DTR		UART1_DTR
RI		UART1_RI
DCD		UART1_DCD

The following table shows the signal direction when H330 Mini PCIe Adapter (DCE) UART2 connects to PC (DTE):

Application MCU(DTE)	Signal Direction	H330 Mini PCIe Adapter (DCE)
RXD	←	UART2_TXD
TXD	→	UART2_RXD

**Note:** The high level of H330 Mini PCIe Adapter's UART interface is 3.3V.

### 5.4.3 Ring Indication

UART1\_R1 is used for indicating incoming call and SMS, sending pulse to host application program.

Mode	Status
No ringing	Low level
Ringing	1s high level, 1s low level, cycling
No message	Low level
Incoming message	150ms pulse

## 5.5 Reset Signal

H330 Mini PCIe Adapter supports external reset; it can restore the module to default settings through Reset signal.

When Reset signal is Active Low by 100ms, the module will reset. When users reset the module, PMU inside the module is still on. If the module is connected to PC, you can see PC Virtual port restarts.

**Note:** Reset signal is sensitive; please stay away from radio frequency interference when PCB layout, add debounce capacitor near the module end is recommended.

The following table shows the burst timing:

Parameter	Condition	Minimum Value	Typical Value	Maximum Value	Unit
Pulse Width		100	300	3000	ms

Recommended design:

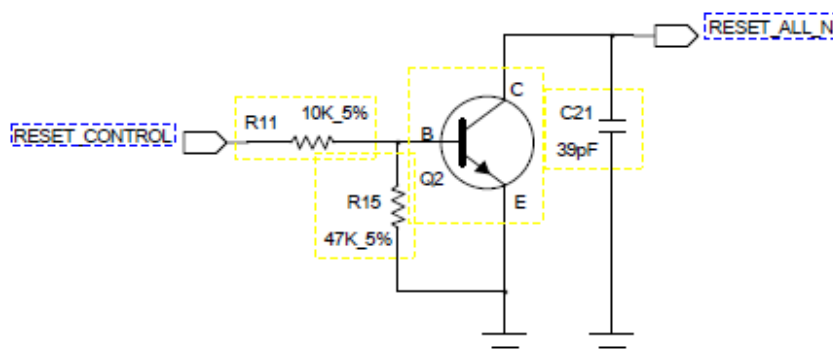


Figure 5-3



## 5.6 LPG Signal

LPG signal description:

Status	Mode
idle(unregistered)	600ms high level, 600ms low level
idle(registered)	75ms high level, 35 low level
Call	low level
Data communicating	75ms high level, 75ms low level
Sleep	high level

## 5.7 W\_DISABLE Signal

Module Status	W_DISABLE Signal	Mode
Normal mode	high level	W_DISABLE high level, module is in normal mode.
Fight mode	low level	W_DISABLE low level, module is in fight mode.



## 7 Antenna Design Requirements

### (1) Antenna Efficiency

Antenna efficiency is the ratio between antenna input power and radiation power. The radiation power of an antenna is always lower than the input power due to the following factors: return loss, material loss, and coupling loss.

Efficiency of the master antenna > 40% (−4dB)

### (2) S11 or VSWR

S11 (return loss) indicates the degree to which the input impedance of an antenna matches the reference impedance (50 ohm). S11 shows the resonance feature and impedance bandwidth of an antenna. Voltage standing wave ratio (VSWR) is another expression of S11. S11 relates to the antenna efficiency. S11 can be measured by vector analyzer.

S11 of the master antenna < −10 dB

### (3) Polarization

The polarization of an antenna is the orientation of the electric field vector that rotates with time in the direction of maximum radiation.

Linear polarization is recommended: it would be better if the polarization direction of diversity antenna is different from main antenna.

### (4) Radiation Pattern

Radiation pattern refers to the directional dependence of the strength of the radio waves from the antenna or other source.

The radiation pattern of half wave dipole antennas is the best choice for wireless terminals. If it is built-in antenna, PIFA antenna is recommended:

Antenna area (H x W x L): 6mm x 10mm x 100mm. PIFA or IFA antenna is recommended.

Radiation Pattern: Omni directional

### (5) Gain and Directivity

The directivity of the antenna is the electromagnetic field strength of the electromagnetic wave in each direction. An antenna's power gain is a key performance figure which combines the antenna's directivity and electrical efficiency.

Recommended antenna gain  $\leq 2.5\text{dBi}$

### (6) Interference

Besides the antenna performance, the interference on the PCB board also affects the radio performance (especially the TIS) of the module. To guarantee high performance of the module, the interference sources on the user board must be properly controlled. On the PCB board, there are various interference sources that can affect the module, such as the speaker, LCD, CPU, FPC trace, audio circuits. Power supply should be far away from the antenna, notice isolation, shield and filtering processing.

### (7) TRP/TIS

TRP (Total Radiated Power):

- W850/W900/W1900/W2100>19dBm
- GSM850>28dBm
- GSM900>28dBm
- DCS1800>25dBm
- PCS1900>25dBm

TIS (Total Isotropic Sensitivity) :

- W850/W900<-102dBm
- W1700/W1900/W2100<-103dBm
- GSM850<-102dBm
- GSM900<-102dBm
- DCS1800/PCS1900<-102dBm