

Hardware Manual: Customer Development Board PNEV5180B

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1. Customer Evaluation Board PNEV5180B: Photo

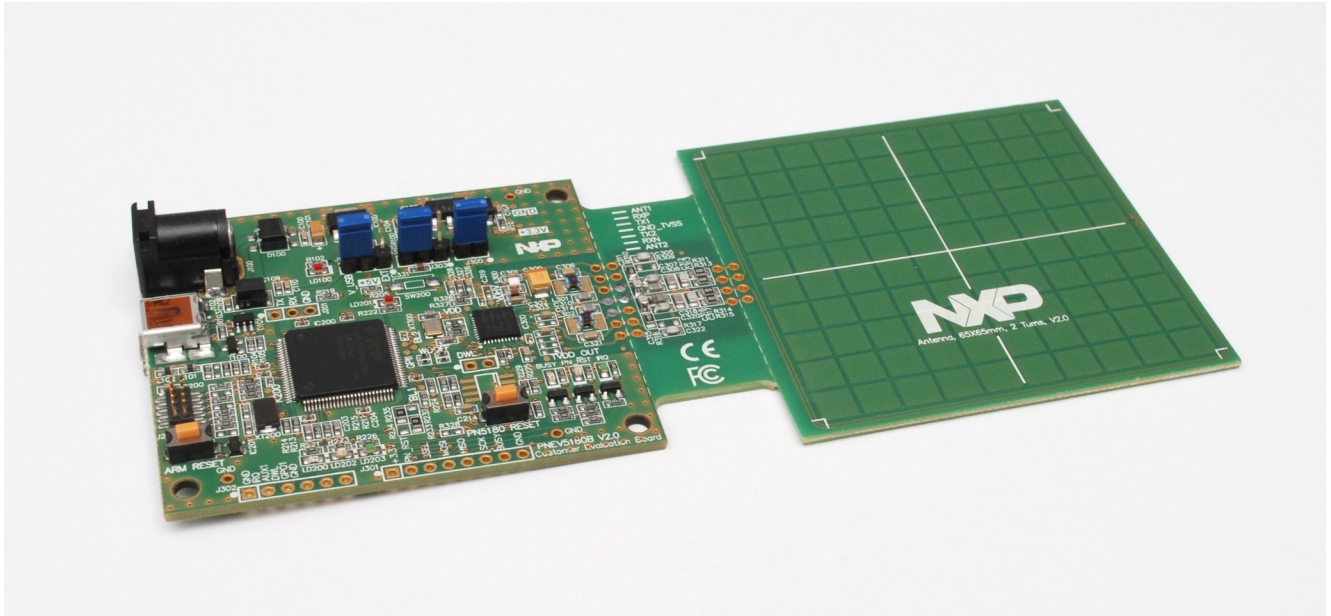


Figure 1: Customer Evaluation Board PNEV5180B – side view.

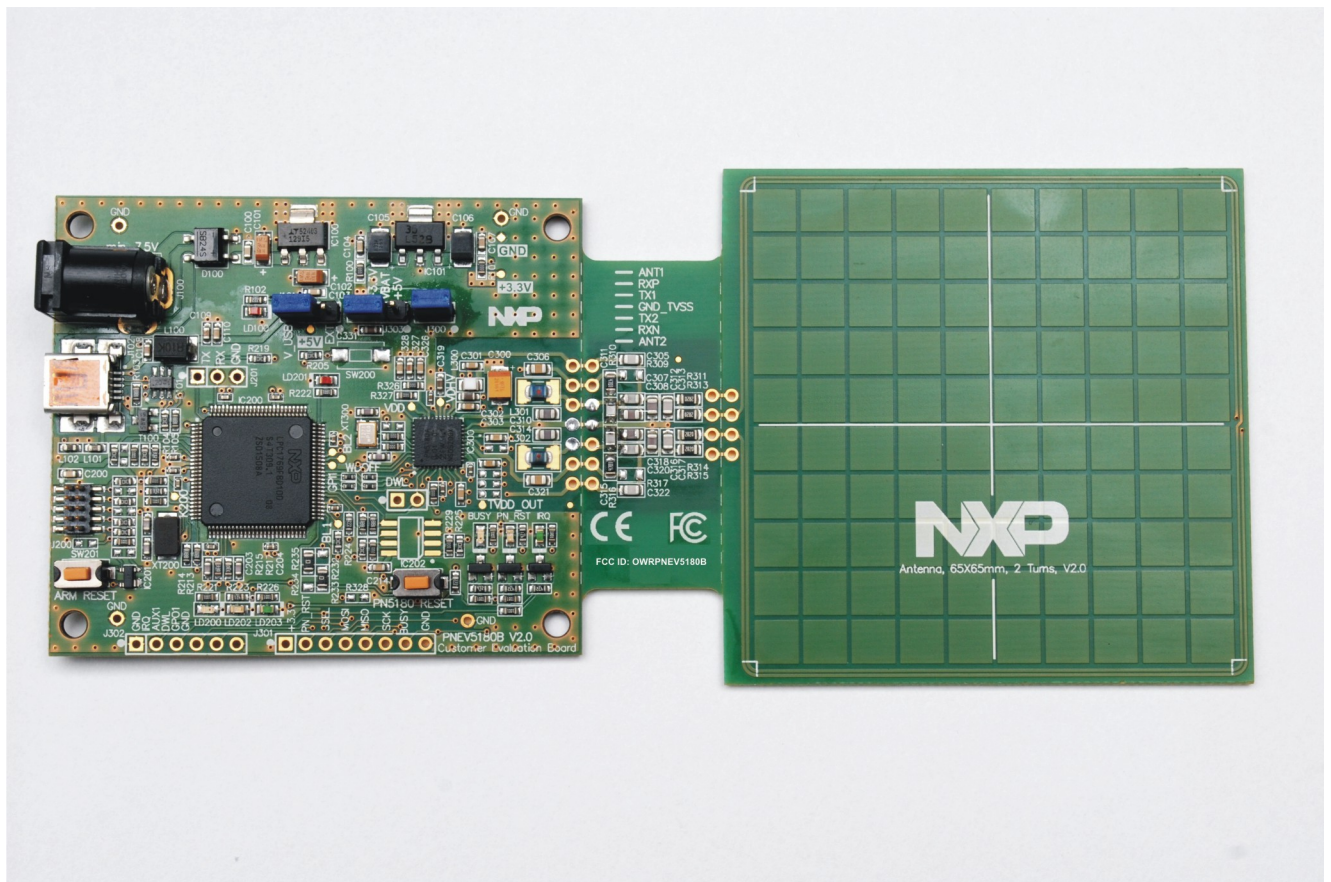


Figure 2: Customer Evaluation Board PNEV5180B – top view.

2. Customer Evaluation Board PNEV5180B: Description

1. Operational description

Customer Evaluation Board PNEV5180B is an example of implementation of ISO/IEC 14443A and ISO/IEC 14443B reader/writer, NFC reader/writer and Card Emulation Device on the same printed board. Middle size antenna, implemented on the same pcb (reader and antenna can be broken into separate parts), permits reading/writing on distance up to 50 mm (RFID card or other NFC device). The onboard USB connector permits direct connection and communication with personal computer.

Power supply is via usb port or via external power supply (7.5 V / 500 mA).

On the Customer Evaluation Board PNEV5180B main parts are easily visible:

- the pcb antenna (can be separated from matching part),
- the antenna matching components (can be separated from reader and antenna part),
- the reader part: PN5180 reader IC, LPC 1769 microcontroller IC, two crystall oscillators and decoupling capacitors, power supply ICs and EEPROM, USB serial communication port and JTAG port.

The Customer Evaluation Board PNEV5180B uses USB serial communication port for communicating with personal computer and transfer data. JTAG port is for development purposes (programming). Some test pins are added on pcb.

The Customer Evaluation Board PNEV5180B has following features:

- Supports ISO/IEC 14443A and ISO/IEC 14443B reader/writer up to 848 Kbps.
- Supports MIFARE 1K/4K encryption in reader/writer mode.
- Supports contactless RF communication according to the FeliCa protocol at 212 Kbps and 424 Kbps.
- Supports all NFCIP-1 modes up to 424 Kbps. The PN512 handles the complete NFC framing and error detection.
- Supports the reading of NFC Forum Tag Types 1,2,3,4,5
- P2P supported for types: A (106 kbit/s), F (212, 424 kbit/s)
- ISO/IEC15693 reader (I-Code)
- ISO/IEC 18000 EPC-HF reader (I-Code ILT)
- EMVCo 2.4 L1 digital & analog Compliance
- Card Emulation: ISO/IEC 14443A (up to 848 kbit/s)
- Serial communication via USB port with Personal computer
- Power supply via USB port or via external power adapter.

Disclaimer:

This module is intended only for development and evaluation purposes, and cannot be used in a finished product.

Figure 3: Customer Evaluation Board PNEV5180B - Block diagram.

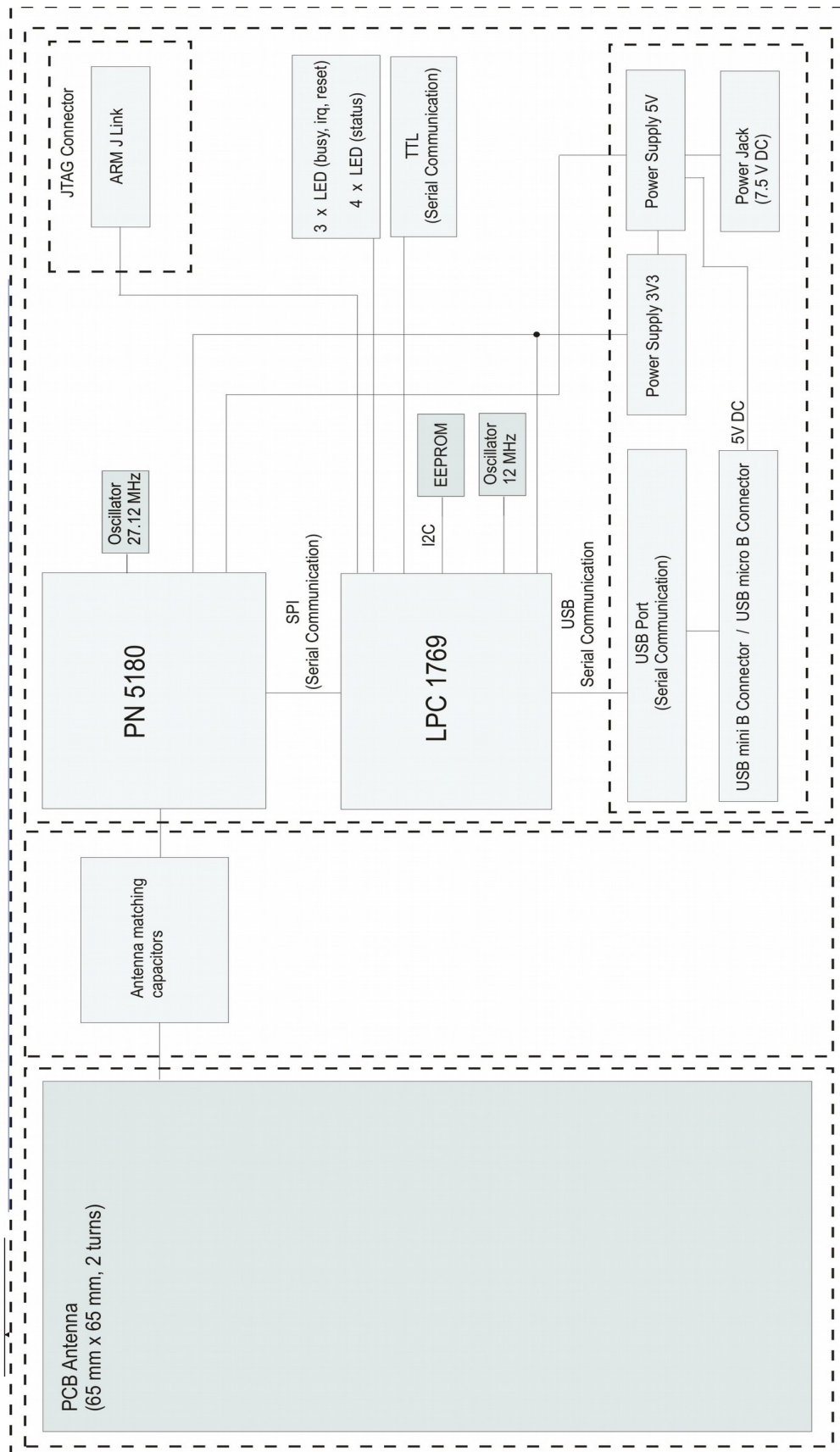
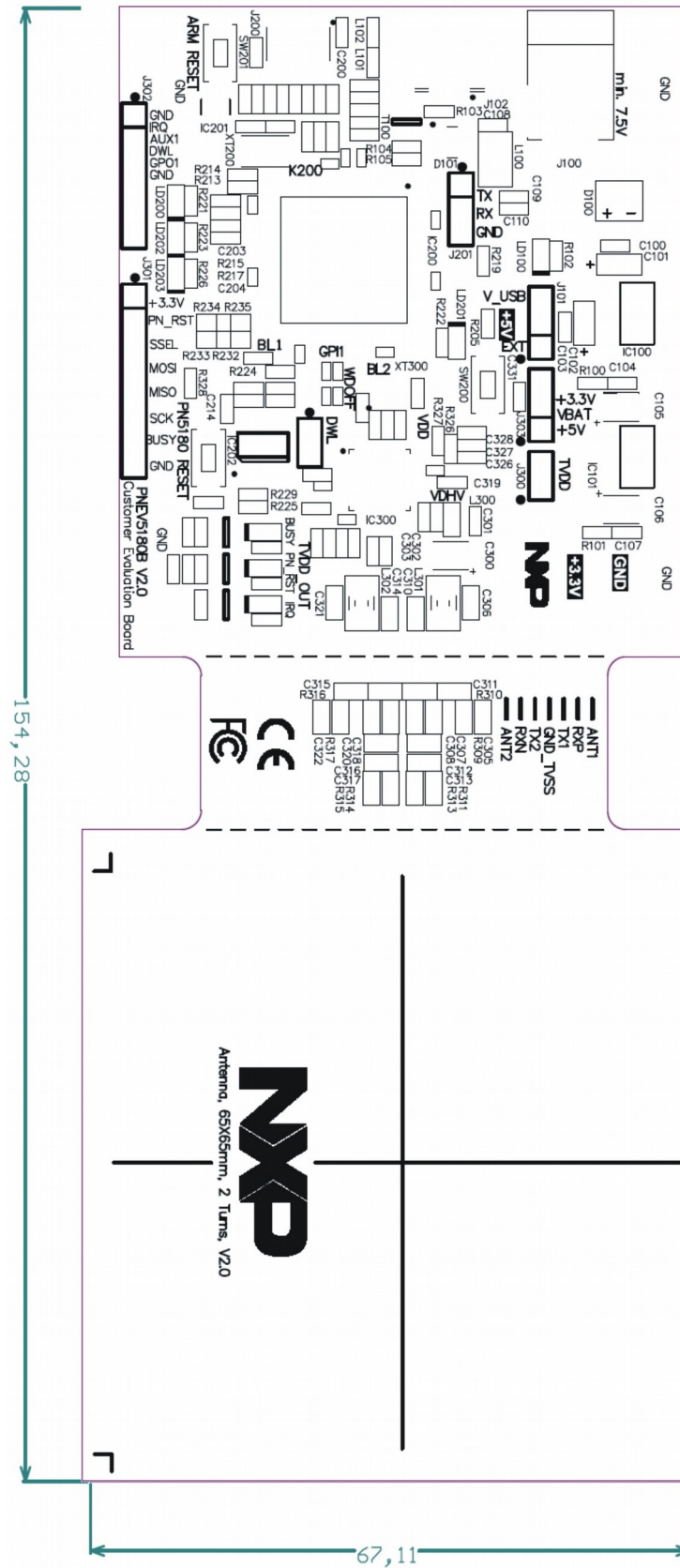


Figure 4: Customer Evaluation Board PNEV5180B: dimensions, pcb with elements.



3. Customer Evaluation Board PNEV5180B: SPECIFICATION

3.1. Customer Evaluation Board PNEV5180B: Specifications

Table 2: Customer Evaluation Board PNEV5180B – specifications

Antenna	
	PCB type, 65 mm x 65 mm
Contactless operating frequency	
	13.56 MHz
Card reading/writing distance	
	Up to 50 mm
Contactless (RFID) Smart Card Interface	
Reader/Writer mode	
	ISO 14443 A up to 848 Kbps transmission rate (depending on card)
	ISO 14443 B up to 848 Kbps transmission rate (depending on card)
	Reader/Writer mode supporting JIS X 6319-4 (comparable with FeliCa scheme)
	NFC Forum tag type 1,2,3,4,5 reader
	NFC Forum compliance for R/W – Analog & Digital
	SO/IEC15693 reader (I-Code)
	ISO/IEC 18000 EPC-HF reader (I-Code ILT)
	EMVCo 2.4 L1 digital & analog Compliance
Peer to Peer mode	
	Passive-Initiator / Passive-Target
	Active-Initiator / Active-Target
	P2P supported for types: A (106 kbit/s), F (212,424 kbit/s)
Card Emulation	
	SO/IEC 14443A (up to 848 kbit/s)
Microcontroller LPC1769	
	ARM Cortex-M3 based microcontroller with 512 kb internal flash memory, 64 kb internal RAM
Clock Crystals	12.000 MHz crystal for CPU
Firmware	
	Customer developed firmware for testing PN5180 functionality
Host Interface	
Host Interface	USB 2.0 (also supported USB 1.1)
Transmission Speed	12 Mbps (USB 2.0 full speed)
Power Supply	Bus powered
Other Communication Interfaces	
JTAG IEEE1149.1 Serial Interface	JTAG 10-pin connector; to connect JTAG adapter

Electrical and Mechanical Specifications	
Power Supply	5V DC $\pm 5\%$, 500 mA (via USB port) or external power supply 7.5 V DC $\pm 15\%$ / 500 mA
PCB Dimensions (L x W x H)	152 mm x 68 mm x 15 mm
Weight	approx. 40 g
Operating Temperature	0... + 40 °C (without condensing)
Storage temperature	-40 ... + 85 °C (without condensing)
Operating Humidity	5 ... 95% RH
Certificates	CE, FCC

3.2. Customer Evaluation Board PNEV5180B: Electrical characteristics

Table 3: Customer Evaluation Board PNEV5180B – Electrical Specifications

Operating Range

Symbol	Description	Conditions	Min	Typ	Max	Unit
PWR_DC	DC Power Supply	Active Reader	2.5	-	3.6	V
T _{amb}	Ambient Temperature	/	0	+25	+40	°C

Current Consumption

Symbol	Description	Conditions	Min	Typ	Max	Unit
IC5V	Supply Current	Active, RF on	-	350	450	mA

Operating Distance

Symbol	Description	Conditions	Min	Typ	Max	Unit
DST	Operating Distance	Measured from the center of the antenna	-	0 – 50	-	mm

USB Interface Characteristics

Symbol	Description	Conditions	Min	Typ	Max	Unit
USB	Baudrate	mini B USB Connector / micro B USB Connector	-	12	-	Mbaud

4. INSTALLING MANUAL

4.1. Desktop use

Customer Evaluation Board PNEV5180B is intended for development use in development environment such as development departments in factories, at institutes. PNEV5180B board is powered via USB serial connection from personal computer or via external power supply.

Usual climate conditions in development environment (room temperature and humidity) are deep inside Customer Evaluation Board PNEV5180B specified climate conditions.

4.2. Power supply

Customer Development Board PNEV5180B has no power supply mounted on pcb. There are two possibilities to connect external power supply:

- powering via USB port (mini B or micro B connector) from personal computer or
- via external power supply 7,5 V DC / 500 mA.

Which option is used is set with jumper J4 (figure 17).

The mini B USB (or micro B USB) connector is used for connection to the PC usb port – for power supply and USB serial communication. Used this power option is default setting with jumper J4. USB A male to mini (micro) B USB (5 pin) cable is used for connection between Customer Evaluation Board PNEV5180B and personal computer.

External power supply 7.5 V DC / 500 mA is connected to power jack X4 to supply Customer Development Board PNEV5180B. On board IC LT1129IST-5 is used to stabilize voltage to 5 V.

Note 1:

Power supply from USB port on personal computer has to comply with LPS requirement of IEC60950-1.

Maximum length for USB cable is 1.8 meter.

Note 2:

External power supply 7,5 V DC / 500 mA has to comply with LPS requirement of IEC60950-1.

Maximum length for power cable is 1.8 meter.

5. USER MANUAL

Customer Evaluation Board PNEV5180B is an example of implementation of ISO/IEC 14443A and ISO/IEC 14443B reader/writer, NFC reader/writer and Card Emulation Device on the same printed board. Middle size antenna, implemented on the same pcb (reader and antenna can be broken into separate parts), permits reading/writing on distance up to 50 mm (RFID card or other NFC device). The onboard USB connector permits direct connection and communication with personal computer.

Customer Evaluation Board PNEV5180B is intended to send and receive data according to the ISO 14443A and ISO 14443B protocol. Data transfer from reader to/from contactless cards operates at frequency 13.56 MHz. Data transfer between PN5180 reader IC and microcontroller LPC1769 is via SPI serial communication.

The firmware for testing and development purposes is written into LPC1769 microcontroller. But user can develop his own firmware and write it via JTAG port into LPC1769 memory.

Power supply is via usb port or via external power supply (7.5 V / 500 mA).

How to installing user developed firmware is written in detail in Quick Start Guide (and ARM Board User Manual).

5.1. General user instructions

- Reading/writing is possible with MIFARE contactless cards, FeliCa cards or with NFC device.
- PNEV5180B board can detect contactless card or NFC device up to 50 mm from the center reader's antenna.
- PNEV5180B board can emulate contactless (NFC) card.
- Contactless card identification is possible in electromagnetic field (created from contactless reader). Nonmetal material between antenna and RFID contactless card have no influence to reading distance or reading reliability.
- Reading/writing to/from card is very simple: user approaches his contactless card to reader's antenna. PNEV5180B board detects card and confirm reading via serial (USB) communication to personal computer (depend from customer firmware). Successfully reading/writing can be signalled with status led diode on PNEV5180B board.

5.2. Instructions for safe work, maintaining and care

- Be careful not to damage the connectors, antenna, PCB, ICs and other connected parts.
 - Because of the specifics of the device and the damage, only qualified staff, authorized by the producer, are allowed to repair the device. All interventions of the unauthorized person and mechanical damage means repealing of the guarantee.
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6. ELECTROMAGNETIC COMPATIBILITY

Customer Evaluation Board PNEV5180B fulfils the following requirements of electromagnetic compatibility:

FCC, Part 15 and CE.

6.1 FCC Compliance Statement

NOTE:

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a residential environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

FCC Compliance for Limited Modular Approval (§15.212(b))

As note, the module is intended for PROFESSIONAL AND DEVELOPMENT USE ONLY and cannot be used in final products. The module is tested to comply with relevant part 15 rules without shielding and in the same configuration as it is intended to be used by developer. PNEV5180B board has passed spurious emissions test without shielding and is certified as limited modular transmitter. Under FCC part 15.212(b), shielding is not required.

Concerning §2.803 the PNEV5180B board will be not offered for sale to other parties or to end users located in a residential environment.

Caution!

The Federal Communications Commission warns the users that changes or modifications to the unit not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

6.2 COMPLIANCE INFORMATION according to 47CFR 2.1033

We, declare that the product

Customer Evaluation Board PNEV5180B

FCC 12.225, Limited Modular Approval, FCC ID: OWRPNEV5180B

is in conformity with Part 15 of the FCC Rules.

Operation of this product is subject to the following conditions:

- (1) this device may not cause harmful interference
- (2) this device must accept any interference received, including interference that may cause undesired operation.

Note:

Any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.