

Manual

Serial PCI Cards



Models	13011, 13410 13411, 13610 13611, 13812
Version	1.4

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The gradual decline in ISA slots in modern PCs has made it necessary to make the functionality of ISA cards available for the PCI bus as well.

W&T has responded by creating an entire family of serial PCI interface cards which meet the needs of industrial automation through integrated galvanic isolation of the PC ports and the ability to equip the serial ports of the card with a variety of physical interfaces.

This PCI card family is described on the following pages along with their technical specifications and wiring examples.

The inherent benefits of PCI with respect to easy installation and automatic assigning of PC resources stand in contrast to the fact that these cards are no longer supported by the operating system itself, but rather require driver software.

One exception is Linux, which in kernel version 2.4. and higher supports the serial W&T PCI cards directly, without additional driver software.

Current information on the new developments as well as the newest driver releases can be found in the Internet at <http://www.wut.de> or in the e-mail updates provided to members of the W&T Interface Club. Subscriptions to the Interface Club can requested from the W&T homepage.

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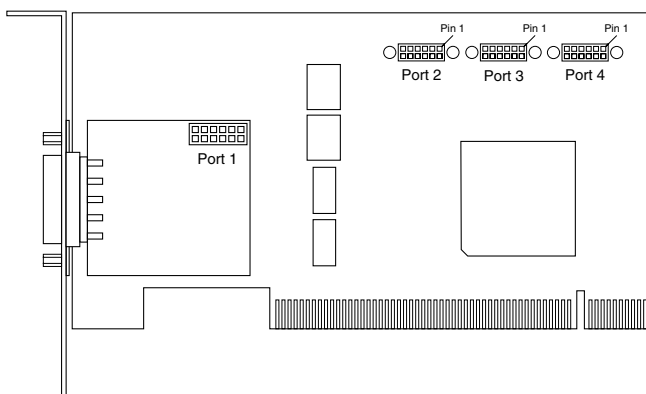
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Low Profile PCI cards: General characteristics

Function

All serial Low Profile PCI cards add the functionality of maximum four additional serial ports to your PC. One of these ports (Port 1) is integrated on the interface card, whereas three additional, optional ports (ports 2 through 4) are connected to the circuit board through ribbon cable. These optional ports are configured on the PCI card as serial TTL interfaces which can be converted into any serial standard interface (RS232, RS422, RS485 or 20mA) using W&T Interface Modules.



Adapting to the physical housing requirements

The serial interface cards are supplied with a short slot bracket which enables installation in Low Profile PCI systems. A longer slot bracket is provided for attaching the cards in standard PCI systems; this is attached to the circuit board in place of the short slot bracket.

To make the switch, remove the two threaded pins on the SUB-D plug, remove the slot bracket and attach the new bracket to the SUB-D plug using the threaded pins.

Galvanic isolation and ESD protection

Port 1 on all W&T Low Profile PCI interface cards is galvanically isolated from the PC with an isolation voltage of at least 1kV DC, whereas the optional ports 2 through 4 have no galvanic isolation from the PC.

Galvanic isolation of the signals is implemented using fast opto-couplers; driver and receiver chips are powered by a galvanically isolated DC/DC converter. Please note that the shielding for the port connectors has a direct connection to the chassis ground of the PC using the metallic slot bracket.

The signal lines for the serial ports are protected against static discharge for a voltage of up to 15kV per IEC 801-2, Level 4.

Driver and software installation

All the serial PCI interface cards are accessible under the various operating systems only using special drivers. These drivers are subject to continuous improvement both with respect to their technical features and the number and type of supported operating systems.

For this reason W&T makes the current drivers and software installation manuals available on the data sheet pages for the PCI cards in the Internet under <http://www.wut.de>.

Implementing optional ports 2 through 4

As an option all serial Low Profile interface cards are able to also provide three additional serial ports in addition to the port integrated on the card. These ports are configured on the card as serial TTL interfaces which can be converted into the desired interface type by using interface modules.

It must be noted however that the optional ports 2 through 4 are not galvanically isolated from each other or from the PC, so that these ports may be used only for connecting peripherals

where no ground potential differences can be expected. This would include any peripherals which are located in the direct vicinity of the PC and thus are powered from the same sub-division as well as peripherals which are inherently potential-free. This generally applies to all devices which are powered from the interface or by a plug-in power supply. In all other cases external galvanic isolation must be provided.



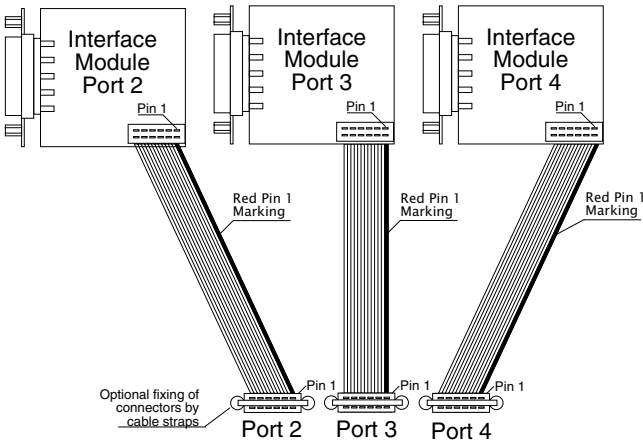
The additional interface modules are connected to the interface card using 2mm ribbon cable and attached by means of a slot bracket in the PC housing. Both components can be obtained as a special accessory from W&T under article number 13014. The ribbon cable connectors can be affixed to the interface card as needed using standard cable ties.

Important notes

The serial W&T PCI cards may be equipped only with the 18x1x series interface modules (e.g. 18811, 18813, 18611, 18411, etc.) which have a supply voltage of 5V DC.

The use of 3.3V modules in the 18x3x series (e.g. 18831, 18833, 18631, etc.) will result in destruction of the interface modules and/or the PCI card.

When installing you must ensure that the arrangement of the ribbon cable and the interface modules corresponds to the drawing below. Otherwise the modules and/or the interface card may be destroyed.



Low Profile PCI card 1x 20mA, #13410**Function**

The W&T PC card model 13410 provides a serial 20mA interface with galvanic isolation of 1kV DC on port 1. Ports 2 through 4 may also be used for any three, non-galvanically isolated serial ports.

Wiring configuration

The 20mA connection for the PC card is implemented as a DB9 plug. The connector pin assignments are shown in the following table:

pin#	function
1	Data Out 20 mA
2	Data Out +
3	Data Out -
4	Data Out GND
5	Halfduplex control
6	Data In 20 mA
7	Data In +
8	Data In -
9	Data In GND

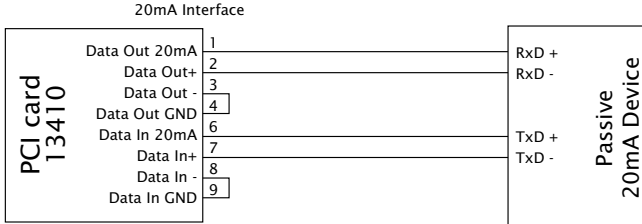
Applications

A ground level signal on Pin 5 of the SUB-D connector can be used to bring the 20mA interface into half-duplex mode, in which there is echo suppression of the sent signals.

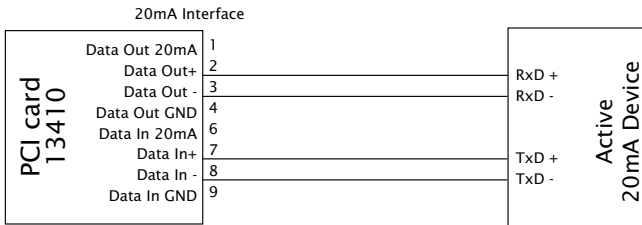
The PC card can be used as either an active or passive 20mA component. In active mode the card provides the loop current for the respective 20mA loop, whereas in passive mode the connected device itself must provide the loop current.

The operating mode can be set separately for both loops using the external wiring of the card. Examples for wiring the PC card in active/passive mode can be seen in the following drawings:

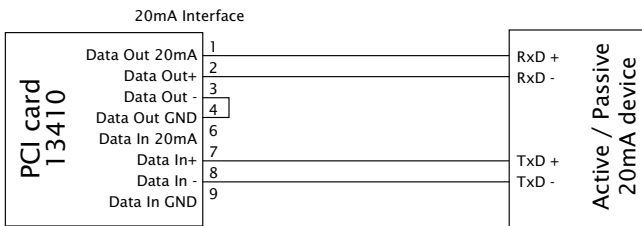
Active Tx and Active Rx Current Loop Application



Passive Tx and Passive Rx Current Loop Application



Active Tx and Passive Rx Current Loop Application



Technical Data

System bus:	32-bit bus / 33MHz
PCI standard:	PCI2.2 / signal voltage: 5V
Serial ports:	One galvanically isolated 20mA-port Three non-isolated TTL-ports
Galvanic isolation:	port 1: min. 1kV DC port 2..4: No isolation
Modes:	Active and passive mode Full- and half-duplex mode
UART:	16950 with 128 bytes FIFO
Base addresses:	automatic configuration
Interrupts:	automatic configuration
Baud rate:	50..57.600 baud
Data format:	any
Signals:	RxD+, RxD-, TxD+, TxD-
Serial connections:	1x 9-pin. SUB-D plug 3x 12-pin. 2mm PCB plug
Supply voltage:	+5V, typ. 180mA
Dimensions:	119.9 x 63.5 mm
Weight:	approx. 110 g
Scope of delivery:	Low Profile PCI card 1x 20mA Standare slot bracket Driver CD

Low Profile PCI card 1x RS232/RS422/RS485, #13610

Function

The W&T PC card model 13610 provides on port 1 a switchable serial RS232/RS422/RS485 interface with 1kV DC galvanic isolation. Ports 2 through 4 can also be used for any three non-galvanically isolated serial interfaces.

Wiring configuration

The serial connection of the Low Profile PCI card is configured as a DB9 plug. The connector pin assignments are shown in the following table:

RS232 mode

pin#	signal	function
1	DCD	input
2	RxD	input
3	TxD	output
4	DTR	output
5	GND	GND
6	DSR	input
7	RTS	output
8	CTS	input
9	RI	input

RS422/RS485 mode

pin#	signal	function
1	TXD A	output
2	RxD A	input
3	DTR A	output
4	CTS A	input
5	GND	GND
6	TXD B	output
7	RxD B	input
8	DTR B	output
9	CTS B	input

Modes

The combined RS232/RS422/485 interface of the PCI card can be set to various operating modes using the DIL switches located near the serial connector as described briefly below:

RS232 mode

This mode provides one data channel each (RxD and TxD) in each direction as well as six handshake channels (RTS, CTS, DSR, DCD, DTR and RI).

RS422 mode

The PCI card supports one data and one handshake channel each (selectable DTR or RTS handshake output) in each direction. The RS422 sender and receiver chips are always active.

RS485 mode

In all RS485 modes there is one data channel available in each direction. The operating modes differ only in how the RS485 driver and receiver chips are controlled.

RS485 4-wire bus master

In this mode the Master uses a wire pair to send requests to the Slaves, which send their replies to the Master on an additional common wire pair. The RS485 drivers and receivers are always active, whereby the Master can always send and is continuously listening for the Slaves.

RS485 4-wire mode / RS485 2-wire mode with echo, handshake control

One data channel in each direction is available. The RS485 driver chip is turned „ON“ with RTS or DTR, whereas RTS or DTR = „OFF“ switches the driver to tristate. The receive channel is always active in this mode.

RS485 2-wire mode without echo, with handshake control

One data channel in each direction is available. The RS485 driver chip is turned „ON“ with RTS or DTR, whereas RTS or DTR = „OFF“ turns the driver into tristate. The receive channel is deactivated when the driver is turned on, and the channel is on when the driver is in tristate.

RS485 4-wire mode / RS485 2-wire mode with echo, automatic control

One data channel in each direction is available. The RS485 driver chip is automatically activated for each data transmission and reset to tristate after data output is finished. The receive channel is always active in this mode.

RS485 2-wire mode without echo, automatic control

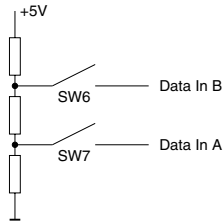
One data channel in each direction is available. The RS485 driver chip is automatically activated for each data transmission and reset to tristate after data output is finished. The receive channel is deactivated when the driver is turned on, and the channel is on when the driver is in tristate.

The DIL switch mode settings are shown in the following table:

Operating mode	SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8
RS232	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON
RS422, RS485, 4-wire bus master DTR handshake	OFF	OFF	OFF	ON	OFF	*	*	OFF
RS422, RS485, 4-wire bus master RTS handshake	OFF	OFF	OFF	OFF	ON	*	*	OFF
RS485, 4-wire / 2-wire with echo DTR control	OFF	OFF	ON	ON	OFF	*	*	OFF
RS485, 2-wire without echo DTR control	ON	OFF	ON	ON	OFF	*	*	OFF
RS485, 4-wire / 2-wire with echo RTS control	OFF	OFF	ON	OFF	ON	*	*	OFF
RS485, 2-wire without echo RTS control	ON	OFF	ON	OFF	ON	*	*	OFF
RS485, 4-wire / 2-wire with echo automatic control	OFF	ON	OFF	ON	OFF	*	*	OFF
RS485, 2-wire without echo automatic control	ON	ON	OFF	ON	OFF	*	*	OFF

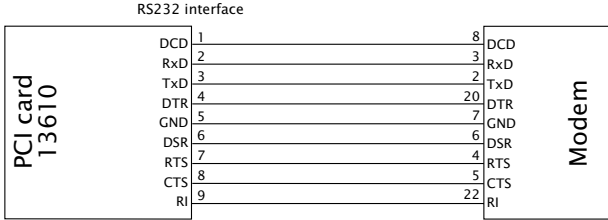
Terminating

All RS485 modes require terminating the bus system with a termination network which ensures a defined rest state in the tristate phases of bus operation. The bus system can be connected to a termination network on the PC card by closing DIL switches 6 and 7:

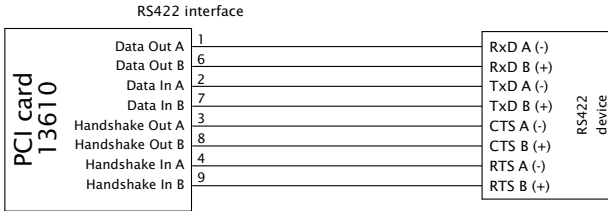


Applications

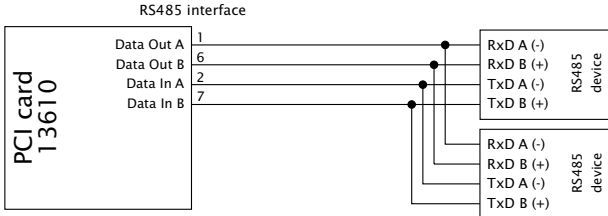
RS232 application with hardware handshake



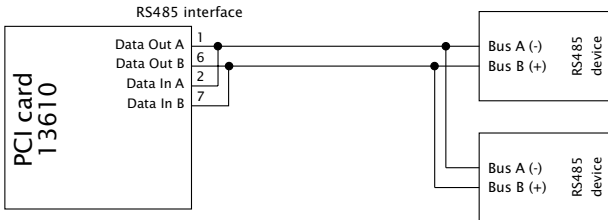
RS422 application with hardware handshake



RS485 4-wire bus master application



RS485 2-wire application



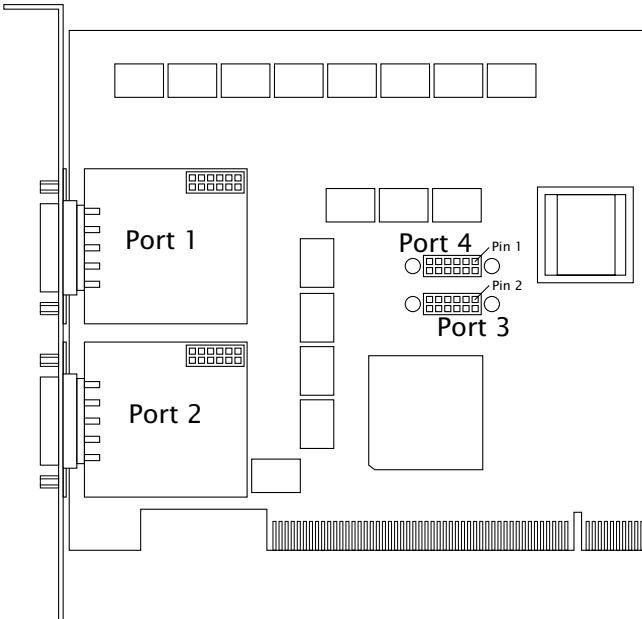
Technical Data

System bus:	32-bit bus / 33MHz
PCI standard:	PCI2.2 / signal voltage: 5V
Serial ports:	One galvanically isolated, selectable RS232-/RS422-/RS485-port Three non-isolated TTL-ports
Galvanic isolation:	port 1: min. 1kV DC port 2..4: No isolation
Modes:	RS232 RS422 RS485 handshake control RS485 automatic control
UART:	16950 with 128 bytes FIFO
Base addresses:	automatic configuration
Interrupts:	automatic configuration
Baud rate:	RS232: 50..230.400 baud RS422/RS485: 50..460.800 baud
Data format:	any
Signals:	RS232 mode: RxD, TxD, RTS, CTS, DSR, DTR, DCD, RI RS422/RS485 mode: RxD A/B, TxD A/B, CTS A/B, DTR A/B
Serial connections:	1x 9-pin. SUB-D plug 3x 12-pin. 2mm PCB plug
Supply voltage:	+5V, typ. 150mA
Dimensions:	119.9 x 63.5 mm
Weight:	approx. 110 g
Scope of delivery:	Low Profile PCI card 1x RS232/RS422/RS485 Standare slot bracket Driver CD

Standard PCI cards: Common characteristics

Function

All W&T serial interface cards for PCI bus systems add the functionality of maximum four additional serial ports to your PC. Two of these ports (port 1 and port 2) are integrated on the interface card, whereas two additional, optional ports (ports 3 and 4) are connected to the circuit board through ribbon cable. These 2 optional ports are configured on the circuit board as serial TTL interfaces which can be converted into any serial standard interface (RS232, RS422, RS485 or 20mA) using W&T Interface Modules.



Galvanic isolation and ESD protection

Ports 1 and 2 on all W&T PCI interface cards are galvanically isolated from each other and from the PC with an isolation voltage of at least 1kV DC, whereas the optional ports 3 and 4 have no galvanic isolation from the PC.

Galvanic isolation of the signals is implemented using fast opto-couplers; driver and receiver chips are powered by a galvanically isolated DC/DC converter. Please note that the shielding for the port connectors has a direct connection to the chassis ground of the PC using the metallic slot bracket.

The signal lines for the serial ports are protected against static discharge for a voltage of up to 15kV per IEC 801-2, Level 4.

Driver and software installation

All the serial PCI interface cards are accessible under the various operating systems only using special drivers. These drivers are subject to continuous improvement both with respect to their technical features and the number and type of supported operating systems.

For this reason W&T makes the current drivers and software installation manuals available on the data sheet pages for the PCI cards in the Internet under <http://www.wut.de>.

Implementing optional ports 3 and 4

As an option all serial interface cards are able to also provide two additional serial ports (ports 3 and 4) in addition to the two ports integrated on the card. These ports are configured on the card as serial TTL interfaces which can be converted into the desired interface type by using interface modules.

It must be noted however that the optional ports 3 and 4 are not galvanically isolated from each other or from the PC, so that these ports may be used only for connecting peripherals where no ground potential differences can be expected. This would include any peripherals which are located in the direct vicinity of the PC and thus are powered from the same sub-division as well as peripherals which are inherently potential-free. This generally applies to all devices which are powered from the interface or by a plug-in power supply. In all other cases external galvanic isolation must be provided.



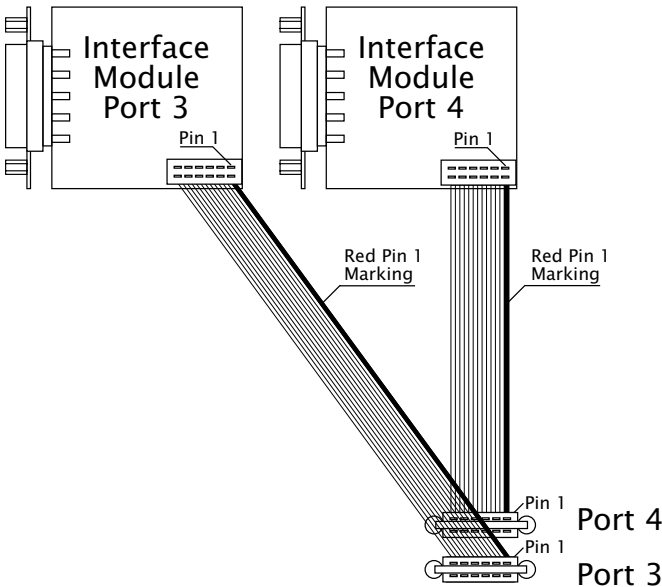
The additional interface modules are connected to the interface card using 2mm ribbon cable and attached by means of a slot bracket in the PC housing. Both components can be obtained as a special accessory from W&T under article number 13013. The ribbon cable connectors can be affixed to the interface card as needed using standard cable ties.

Important notes

The serial W&T PCI cards may be equipped only with the 18x1x series interface modules (e.g. 18811, 18813, 18611, 18411, etc.) which have a supply voltage of 5V DC.

The use of 3.3V modules in the 18x3x series (e.g. 18831, 18833, 18631, etc.) will result in destruction of the interface modules and/or the PCI card.

When installing you must ensure that the arrangement of the ribbon cable and the interface modules corresponds to the drawing below. Otherwise the modules and/or the interface card may be destroyed.



PCI card base board for Interface-Modules, #13011

Function

The serial W&T module base board 13011 together with W&T interface modules provides two independent serial interfaces with galvanic isolation of 1kV DC as well as two serial interfaces without galvanic isolation. Integration of the interface-specific components on the cards in the form of interchangeable interface modules provides for an optional mixed configuration of the cards with different interface types. This means for example you can easily implement an RS232 interface for connecting a mouse and a 20mA interface for connecting a controller on a single card.

Wiring configuration

The serial TTL interface on the base board is implemented as a 12-pin PCB connector. The connector pin assignments are shown in the following table:

pin#	signal	function
1	5V	power supply
2	RI	input
3	RxD	input
4	TxD	output
5	n.c.	n.c.
6	CTS	input
7	DTR	output
8	DSR	input
9	RTS	output
10	DCD	input
11	12V	power supply
12	GND	signal ground

Pin 1 of the connector is indicated by a rectangular soldering pad.

Technical Data

System bus:	32-bit bus / 33MHz
PCI standard:	PCI2.2 / signal voltage: 5V
Serial ports:	Two galvanically isolated TTL ports Two non-isolated TTL ports
Note:	The card can be configured with modules of various interface types
Galvanic isolation:	port 1,2: min. 1kV DC port 3,4: No isolation
UART:	16950 with 128 bytes FIFO
Base addresses:	automatic configuration
Interrupts:	automatic configuration
Baud rate:	50..460.800 baud
Data format:	any
Signals:	RxD, TxD, RTS, CTS, DSR, DCD, DTR, RI
Serial connections:	4x 12-pin. 2mm PCB plug
Supply voltage:	+5V, +12V, depending on current draw of the modules used
Dimensions:	120 x 106 mm
Weight:	approx. 110 g
Scope of delivery:	PCI card base board Driver CD

PCI card 2x 20mA, #13411

Function

The W&T PC card model 13411 provides on port 1 and port 2 two independent serial 20mA interfaces with galvanic isolation of 1kV DC. Ports 3 and 4 can be used also for any two non-galvanically isolated serial interfaces.

Wiring configuration

The 20mA connections on the PC card are implemented as DB9 plugs. The connector pin assignments are shown in the following table:

pin#	function
1	Data Out 20 mA
2	Data Out +
3	Data Out -
4	Data Out GND
5	Halfduplex control
6	Data In 20 mA
7	Data In +
8	Data In -
9	Data In GND

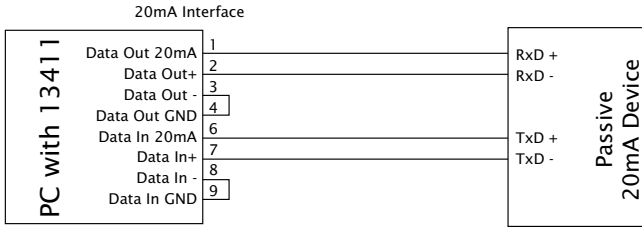
Applications

A ground level on Pin 5 of the SUB-D connector places the 20mA interface in half-duplex mode in which there is echo suppression of the sent signals.

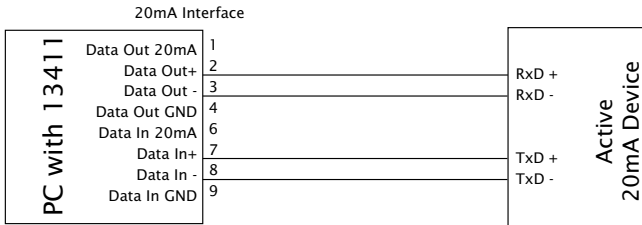
The PC card can be used as either an active or passive 20mA component. In active mode the card provides the loop current for the respective 20mA loop, whereas in passive mode the connected device itself must provide the loop current.

The mode can be set independently for both loops using the external wiring of the card. Examples for wiring the PC card in active/passive mode are shown in the following drawings:

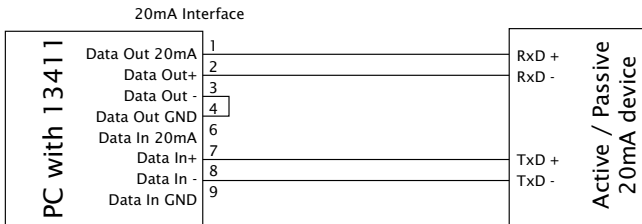
Active Tx and Active Rx Current Loop Application



Passive Tx and Passive Rx Current Loop Application



Active Tx and Passive Rx Current Loop Application



Technical Data

System bus:	32-bit bus / 33MHz
PCI standard:	PCI2.2 / signal voltage: 5V
Serial ports:	Two galvanically isolated 20mA ports Two non-isolated TTL ports
Galvanic isolation:	port 1,2: min. 1kV DC port 3,4: No isolation
Modes:	Active and passive mode Full- and half-duplex mode
UART:	16950 with 128 bytes FIFO
Base addresses:	automatic configuration
Interrupts:	automatic configuration
Baud rate:	50..57.600 baud
Data format:	any
Signals:	RxD+, RxD-, TxD+, TxD-
Serial connections:	2x 9-pin. SUB-D plug 2x 12-pin 2mm PCB plug
Supply voltage:	+5V, typ. 200mA, +12V, typ. 100mA
Dimensions:	120 x 106 mm
Weight:	approx. 110 g
Scope of delivery:	PCI card 2x 20mA Driver CD

PCI card 2x RS422/RS485, #13611**Function**

The W&T PC card model 13611 provides on port 1 and port 2 two independent serial RS422/RS485 interfaces with galvanic isolation of 1kV DC. Ports 3 and 4 can be used also for any two non-galvanically isolated serial interfaces.

Wiring configuration

The RS422/RS485 connections on the PC card are implemented as DB9 connectors. The connector pin assignments are shown in the following table:

pin#	function
1	Data Out A (-)
2	Data in A (-)
3	Handshake Out A (-)
4	Handshake In A (-)
5	Signal GND
6	Data Out B (+)
7	Data In B (+)
8	Handshake Out B (+)
9	Handshake In B (+)

Modes

The RS422/485 interface of the PCI card can be set to various operating modes using the DIL switches located near the serial connector as described briefly below:

RS422, RS485 4-wire-Bus-Master

One data and one handshake channel each in each direction is available. The RS422/RS485 driver and receiver chips are always active in this mode.

RS485 4-wire mode / RS485 2-wire mode with echo, handshake control

One data channel in each direction is available. The RS485 driver chip is turned „ON“ with RTS or DTR, whereas RTS or DTR = „OFF“ turns the driver into tristate. The receive channel is always active in this mode.

RS485 2-wire mode without echo, handshake control

One data channel in each direction is available. The RS485 driver chip is turned „ON“ with RTS or DTR, whereas RTS or DTR = „OFF“ turns the driver into tristate. The receive channel is deactivated when the driver is turned on and the channel is on when the driver is in tristate.

RS485 4-wire mode / RS485 2-wire mode with echo, automatic control

One data channel in each direction is available. The RS485 driver chip is automatically activated for each data transmission and reset to tristate after data output is finished. The receive channel is always active in this mode.

RS485 2-wire mode without echo, automatic control

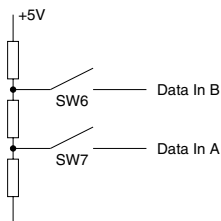
One data channel in each direction is available. The RS485 driver chip is automatically activated for each data transmission and reset to tristate after data output is finished. The receive channel is deactivated when the driver is turned on, and the channel is turned on when the driver is in tristate.

The DIL switch mode settings are shown in the following table:

operating mode	SW1	SW2	SW3	SW4	SW5
RS422, RS485, 4 wire bus master, DTR handshake	OFF	OFF	OFF	ON	OFF
RS422, RS485, 4 wire bus master, RTS handshake	OFF	OFF	OFF	OFF	ON
RS485, 4 wire / 2-wire with echo, DTR control	OFF	OFF	ON	ON	OFF
RS485, 2-wire without echo, DTR control	ON	OFF	ON	ON	OFF
RS485, 4 wire / 2-wire with echo, RTS control	OFF	OFF	ON	OFF	ON
RS485, 2-wire without echo, RTS control	ON	OFF	ON	OFF	ON
RS485, 4 wire / 2-wire with echo, automatic control	OFF	ON	OFF	ON	OFF
RS485, 2-wire without echo, automatic control	ON	ON	OFF	ON	OFF

Terminating

All RS485 modes require terminating the bus system with a termination network which ensures a defined rest state in the tristate phases of bus operation. The bus system can be connected to a termination network on the PC card by closing DIL switches 6 and 7:



Applications

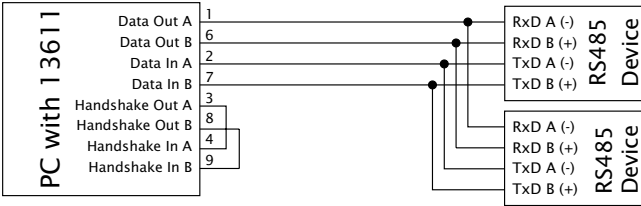
RS422 Hardware Handshake Application

RS422/485 Interface



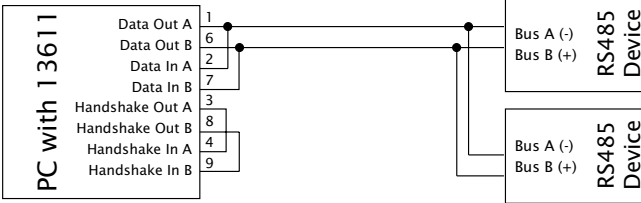
RS485 4 Wire Bus Master Application

RS422/485 Interface



RS485 2 Wire Application

RS422/485 Interface



Technical Data

System bus:	32-bit bus / 33MHz
PCI standard:	PCI2.2 / signal voltage: 5V
Serial ports:	Two galvanically isolated RS422-/RS485 ports Two non-isolated TTL ports
Galvanic isolation:	port 1,2: min. 1kV DC port 3,4: no isolation
Modes:	RS422 RS485 handshake control RS485 automatic control
UART:	16950 with 128 bytes FIFO
Base addresses:	automatic configuration
Interrupts:	automatic configuration
Baud rate:	50..460.800 baud
Data format:	any
Signals:	RxD A/B, TxD A/B, CTS A/B, DTR A/B
Serial connections:	2x 9-pin. SUB-D plug 2x 12-pin. 2mm PCB plug
Supply voltage:	+5V, typ. 200mA, +12V, typ. 100mA
Dimensions:	120 x 106 mm
Weight:	approx. 110 g
Scope of delivery:	PCI card 2x RS422/RS485 Driver CD

PCI card 2x RS232, #13812

Function

The W&T PC card model 13812 provides on port 1 and port 2 two independent serial RS232 interfaces with galvanic isolation of 1kV DC. ports 3 and 4 can be used also for any two non-galvanically isolated serial interfaces.

Wiring configuration

The RS232 connections on the PC card are implemented as DB9 plugs with standard PC pin assignments. The connector pin assignments are shown in the following table:

pin#	function
1	DCD
2	RxD
3	TxD
4	DTR
5	GND
6	DSR
7	RTS
8	CTS
9	RI

Technical Data

System bus:	32-bit bus / 33MHz
PCI standard:	PCI2.2 / signal voltage: 5V
Serial ports:	Two galvanically isolated RS232-ports Two non-isolated TTL ports
Galvanic isolation:	port 1,2: min. 1kV DC port 3,4: No isolation
UART:	16950 with 128 bytes FIFO
Base addresses:	automatic configuration
Interrupts:	automatic configuration
Baud rate:	50..230.400 baud
Data format:	any
Signals:	RxD, TxD, RTS, CTS, DSR, DCD, DTR, RI
Serial connections:	2x 9-pin. SUB-D plug 2x 12-pin. 2mm PCB plug
Supply voltage:	+5V, typ. 200mA, +12V, typ. 100mA
Dimensions:	120 x 106 mm
Weight:	approx. 110 g
Scope of delivery:	PCI card 2x RS232, 1kV isolated Driver CD