

PX1N

PCI Express Mini Card GLONASS & GPS Interface



PX1 GLONASS & GPS PCI Express® Mini Card

Provides GLONASS and GPS functionality

The PX1N is a PCI Express® Mini Card providing a GNSS receiver with GLONASS and GPS functionality and can be used in 19" systems, box PCs and display computers. It supports active or passive antennas, which can be connected to an U.FL connector. The received antenna signals are sent to the host via USB.

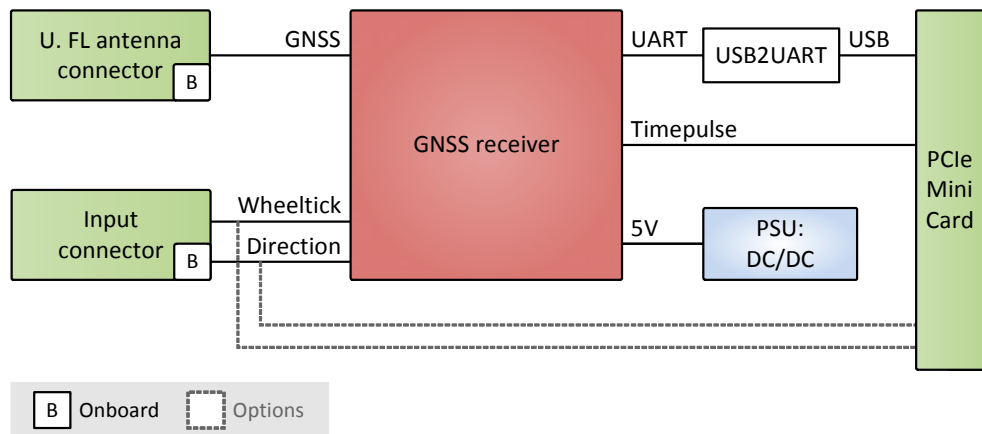
Supports global satellite navigation systems

The PX1N supports concurrent reception of GPS/QZSS, GLONASS, BeiDou and is Galileo-ready.

Uses dead reckoning functions for high accuracy positioning

The GNSS module provides a 3-axis accelerometer and gyroscope sensors for dead reckoning functions, which enable accurate positioning. Various Satellite-Based Augmentation Systems (SBAS) are also supported. The PX1N provides communication information compliant to the NMEA 0183 protocol.

Diagram



Technical Data

Connectivity

- 72-channel GNSS (Global Navigation Satellite System) receiver
- GPS signals/frequency: L1C/A, 1575.42 MHz
- GLONASS signals/frequency: L1OF, 1602 MHz
- BeiDou signals/frequency: B1, 1561.098 MHz
- QZSS signals: L1C/A (Pacific region)
- Galileo ready for signals E1B/C
- Assisted GNSS support (A-GNSS)
 - AssistNow™ Online
 - AssistNow™ Offline
 - AssistNow™ Autonomous
- Automotive Dead Reckoning support (gyroscope)
- Augmentation Systems
 - Satellite Based Augmentation System (SBAS)
 - Differential GPS support (D-GPS)
 - RTCM 10402.3
- Integrated Real-Time Clock (RTC)
- Accuracy:
 - Horizontal: 2.5 m Autonomous, 2.0 m SBAS
 - Velocity: 0.05 m/s
 - Heading: 0.3 degrees
- Time To First Fix (TTFF):
 - Cold start: 27 s (GPS/GLONASS), 28 s (GPS/BeiDou), 30 s (GPS)
 - Hot start: 1.5 s (GPS/GLONASS), 1.5 s (GPS/BeiDou), 1.5 s (GPS)
 - Aided start: 4 s (GPS/GLONASS), 6 s (GPS/BeiDou), 3 s (GPS)
- Sensitivity:
 - Tracking and navigation: -160 dBm
 - Re-acquisition: -159 dBm
 - Cold start: -147 dBm
 - Hot start: -156 dBm
- Protocol: NMEA 0183 rev. 4.0

Onboard Interfaces

- One U.FL antenna connector
 - For the use of an external active or passive antenna
 - Phantom power supply: 3.3V
- PCI Express® Mini Card connector
 - USB 2.0
- Input connector
 - Wheel tick and direction inputs for dead reckoning support
 - Voltage input range of 24 VDC nominal
 - Galvanically isolated

Electrical Specifications

- Supply voltage/power consumption:
 - +3.3 V, max. 191 mA
 - Impedance: 50 Ohm

Mechanical Specifications

- Dimensions: 30 mm x 58 mm x 5 mm (PCI Express® Full-Mini Card)
- Weight: 4 g

Environmental Specifications

- Temperature range (operation):
 - -40 to +85°C (qualified)
 - Airflow: min. 1 m/s
- Temperature range (storage): -40 to +85°C
- Relative humidity (operation): max. 95% non-condensing (EN 50155 / EN 60068-2-30)
- Relative humidity (storage): max. 95% non-condensing (EN 50155 / EN 60068-2-30)
- Altitude: -300 m to +3000 m
- Shock: 15 g, 11 ms
- Bump: 10 g, 16 ms
- Vibration (sinusoidal): 1 g, 10 to 150 Hz

MTBF

- 1.800.000 h @ 40°C according to IEC/TR 62380 (RDF 2000)

Safety

- PCB manufactured with a flammability rating of 94V-0 by UL recognized manufacturers

EMC Conformity

- EN 50121-3-2 (immunity)
- EN 55011 (radio disturbance)
- EN 61000-4-2/EN 50121-3-2 (ESD)
- EN 61000-4-3/EN 50121-3-2 (electromagnetic field immunity)
- EN 61000-4-4/EN 50121-3-2 (burst)
- EN 61000-4-6/EN 50121-3-2 (conducted disturbances)

Software Support

- Windows® 7 or later
- Linux

Product Safety

Electrostatic Discharge (ESD)



Computer boards and components contain electrostatic sensitive devices. Electrostatic discharge (ESD) can damage components. To protect the board and other components against damage from static electricity, you should follow some precautions whenever you work on your computer.

- Power down and unplug your computer system when working on the inside.
- Hold components by the edges and try not to touch the IC chips, leads, or circuitry.
- Use a grounded wrist strap before handling computer components.
- Place components on a grounded antistatic pad or on the bag that came with the component whenever the components are separated from the system.
- Only store the board in its original ESD-protected packaging. Retain the original packaging in case you need to return the board to MEN for repair.

About this Document

This user manual is intended only for system developers and integrators, it is not intended for end users.

It describes the hardware functions of the board, connection of peripheral devices and integration into a system. It also provides additional information for special applications and configurations of the board.

The manual does not include detailed information on individual components (data sheets etc.). A list of literature is given in the appendix.

History

Issue	Comments	Date
E1	First issue	2015-09-09

Conventions



Indicates important information or warnings concerning the use of voltages that could lead to a hazardous situation which could result in personal injury, or damage or destruction of the component.



Indicates important information or warnings concerning proper functionality of the product described in this document.



The globe icon indicates a **hyperlink** that links directly to the Internet, where the latest updated information is available. When no globe icon is present, the hyperlink links to specific elements and information within this document.

Italics Folder, file and function names are printed in *italics*.

Bold **Bold** type is used for emphasis.

Mono A **monospaced** font type is used for hexadecimal numbers, listings, C function descriptions or wherever appropriate. Hexadecimal numbers are preceded by "0x".

Comment Comments embedded into coding examples are shown in green text.

IRQ# Signal names followed by a hashtag "#" or preceded by a forward slash "/" indicate that this signal is either active low or that it becomes active at a falling edge.

In/Out Signal directions in signal mnemonics tables generally refer to the corresponding board or component, "in" meaning "to the board or component", "out" meaning "from the board or component".

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Since July 1, 2006 all MEN standard products comply with RoHS legislation.

Since January 2005 the SMD and manual soldering processes at MEN have already been completely lead-free. Between June 2004 and June 30, 2006 MEN's selected component suppliers have changed delivery to RoHS-compliant parts. During this period any change and status was traceable through the MEN ERP system and the boards gradually became RoHS-compliant.

WEEE Application



The WEEE directive does not apply to fixed industrial plants and tools. The compliance is the responsibility of the company which puts the product on the market, as defined in the directive; components and sub-assemblies are not subject to product compliance.

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Nevertheless, MEN is registered as a manufacturer in Germany. The registration number can be provided on request.

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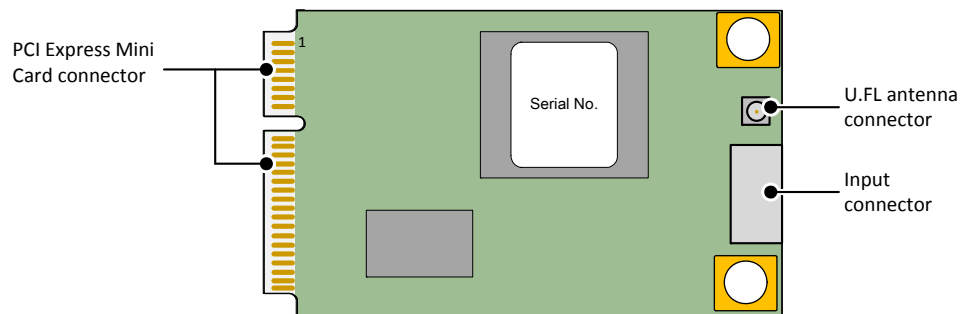
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1 Getting Started

This chapter provides an overview of the board and some initial installation instructions.

1.1 Map of the Board

Figure 1. Map of the board - top view



1.2 Integrating the Board into a System

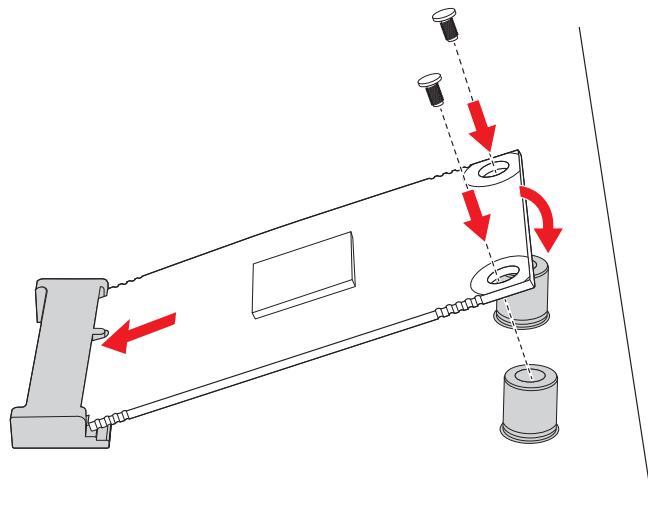
You can use the following check list when installing the card in a system for the first time and with minimum configuration. The installation of the PX1N depends on the carrier board. Please refer to your carrier board's user manual before installing the PX1N.

- » Power down the system and remove the PCI Express Mini Card carrier board.
- » Install the PX1N on the PCI Express Mini Card slot of the carrier board as described in the carrier board's user manual.

Also see [Figure 2, Installing the PCI Express Mini Card \(example only\)](#).

- » Insert the carrier board into the system again
- » Power up the system.

Figure 2. Installing the PCI Express Mini Card (example only)



2 Connecting the PCI Express Mini Card

2.1 Antenna Connector

An external active or passive antenna can be connected to the U.FL antenna connector. Depending on the used antenna, an U.FL to SMA adapter might be required to connect an antenna.

Table 1. U.FL antenna connector pinning


	1	RF_INPUT
	2	GND

Table 2. Signal mnemonics of the 2-pin antenna connector

Name	Direction	Function
RF_INPUT	In	Input of GPS/GLONASS/Galileo/AGPS
GND	-	Ground

2.2 Input Connector

The input connector is a 4-pin single-row interface. The PX1N provides the binary inputs wheel tick (WT) and direction (forward signal) which are routed to the GNSS or, optionally, to reserved pins on the PCI Express Mini Card connector. The wheel tick and direction inputs support reliable dead reckoning functionality.

Table 3. Input connector pinning


	1	FWD_IN
	2	FWD_IN_GND
	3	WT_IN
	4	WT_IN_GND

Table 4. Signal mnemonics of the 4-pin antenna connector

Name	Direction	Function
FWD_IN	In	Direction input
FWD_IN_GND	In	Ground direction input
WT_IN	In	Wheel tick input
WT_IN_GND	In	Ground wheel tick input

2.3 PCI Express Mini Card Interface

The PX1N connects to the carrier board via a PCI Express Mini Card connector. PCI Express® Mini Cards use either a single PCI Express lane (x1) or a USB connection; the PX1N only supports the USB 2.0 connection. It is equipped with one 52-pin standard PCI Express Mini Card connector. The following standard signals are supported (signal directions according to PCI Express Mini Card standard):

Table 5. Pin assignment of PCI Express Mini Card connector

	2	+3.3V	1	WAKE#
	4	GND	3	reserved
	6	1.5V	5	reserved
	8	UIM_PWR	7	CLKREQ#
	10	UIM_DATA	9	GND
	12	UIM_CLK	11	REFCLK-
	14	UIM_RST	13	REFCLK+
	16	UIM_VPP	15	GND
	18	GND	17	reserved
	20	W_DISABLE#	19	reserved
	22	PERST#	21	GND
	24	+3.3Vaux	23	PERn0
	26	GND	25	PERp0
	28	+1.5V	27	GND
	30	SMB_CLK_MINI	29	GND
32	SMB_DATA_MINI	31	PETn0	
34	GND	33	PETp0	
36	USB_D-	35	GND	
38	USB_D+	37	GND	
40	GND	39	+3.3Vaux	
42	LED_WWAN#	41	+3.3Vaux	
44	LED_WLAN#	43	GND	
46	LED_WPAN#	45	FWD	
48	+1.5V	47	WHEELTICK	
50	GND	49	TIMEPULSE	
52	+3.3Vaux	51	W_DISABLE[2]	

Table 6. Signal mnemonics of 52-pin PCI Express Mini Card connector

	Signal	Direction	Function
Power	GND	-	Ground
	+3.3Vaux	out	3.3V source
	1.5V	out	1.5V source
SIM card¹	UIM_PWR	in	SIM card power
	UIM_DATA	in/out	SIM card data
	UIM_CLK	in	SIM card clock
	UIM_RST	in	SIM card reset
	UIM_VPP	in	not connected
PCI Express¹	REFCLK- REFCLK+	out	PCI Express differential reference clock
	PERn0/PERp0	in	PCI Express receive signals
	PETn0/PETp0	out	PCI Express transmit signals
Auxiliary Signals¹	CLKREQ#	in	Clock request
	PERST#	out	Reset for the Mini Card
	W_DISABLE#	out	Wireless disable
	WAKE#	in	Wake signal
	SMB_CLK	out	System management bus clock
	SMB_DATA	in/out	System management bus data
USB	USB_D-	in/out	USB line
	USB_D+	in/out	USB line
Communications - specific signals¹	LED_WWAN#	in	not connected
	LED_WLAN#	in	not connected
	LED_WPAN#	in	not connected
Optional ²	WHEELTICK	in	Optional WHEELTICK input
	TIMEPULSE	out	1PPS / TIMEPULSE output

¹ Signals in grey font are not supported.

² These signals are only available as an option.

Please refer to the PCI Express Mini Card Specifications in [Chapter 4.1.1 PCI Express Mini Card on page 17](#), for further details

3 Functional Description

3.1 Power Supply

The PX1N is supplied with 3.3V via the PCI Express Mini Card connector.

3.1.1 Power Supply for Active Antennas

The standard power supply for the PX1N is 3.3 V. A phantom supply is available as an option, allowing the PX1N to supply active GPS antennas with 3.3 V or 5 V. In addition, it is possible to extend the power supply to 3.5 V or 5 V with either an optional assembly, or a version that has been configured specifically.

3.2 GNSS Interface

The PX1N is equipped with a U-Blox Neo M8L GNSS module with dead reckoning, which supports concurrent reception of GPS, GLONASS, BeiDou and is Galileo ready. The GNSS signals are received via an onboard U.FL connector, which has to be connected to an external antenna.



The PX1N itself has no antenna. Please note that MEN does not supply antennas with the PX1N, since the choice of a suitable antenna depends on your application

Please see [Chapter Technical Data on page 3](#) for detailed information on the GNSS interface.

3.3 Software Requirements

The PX1N does not require a specific driver. The USB2UART interface is supported under Linux, kernels higher than 3.0 and under Windows 7 and newer.



Please check the [MEN website](#) for a VxWorks driver.
For more information on first installation please [contact the MEN sales team](#).



For evaluation software, please see the [u-blox website](#) (GNSS receiver manufacturer).



For integration software please go to [FreeGPS](#).

4 Appendix

4.1 Literature and Web Resources



PX1N data sheet with up-to-date information and documentation:
www.men.de/products/px1n/

4.1.1 PCI Express Mini Card



PCI Express Mini Card Electromechanical Specification Rev. 2.0
 August 31, 2011
 PCI Special Interest Group
www.pcisig.com

4.1.2 GNSS



- U-Blox Neo M8(L) GNSS Receiver
<https://www.u-blox.com/en/product/neo-m8l>
- GNSS in general
en.wikipedia.org/wiki/Satellite_navigation

4.2 Finding the Product's Article Number, Revision and Serial Number

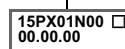
MEN user documentation may describe several different models and/or design revisions of the PX1N. You can find information on the article number, the design revision and the serial number on a label attached to the board.

- **Article number:** Product family and model. This is also MEN's ordering number. To be complete it must have 9 characters.
- **Revision number:** Product design revision.
- **Serial number:** Unique identification assigned during production.

If you need support, you should communicate these numbers to MEN.

Figure 3. Labels showing the product's article number, revision and serial number

Complete article number



Revision number



Serial number