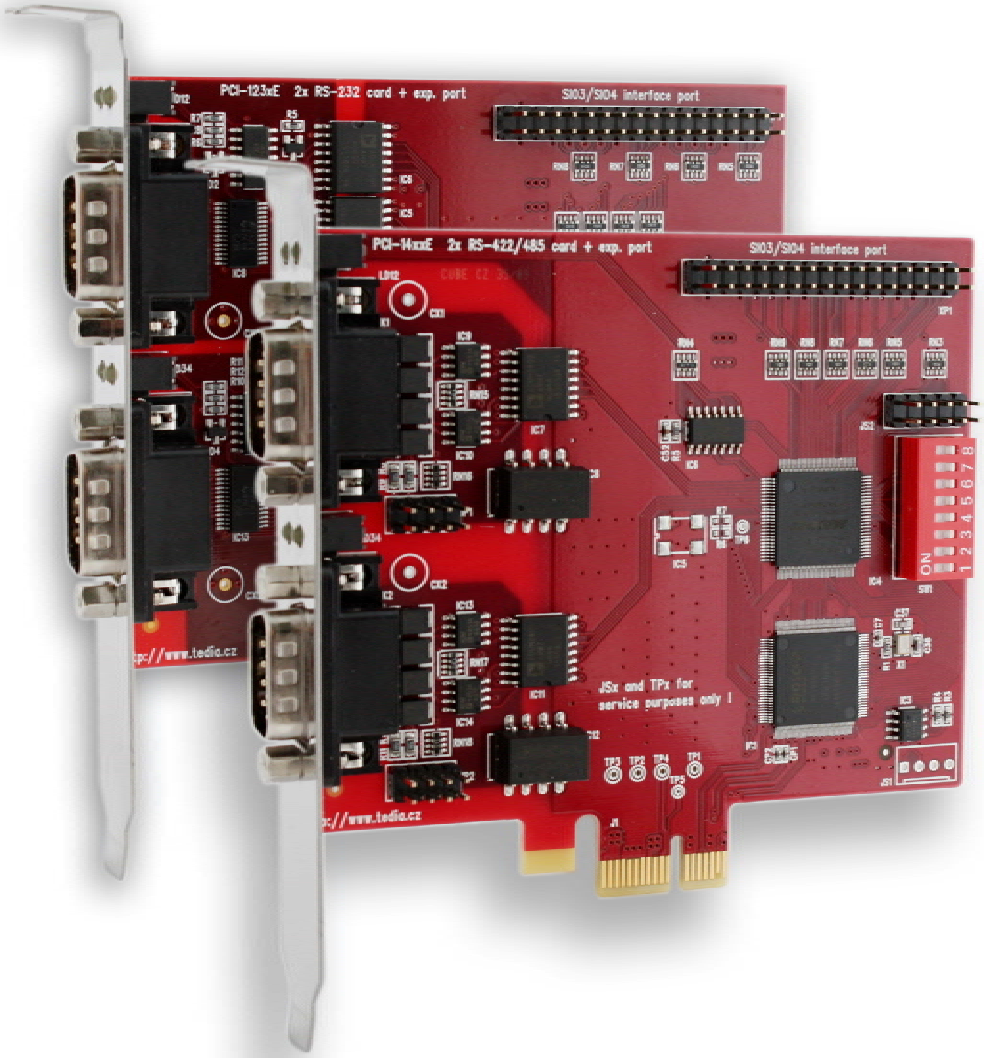


PCI Express Communication Cards User Guide

My Communication Card Details:

type of card: . . . . . (e.g. PCI-1482E)

serial number: . . . . . (e.g. 8100016B0)

purchase date: . . . . . .

card owner: . . . . . .

Manufacturing, sales office, service center, technical support and headquarters:

address: TEDIA® spol. s r. o.
Zábělská 12
31211 Plzeň
Czech Republic

phone: +420 373730431 (sales office)
+420 373730436 (technical support)

fax: +420 373730430

e-mail: sales@tedia.eu
support@tedia.eu

internet: http://www.tedia.eu

Table of Contents

CE Declaration of Conformity

Issued in terms of Directive 2004/108/EC of the European parliament and of the Council.

We, TEDIA® spol. s r. o., declare under our sole responsibility that the following products

PCI-1200E series (i.e. PCI-1232E and PCI-1234E),
and
PCI-1400E series (i.e. PCI-1414E, PCI-1434E, PCI-1482E and PCI-1484E),

when installed in accordance with the manufacturers specifications, are in conformity with the following standards

EN 55022, EN 61000-3-2, EN 61000-3-3,
EN 55024, EN 61000-4-2, EN 61000-4-3, EN 61000-4-4,
EN 61000-4-5, EN 61000-4-6, EN 61000-4-8, EN 61000-4-11

and with directive 2004/108/EC including amendments.

Products are marked with the "CE" logo.

CE

Test Certificate:	202199-01 issued by EZÚ Praha
Date of Issue CE Declaration:	21.5.2009
Manufacturer:	TEDIA® spol. s r. o. Zábělská 12 31211 Plzeň Czech Republic
Manufacturer's Representative:	Ing. Martin Linda, Managing Director
Signature of the Representative:	

1. Introduction

1.1. Description

The PCI bus communication series cards are products of a modern design intended especially for industrial automation systems. These cards provide optionally 2 or 4 communication ports of serial line standards RS-232, RS-422 or RS-485.

Due to their conception, these communication cards are intended especially for:

- Distributed process control applications
- Industrial automation
- Multipoint data acquisition
- POS (Point-of-Sale) Systems
- Remote serial device control
- Communication with measuring systems

1.2. Available Versions

card type (connectors)	RS-232 non-isolated	RS-232 isolated	RS-422/485 non-isolated	RS-422/485 isolated	for details see page
Supported signals ==>	all	all	TXD, RXD	TXD, RXD	
PCI-1232E (2x D-Sub 9)	*	2	*	*	II - 1
PCI-1234E (4x D-Sub 9)	*	4	*	*	II - 1
PCI-1414E (4x D-Sub 9)	*	1	*	3	II - 2
PCI-1434E (4x D-Sub 9)	*	2	*	2	II - 2
PCI-1482E (2x D-Sub 9)	*	*	*	2	II - 2
PCI-1484E (4x D-Sub 9)	*	*	*	4	II - 2

Note: At the time of issuing this manual, no cards providing non-isolated ports or specific connectors (such as RJ45) had been in production.

1.3. General Instructions for Use

The cards are suitable for installation in either office or industrial computers that are fitted with the PCI Express bus slot (with x1 to x16 link width).

For the recommended cable specifications and maximal length see Chapter 3.7.

Caution:

The cards are designed for data transmission and may be used only according to the manufacturer's recommendations and precautions given in this manual and other general standards and terms and may be used only such a way, that its failure caused by any reason will not be dangerous to any person or property.

2. Specifications

2.1. Common Features

Number of ports:	2 or 4	
Supported interfaces:	RS-232, RS-422, RS-485	
Supported signals RS-232:	TXD, RXD, RTS, CTS, DTR, DSR, DCD, RI	
Supported signals RS-422:	TXD+ (B), TXD- (A), RXD+ (B), RXD- (A)	
Supported signals RS-485:	TXD/RXD+ (B), TXD/RXD- (A)	
Communication controller:	MCS9901CV	
Oscillator:	1.8432 MHz	(controller standard speed)
	96 MHz max.	(controller optional speed)
	12 MHz	(card crystal oscillator)
UART type:	MosChip enhanced	
Backward compatibility:	16C450, 16C550, 16C650, 16C750, 16C850	
Data bits:	5, 6, 7, 8	
Parity:	odd, even, space, mark, none	
Stop bits:	1, 1.5, 2	
FIFO (TXD + RXD):	128 + 128 characters	

2.2. RS-232 Isolated Interface

Transceiver type:	MAX3243E (Texas Instruments or equivalent)	
Transfer rate:	460.8 kBd max.	
Compatibility:	ANSI/TIA/EIA-232-F	
Isolation voltage:	1000 V_{DC}	(default)
	600 V_{DC}	(with ESD-X2 or ESD-X4 option)
ESD protection:	15 kV	(IEC1000-4-2, air-gap)
Isolation protection (ESD-X2/X4):	surge arrester	(CG5-600L, 5 kA max. @ 1 kV/µs)

2.3. RS-422/485 Isolated Interface

Transceiver type:	ADM4853 (Analog Devices or equivalent)	
Transfer rate:	921.6 kBd max.	
RS-485 Flow control:	ADFC, DTR	
Compatibility:	ANSI/TIA/EIA-422-B, or TIA/EIA-485-A	
Input impedance:	96 kOhm min.	(1/8 of nominal load)
Termination impedance:	120 Ohm / 0.7 V typ.	
Isolation voltage:	1000 V_{DC}	(default)
	600 V_{DC}	(with ESD-X2 or ESD-X4 option)
ESD surge protection:	TVS diode 5.8 V	(600 W/1 ms, 300 A @ 8/20 µs)
Isolation protection (ESD-X2/X4):	surge arrester	(CG5-600L, 5 kA max. @ 1 kV/µs)

Caution: The isolation protection (ESD-X2 or ESD-X4) is an optional feature, which has to be ordered together with the card. It cannot be additionally added by the user.

2.4. RS-232 Non-isolated Interface

No cards with non-isolated interface are available at the time of issuing of this manual.

2.5. RS-422/485 Non-isolated Interface

No cards with non-isolated interface are available at the time of issuing of this manual.

2.6. Other Data

Bus type: (see note below)	PCI Express, single-lane	
I/O and MEM addresses:	assigned by PCI BIOS	
IRQ channel:	assigned by PCI BIOS	
Power consumption:	(see note below)	
PCI-1232E:	250 mA @ 3.3V typ.	(350 mA max.)
	80 mA @ 12V typ.	(150 mA max.)
PCI-1234E:	300 mA @ 3.3V typ.	(400 mA max.)
	160 mA @ 12V typ.	(300 mA max.)
PCI-1414E:	350 mA @ 3.3V typ.	(500 mA max.)
	200 mA @ 12V typ.	(350 mA max.)
PCI-1434E:	350 mA @ 3.3V typ.	(500 mA max.)
	180 mA @ 12V typ.	(330 mA max.)
PCI-1482E:	300 mA @ 3.3V typ.	(450 mA max.)
	100 mA @ 12V typ.	(180 mA max.)
PCI-1484E:	350 mA @ 3.3V typ.	(500 mA max.)
	200 mA @ 12V typ.	(360 mA max.)
Physical dimensions:	approx. 85 x 105 mm	(PCIe cards)
	approx. 90 x 60 mm	(extension PCI-102xE)
Port connectors:	D-Sub 9 - male	
Pin Assignment:	EIA/TIA-574	(RS-232)
	specific	(RS-422, RS-485)
Operating temperature:	0° ~ 65° C	
Storage temperature:	-20° ~ 80° C	
Relative humidity:	10% ~ 90%, non-condensing	
Recommended cable length:	15 m max.	(RS-232)
	1200 m max.	(RS-422, RS-485)

Note: Single-lane PCI Express cards are often designated as PCIe x1.
The single-lane PCI Express cards may be installed in any PCI Express bus slots (i.e. x1, x4, x8 or x16 slots).

3. Installation

3.1. Introduction

Attention has been focused on achieving a high quality and reliability during the manufacturing process and attention was also paid to an inspection of the card before being shipped to you. Detailed reading of this guide and following the instructions precisely are highly recommended for achieving full quality and to prevent any damage during installation. For further information see manufacturer's website http://www.tedia.eu.

3.2. Line Mode Selection

The communication cards support standard interfaces RS-232, RS-422 (four-wire duplex line) and RS-485 (two-wire half-duplex line).

The RS-232 cards do not require any hardware configuration.

When using RS-422/485, it is possible to choose the following modes:

- RS-422 with output transceiver permanently activated
- RS-422 with transceiver driven by DTR, or driven automatically (also called RS-422 multimaster mode or four-wire RS-485)
- RS-485 with transceiver driven by DTR, or driven automatically and the data receiving is blocked during sending data
- RS-485 echo with transceiver driven by DTR, or driven automatically and the own data sent are echoed.

Note: When using the supplied Windows drivers, the mode is fully software selectable. See chapter 4.3 for more information.
When using the operating system not supporting the software mode selection, see Appendix II of this manual to configure the DIP switch at the card.

3.3. Oscillator Selection

When using the supplied Windows drivers, the oscillator frequency of every COM port is user selectable. See Chapter 4 for more information.

Note: When using different operating systems, the oscillator frequency sellection may be realised differentlym or may be not available.

3.4. Card Installation

Important Warning:
While installing the card, please follow instructions below and the requirements for handling the circuits sensitive to electrostatic discharge (ESD). Touch the card carefully only by the edges, and do not touch the components or metal contacts on the card.
The card may be stored only in ESD protection bag, when not installed in the computer.
Failure to comply with the rules listed above may lead to damage of the sensitive circuits of the card, or even of the whole computer.
The PC must be turned off and the power supply cord disconnected during the installation!
In the event of any queries, please contact the manufacturer's technical support.

Step-by-step installation instructions:

Note: Before installing the card into the computer, we to recommend note down the card serial number for the event of contacting technical support (see figures in the Appendix II) . You can note the number in the table at the beginning of this manual.

1) Power off the PC and all peripheral devices.
2) Disconnect the power supply cord and other lead-in cables connected to the peripheral devices; only devices without power supply can stay connected.
3) Remove the PC´s cover and slot cover bracket if there is one.
4) Check Appendix II and configure PCIe card DIP switches as necessary.
5) Insert the card firmly into a free PCIe slot (x1 - x16) and secure it in place by a screw.
6) In the case of a four-port COM card, fasten the expansion card into next position and connect the ribbon cable to the COM card.
7) Replace the PC´s cover and connect all cables and power supply cord.

3.5. Location of Connectors, LEDs and Switches

The location of switches, jumpers and LEDs and connectors may be found in the Appendix II of this manual; each of these elements is explained in the information listed above.

3.6. Connector Pin Assignment

The connector pin assignments are shown in Table 3. and Table 4., and the RS-422/485 interface circuits are shown in Figure 4. and Figure 5. in Appendix II of this manual.

3.7. Topology & Cable Recommendations

The RS-232 line uses a shielded cable, without any termination resistors.

The RS-422/485 communication line is realized by a cable conforming the EIA-RS-485 standard (i.e. shielded pair, conductor cross-section at least 0.22 mm^2, impedance 100÷130 Ohm, line capacitance approx. 60 pF/m). Recommended type is Belden 9841.

The recommended arrangement for RS-422 and RS-485 is a connected series of point-to-point (multidropped) nodes, a line or bus (stubs up to 1 m), up to 1200 m length (for transmittion rates up to 1 MBd). See Figure 6. and Figure 7.

Ideally, the two ends of the cable will have a termination resistor connected across the two wires. Typical value is 120 Ohms for twisted pairs. At least one of the terminators should have active topology (the so-called terminator with failsafe bias resistors), when using RS-485 or RS-422 multimaster (four-wire RS-485).

The maximal number of the devices at one RS-485 communication line is 32. If you need to use more devices than 32, the repeaters can be used to divide the network into several segments - see Figure 8. Each segment should meet the requirements listed above. The repeater is considered as one of the 32 devices. Although the number of the repeaters in a row is not limited, more than three are not generally recommended.

Note: The TEDIA® product line provides a complex series of isolated converters, and repeaters for the RS-232, RS-422 and RS-485 lines.

4. Windows drivers

4.1. Introduction

At the date of issuing of this manual the following operating systems have been supported: Windows 7, Windows Vista, Windows XP and Windows 2000 (both 32-bit and 64-bit versions, including the corresponding Windows Server installations).

Actual drivers can be downloaded at http://www.tedia.eu.

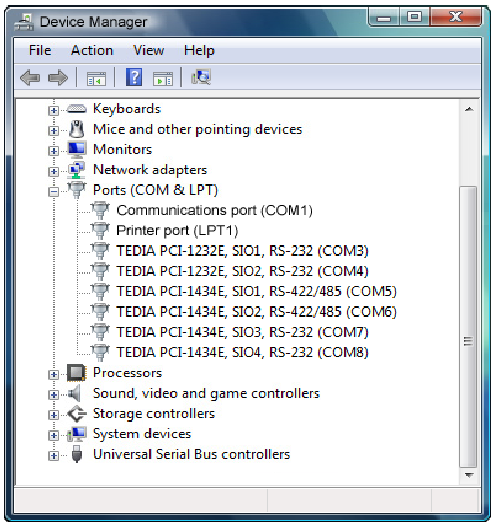
You can find the detailed installation instructions in the folder within the driver.

4.2. Installing and Uninstalling the Driver

Driver Installation

The driver my be either pre-installed prior to installing the card into the PC or installed after detecting new hardware. Please be sure you have the administrator rights to access the system folders before installing.

You can find the detailed installation instructions in the folder within the driver.



Checking Driver Installation

After sucessfull installation, verify the card is present in the Device Manager list under the Windows Control Panel. See figure at this page; it reflects the correct state after installing the PCI-1232E and PCI-1434E cards.

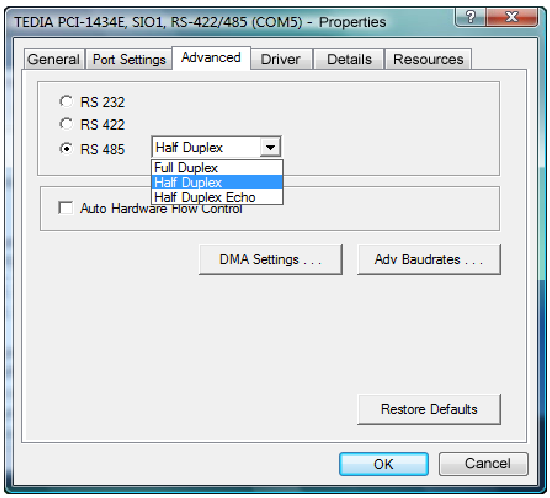
Card Uninstalling, Driver Uninstalling

Removing the corresponding COM ports in the Device Manager and removing the card from the PC will release the COM ports, but the driver will remain installed.

The complete driver uninstallation may be proceeded in the Control Panel -> Add or Remove Programs –> TEDIA PCI Express Controller Driver.

4.3. Advanced Driver Configuration

To access the advanced settings, choose the corresponding port in the Device Manager and open the Properties by double-click or from the menu after right-click on the COM port. The desired settings may be foune at the Advanced tab.



RS-232 this option is intended for standard RS-232 interface; all signals are controlled from the software. If the Auto Hardware Flow Control is on, the data flow is controlled automatically throught the RTS/CTS signals

RS-422	RS-422 with output transceiver permanently activated; DTR and RTS are driven automatically (it is possible to use external RS-232 converters to connect RS-232 devices; contact technical support for more information)
RS-485 FD	(Full Duplex) with transceiver driven by DTR (also called RS-422 multimaster mode or four-wire RS-485)
RS-485 HD	(Half Duplex) is the standard RS-485 option; DTR and RTS signals are used for transceiver control; the data are not received when sending data
RS-485 HDE	(Half Duplex Echo) is the RS-485 mode with transceiver driven by DTR, or driven automatically and the own data sent are echoed.

Note: *The RS-232 ports are set to RS-232 mode after instalatiion by default. The RS-422/485 ports are set to RS-485 HD, after clicking to Restore Defaults, the RS-232 mode is set.*

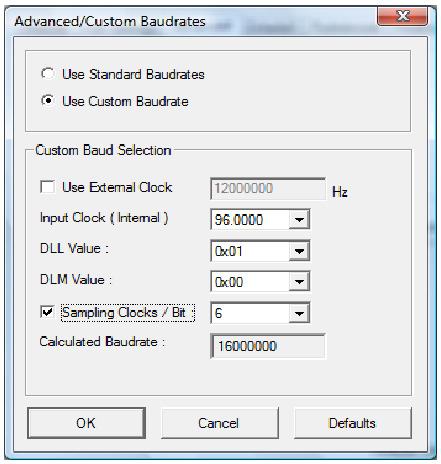
4.4. Advanced Baurates Settings

The user can set the non-standard baudrates by clicking to Adv Baudrates at the Advanced tab, see figure in the previous page.

The default option is "Use Standard Baudrates" which supports common rates from 50 Bd to 921.6 kBd.

When selecting "Use Custom Baudrate" the user may choose various Input Clock (Internal) values. Using the dividers and Sampling Clocks/Bit option, it is possible to set desired baudrate. The selected baudrate is used regarding to the application settings (the driver accepts any baudrate from the application, but the COM port uses the value Calculated Baudrate).

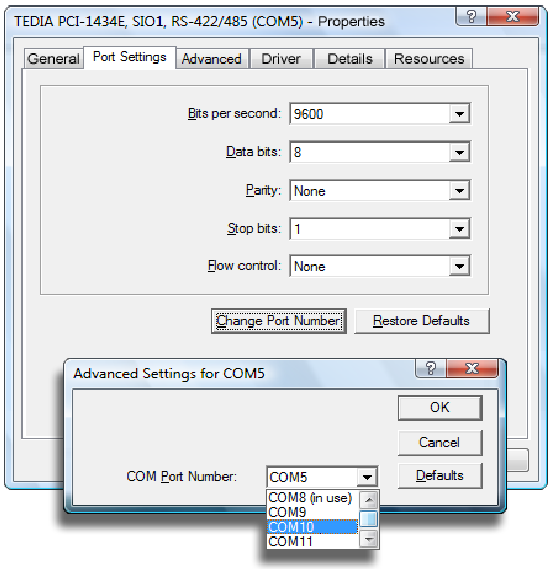
Alternativelly it is possible to choose Use External Clock, i.e. external 12MHz crystall oscillator.



4.5. Changing COM Port Number

The driver allows the user to remap the COM ports, i.e. to change the assigned port number to any other free number,

The feature can be found at the Port Settings tab, "Change Port Number" (see figure on right); after selecting this option, there is the dropdown list of the free COM ports.



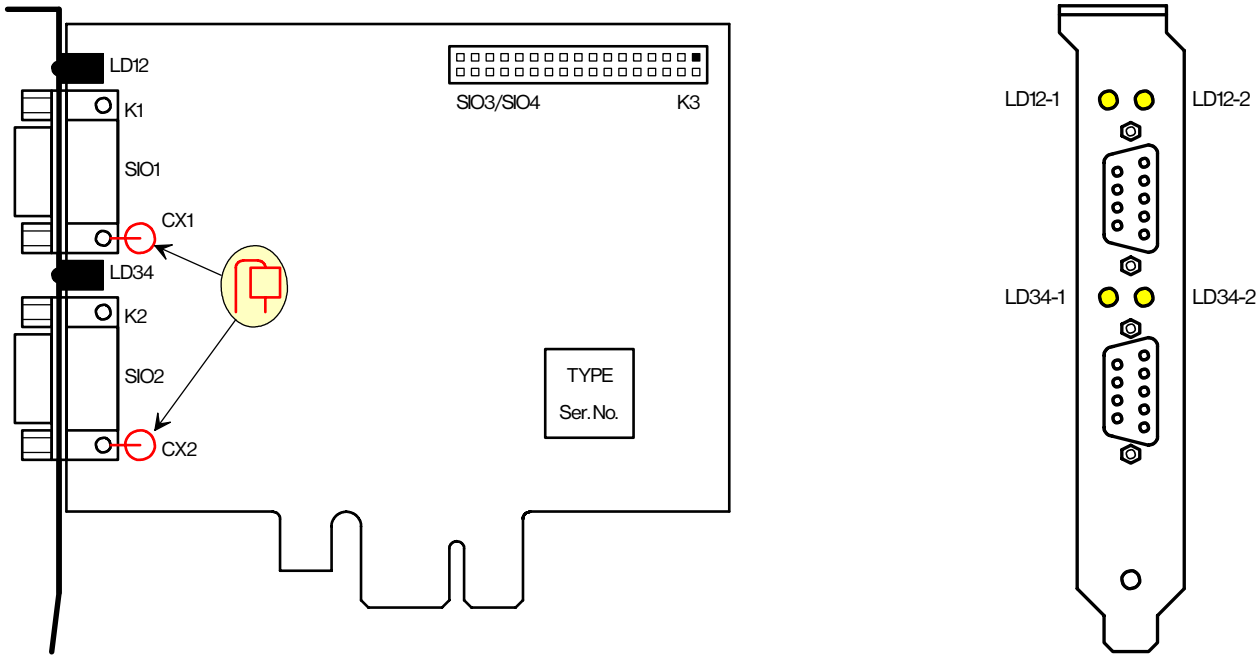


Figure 1. Important Components at PCI-1232E and PCI-1234E.

Notes: *The type and serial number label is located at the MCS9901CV controller, see figure above.*

The PCI-1234E set includes the PCIe card itself and the PCI-1023E extension (see description in page II-3) that provides COM3 and COM4.

K1, K2	SIO1 and SIO2 communication ports (isolated RS-232)
K3	SIO3 a SIO4 communication port connector (only for PCI-1234E)
LD12-1	SIO1 port activity LED indicator (RXD)
LD12-2	SIO1 port activity LED indicator (TXD)
LD34-1	SIO2 port activity LED indicator (RXD)
LD34-2	SIO2 port activity LED indicator (TXD)
CX1, CX2	Surge arrester (only at cards using the ESD-X2 or ESD-X4 optional extension)

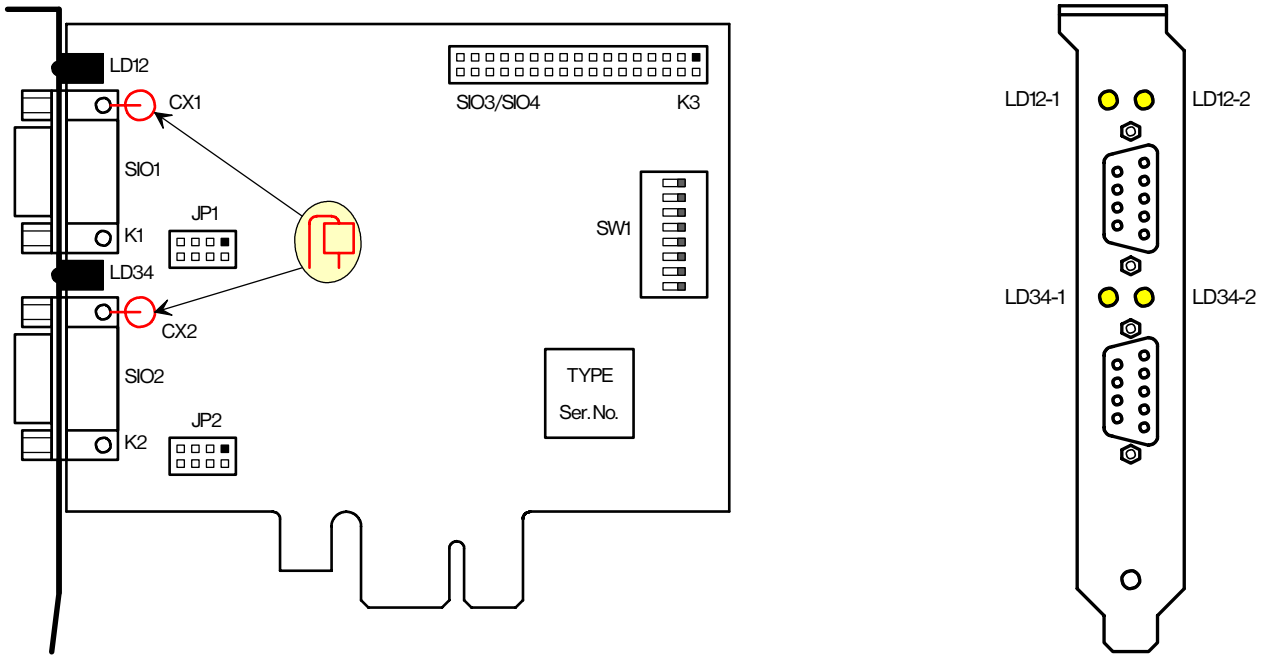


Figure 2. Important Components at PCI-1414E, PCI-1434E, PCI-1482E and PCI-1484E.

Notes: *The type and serial number label is located at the MCS9901CV controller, see figure above.*

The PCI-14x4E set includes the PCIe card itself and the extension (see description in page II-3) that provides COM3 and COM4.

K1, K2 SIO1 ans SIO2 communication ports (RS-422/485 isolated)
K3 SIO3 a SIO4 communication port connector (only for PCI-1414E, PCI-1434E and PCI-1484E)
LDxx-x see previous page
CX1, CX2 Surge arrester (only at cards using the ESD-X2 or ESD-X4 optional extension)
JP1, JP2 Termination impedances activation jumper (see Figure 4.)
SW1 Configuration DIP switch (see Table 1.)

SW1		
segment 1	**segment 2**	**SIO1 configuration**
segment 3	**segment 4**	**SIO2 configuration**
segment 5	**segment 6**	**SIO3 configuration**
segment 7	**segment 8**	**SIO4 configuration**
ON	ON	reserved
ON	OFF	reserved
OFF	ON	reserved
OFF	OFF	interface type set by softwarove

Table 1. SW1 switch configuration.

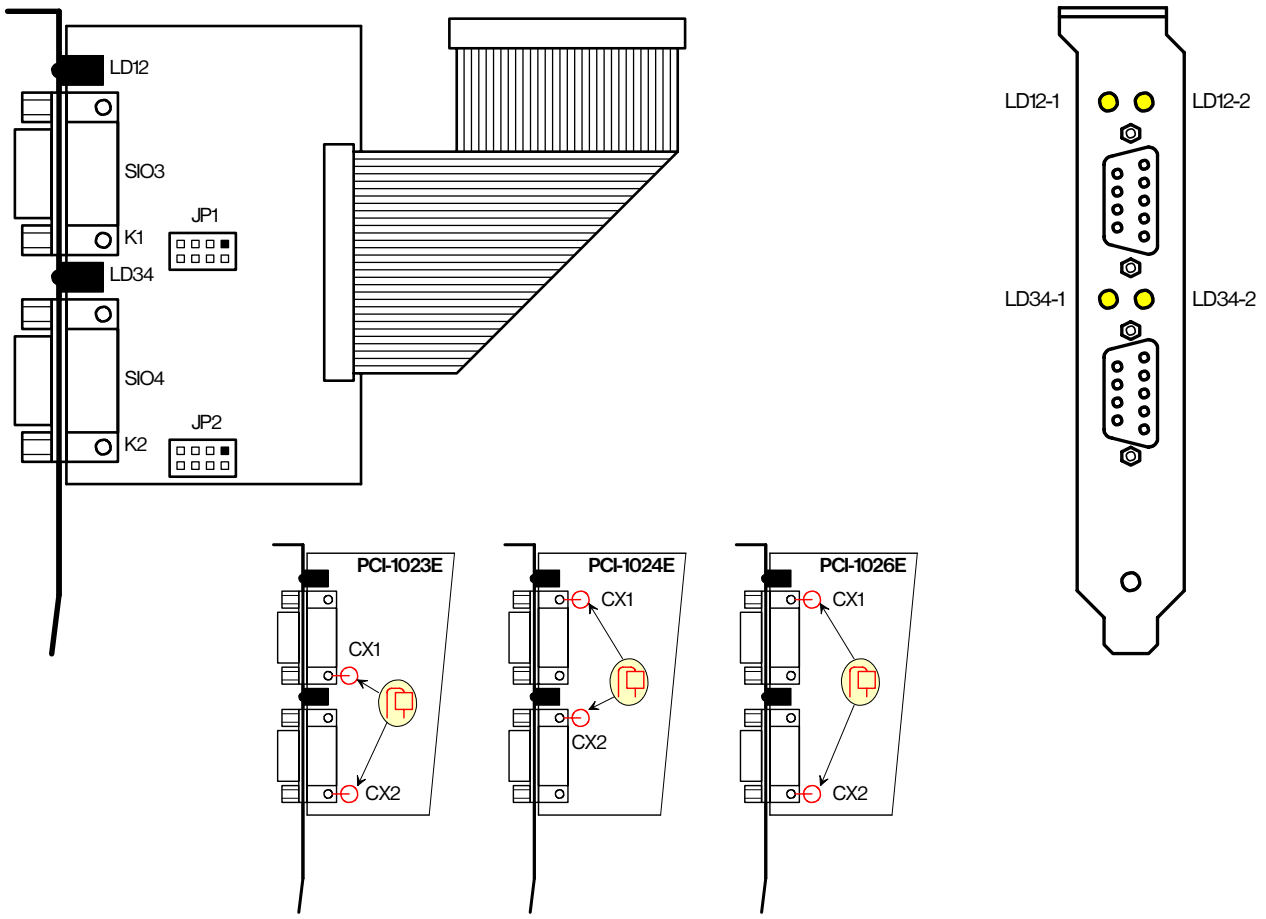


Figure 3. Important Components at PCI-1023E, PCI-1024E a PCI-1026E.

Note: *The PCI-102xE extensions are included at the four-port sets PCI-1234E, PCI-1414E, PCI-1434E a PCI-1484E, see table below.*

The extension type label is located in the top left corner of the card.

K1, K2 SIO3 and SIO4 communication ports (see Table 2.)
LD12-1 SIO3 port activity LED indicator (RXD)
LD12-2 SIO3 port activity LED indicator (TXD)
LD34-1 SIO4 port activity LED indicator (RXD)
LD34-2 SIO4 port activity LED indicator (TXD)
CX1, CX2 Surge arrester (only at cards using the ESD-X2 or ESD-X4 optional extension)
JP1, JP2 Termination impedances activation jumper (see Figure 4.)
(JP1 only at PCI-1024E and PCI-1026E, JP2 only at PCI-1024E)

extension	set product name	SIO3	SIO4
PCI-1023E	PCI-1234E, PCI-1434E	isolated RS-232	isolated RS-232
PCI-1024E	PCI-1484E	isolated RS-422/485	isolated RS-422/485
PCI-1026E	PCI-1414E	isolated RS-422/485	isolated RS-232

Table 2. PCI-102xE extension overview.

RS-232 signals	D-Sub 9
DCD	1
RXD	2
TXD	3
DTR	4
GND (common ground)	5
DSR	6
RTS	7
CTS	8
RI	9

Table 3. RS-232 Connector Pinout.

RS-422 signals	RS-485 signals	D-Sub 9
GND (common ground)		1
RXD+ termination impedance		2
RXD- termination impedance		3
TXD+, or TXD/RXD+ termination impedance		4
TXD-, or TXD/RXD- termination impedance		5
RXD+ (B)	- - -	6
RXD- (A)	- - -	7
TXD+ (B)	TXD/RXD+ (B)	8
TXD- (A)	TXD/RXD- (A)	9

Table 4. RS-422/485 Connector Pinout.

Note: *The circuit schematics including the termination resistors topology is shown in Figure 4.*
The user may activate the termination impedances by connecting the corresponding pins at the D-Sub 9 connector (identical to all TEDIA PCI and ISA communication cards) or by setting the appropriate jumper; see Figure 5.

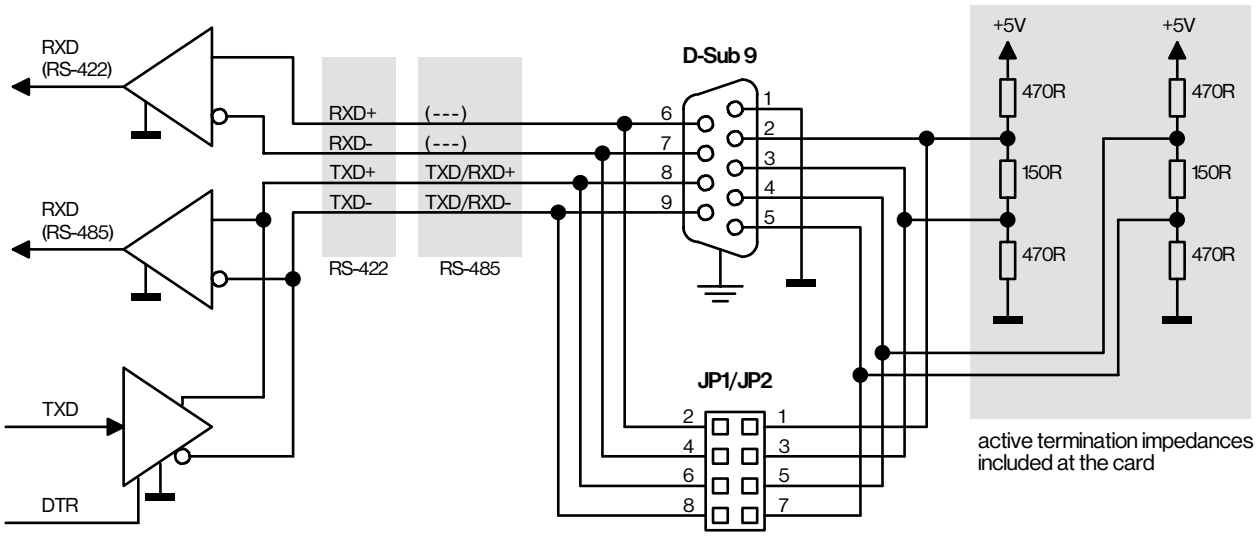


Figure 4. Internal circuit schematics of the RS-422/485 interface using the D-Sub 9 connector.

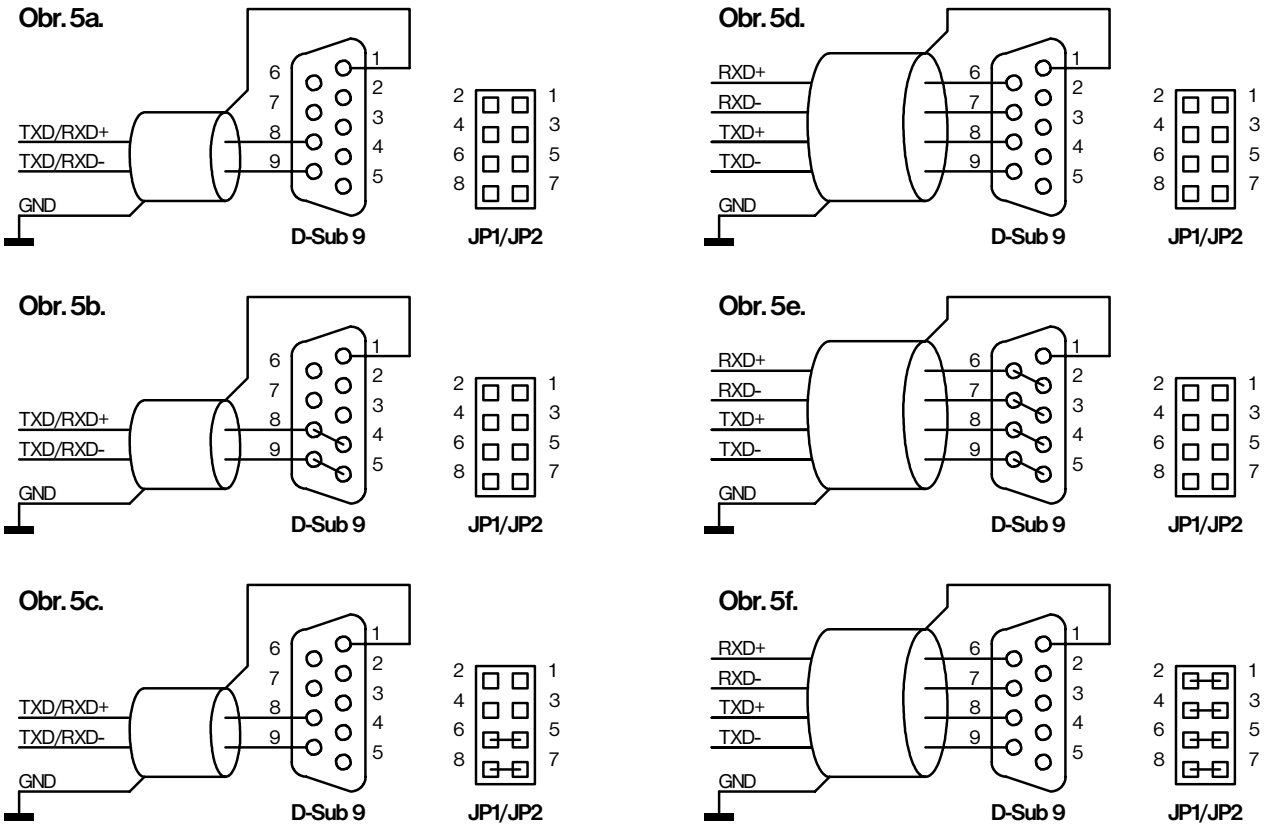


Figure 5. Schematics of the leading cables connection at RS-485 (a-c) and RS-422 (d-e).
The above figures show the schematics for RS-485 (Figure 5a.),
RS-485 with termination impedances activated by connecting the D-Sub 9 pins (Figure 5b.),
RS-485 with termination impedances activated by jumpers (Figure 5c.), RS-422 (Figure 5d.),
RS-422 with termination impedances activated by connecting the D-Sub 9 pins (Figure 5e.) and
RS-422 with termination impedances activated by jumpers (Figure 5f.).

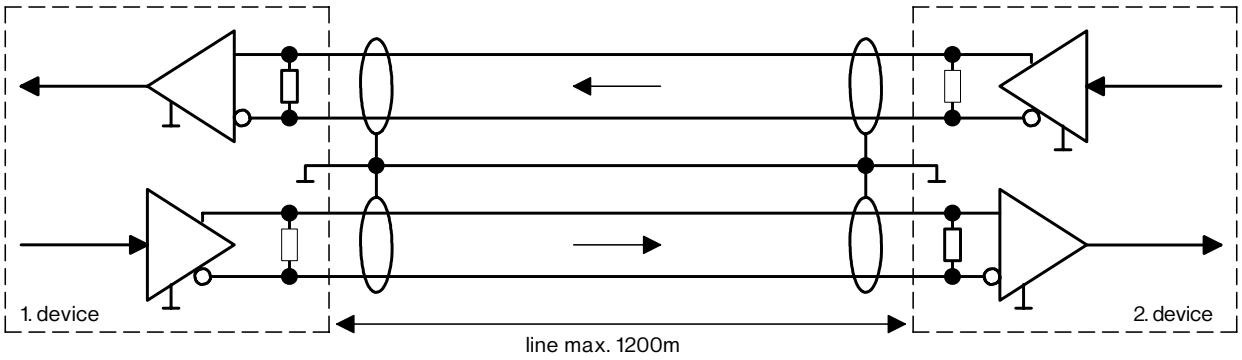


Figure 6. Schematics of RS-422 Line with the Point-To-Point Topology.

Note: The line utilizes two shielded pairs (see Chapter 3.7.). The termination resistors on the driver side are not necessary when using the standard mode. When using the multimaster mode, the requirements are analogical to the RS-485 line.

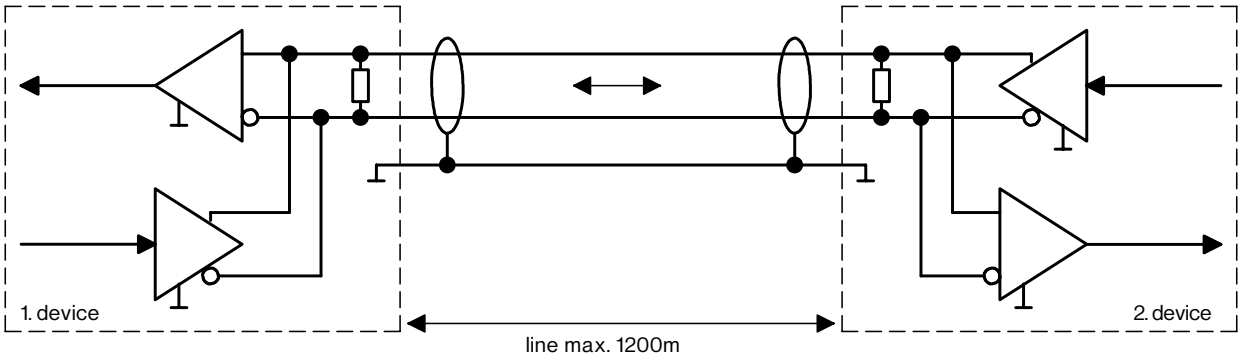


Figure 7. Schematics of Typical RS-485 Line with the Point-To-Point Topology.

Note: The line utilizes one shielded pair (see Chapter 3.7.). The termination resistors are shown as passive here, but at least one of them should have active topology (see Figure 4.).

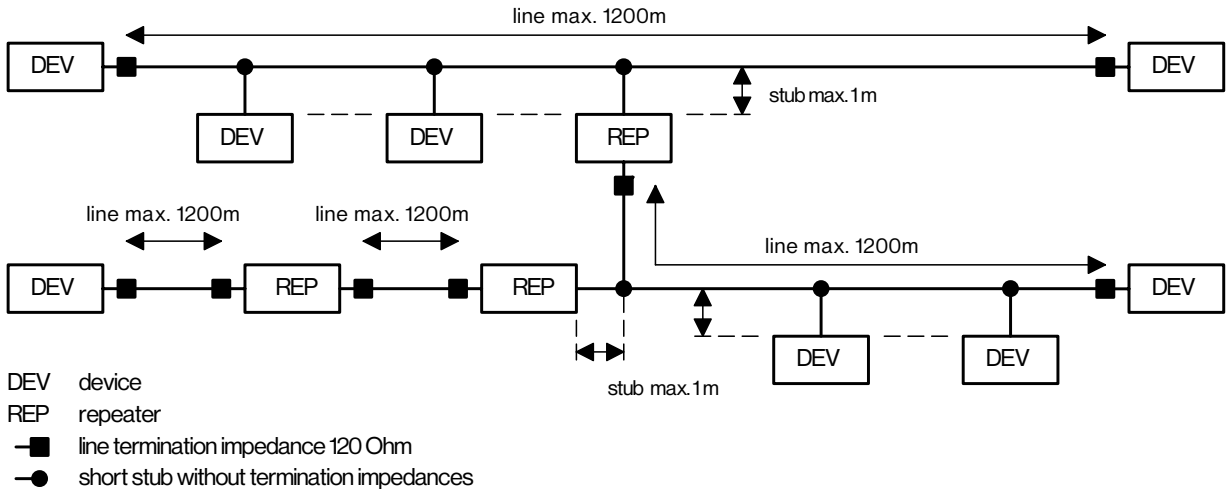
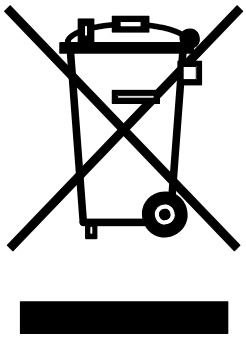


Figure 8. Schematics of RS-485 Network with the Segment Topology.



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