
Hardware Manual

SP-ICE-1 PCI PRO Control Card



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1 BASIC INFORMATION

The SP-ICE-1 PCI PRO control card is either to use as PC-version or as stand-alone version. It is equipped with the RAYLASE advanced scanning.

The control card comprises a complete processor system for scan head and laser control in real time. Marking vectors are transferred from the PC to the control card, which stores these vectors and controls the scan head accordingly, as soon as the processing is enabled. This allows control of the laser and the scan head in real time, even if the host PC is not a real time system, needed for other purposes or if the control card is working in a stand-alone configuration.

There is a laser modulation signal (LM) among other signals available on the control card to control YAG or CO₂ lasers. Optional ports allow adapting the control card to the customer's requirements.

Hardware Features

- On-board real-time processor for precise synchronisation of scanning movement and laser control.
- PCI bus based with Plug-and-Play.
- Stand-alone version for usage outside of a PC with RS 232 interface (up to 115 kBaud) for external download.
- Programmable laser control signals for commonly used lasers (i.e. Nd:YAG, CO₂, ...).
- Interface to XY or XYZ scan heads using XY2-100- and XY2-100-Enhanced-Standard.
- Selectable polarity of laser signals.
- Separate control of standby pulse frequency and pulse width.
- Two analog on-board ports for control of lamp current or pulse intensity (0V to 10V, 8 Bit resolution).
- 3 buffered digital outputs, 12 buffered digital inputs.
- Optional additional I/O capabilities.
- On the card integrated encoder interface for editing moving objects (MOTF Marking-On-The-Fly)

Options

- Using the add-on card for editing moving objects (MOTF Marking-On-The-Fly) furthermore possible.
- For highest throughput up to 4 scan heads can be combined with one laser using the master-slave option.
- Master-master operation allows minimum process time combined with maximum flexibility up to 4 lasers and scan heads can be controlled independently.
- Stand-alone option is available for driving the scan head and the laser without using a PC.

Software Features

- DLL driver software for Windows® Vista/Win 7.
- Double buffer concept with 1,000,000+ commands per list.
- Simultaneous processing of current list and downloading of new commands to next list.
- Scalable output of new data with 1µs resolution.
- Shortest possible output interval 20µs (variable in 1µs steps).

Conventions

- A "/" in front of a signal name indicates that this signal is low active

1.1 Delivery Scope

- SP-ICE-1 PCI PRO control card
- Installation CD

1.2 Warranty

The rights of the customer in respect of any defects in quality or deficiencies in title are governed by the general conditions of business of RAYLASE AG. These conditions are available for review on our website.

Before returning the product, please request an authorization number from RAYLASE. Pack the product in the original packaging or in packaging that provides equivalent protection for shipping.

RAYLASE shall not be obliged to repair defects under the following circumstances:

- If persons not authorized by RAYLASE have attempted to repair the product.
- If persons not authorized by RAYLASE have modified the product.
- If the product has been used improperly.
- If the product has been connected to incompatible devices.
- If the warranty period has expired.

Note: No implicit guarantee or warranty of suitability for specific purposes has been made. RAYLASE is not responsible for damages arising from use of the product. Individual assemblies or other assemblies manufactured by RAYLASE may be subject to separate warranty conditions. Refer to the corresponding manuals for further information.

1.3 Laser Safety

Customers assume all responsibility for maintaining a laser-safe working environment. OEM customers must assume all responsibility for CDRH (Center for Devices and Radiological Health) certification.

CAUTION:

Switch on the PC or the stand-alone SP-ICE-1 PCI PRO control card first, before switching on the laser system. In this way you can avoid an uncontrolled action of the laser when switching on the SP-ICE-1 PCI PRO control card.

Check your application carefully before using the laser system. Faulty software can lock up the complete system with no control over the laser or the scan head.

1.4 Manufacturer

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Fax: +49 (0) 81 53 - 88 98 - 10
<http://www.raylase.de>
E-mail: info@raylase.de

1.5 Customer Support

The RAYLASE customer service is available for your problems either in respect to the subsystem or this manual. Before calling the customer service, please make sure you have referred to any appropriate sections in the manuals on the supplied CD, that may answer your question.

If you need further assistance call RAYLASE customer service, Monday through Friday between 8 A.M. and 5 P.M. (Central European Time).

Germany (Wessling)
+49 (0) 81 53 - 88 98 – 0
E-Mail: support@raylase.de

... ask for the customer service

2 TECHNICAL DATA

2.1 Dimensions and Weight

Dimensions: W = 106mm, L = 188mm

Weight: 155g (with on-board processor)
137g (without on-board processor)

2.2 Environmental Conditions

Ambient temperature: +15°C to +35°C

Storage temperature: 0°C to +80°C

Humidity rel.: ≤80% non-condensing

2.3 Minimal System Requirements

Processor: Intel Pentium or compatible

Operating systems: Windows® XP/ Windows® Vista/ Windows® 7

RAM: 1GB recommended

Graphic card: VGA (16Bit)

Extension slot: One to four PCI slots, according to the configuration

Free hard disc memory: Minimum 30MB

2.4 Overview

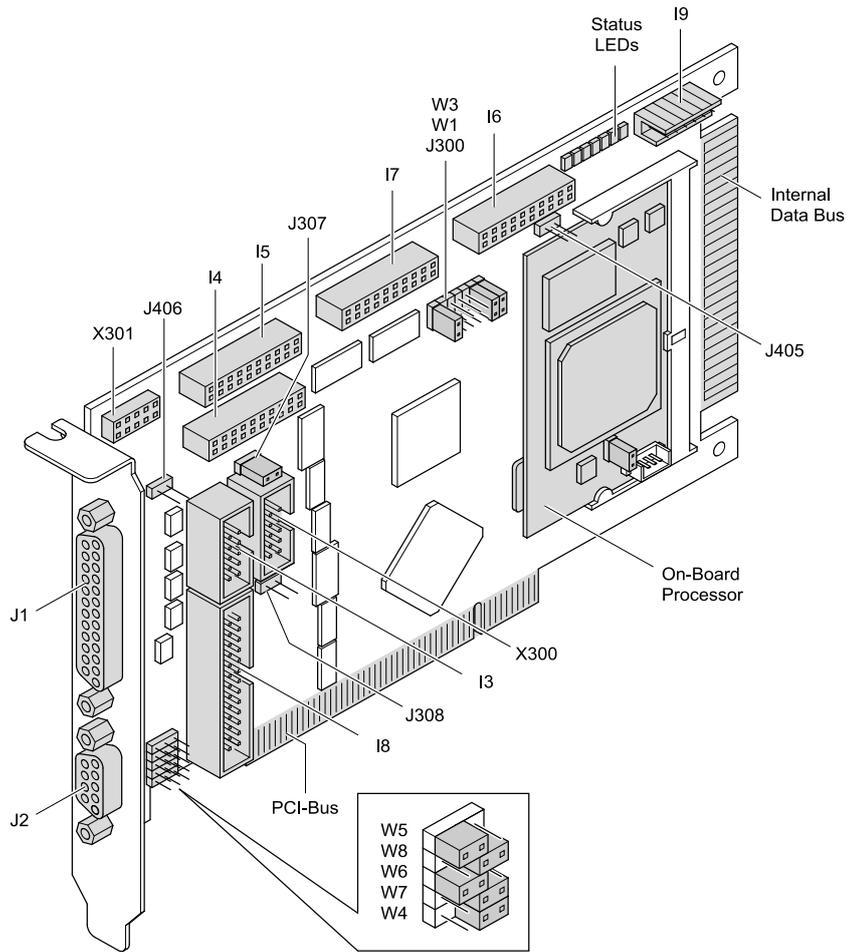


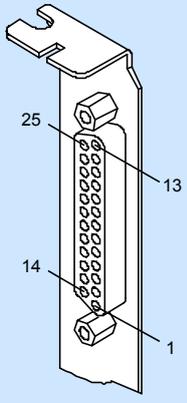
Abb. 1
Control Card,
overview

ID	Assignment	Details	ID	Assignment	Details
I9	Voltage Supply	page 15	J307	MOTF intern +5V	---
X300	MOTF Interface	page 14	J308	Reset	---
X301	Internal use	---	W1	Master/Slave	page 16
I4	Port A, TTL Input	---	W3	Address range	page 11
I3	RS-232 Serial Interface	page 12	W4	LM or /LM	
I8	Laser Control Interface	page 13	W5	FPS or /FPS	
I5	Port B, TTL Output	---	W6	LM_Gate or /LM_Gate	
J2	Port C, Laser / I/O Interf.	page 11	W7	5V or GND	
I6	Port D, TTL Output	---	W8	/MIP or GND	---
J1	Scan Head Interface	page 10	J405	GND	
I7	Port E, TTL Input	---	J406		
J300	Activate MOTF	page 16	LEDs	Status_LEDs	page 15

LM = laser modulation, FPS = first pulse suppression, MIP = mark in progress

2.4.1 Scan Head Interface

At the 25-pin D-SUB connector a RAYLASE XY(Z) scan head can be connected. All signals are in accordance with the RAYLASE XY2-100 standard interface.

J1	PIN	Signal	PIN	Signal
 <p>25 PIN D-SUB</p>	1	Diff.Output- SENDCLOCK	14	Diff.Output+ SENDCLOCK
	2	Diff.Output- SYNC	15	Diff.Output+ SYNC
	3	Diff.Output- X-CHANNEL	16	Diff.Output+ X-CHANNEL
	4	Diff.Output- Y-CHANNEL	17	Diff.Output+ Y-CHANNEL
	5	Diff.Output- Z-CHANNEL	18	Diff.Output+ Z-CHANNEL
	6	Diff.Input- Y-Status	19	Diff.Input+ Y-Status
	7	Diff.Input- Z-Status	20	Diff.Input+ Z-Status
	8	Diff.Input- X-Status	21	Diff.Input+ X-Status
	9	nc	22	nc
	10	nc	23	GND
	11	GND	24	GND
	12	nc	25	nc
	13	nc	---	---

nc = not connected

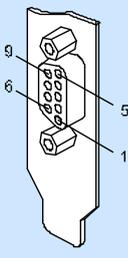
Specifications

Diff.Input-, Diff.Input+	
Input Voltage	-4 to +8V
Input Threshold	max. 200mV
Diff. Input Voltage	max. 5V
Hysteresis	typ. 70mV

Diff.Output-, Diff.Output+		
Output low	max. 0.5V	max. 40mA
Output high	min. 2.0V	max. 40mA

2.4.2 Port C, Laser / I/O Interface

The interface provides analogous signals to control laser power, and digital signals to control laser devices such as a laser modulation driver. Further digital signals can be used for synchronizing marking with external controllers – for instance a foot switch or a PLC.

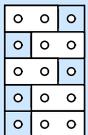
J2	PIN	Signal	PIN	Signal
 <p>9 PIN D-SUB</p>	1	TTL hc Output LM or /LM	6	VDD Out +5V
	2	TTL hc Output LM_GATE or /LM_GATE	7	TTL Output /MIP or GND
	3	TTL hc Output FPS or /FPS	8	TTL INPUT24V /START_MARK
	4	Analog Output 1 ANA_OUT	9	TTL INPUT24V /STOP_MARK
	5	GND Analog & Digital Return	-	---

FPS = first pulse suppression, LM = laser modulation, MIP = mark in progress

Please note:

/START_MARK and /STOP_MARK are read simultaneously with the laser interface (⇒ page 13). After the input buffer, the signals will be merged with an OR function.

Adaption of Outputs

W4 to W8	ID	Jumper at the left	Jumper at the right
 <p>Standard configuration</p>	W5	/FPS	FPS
	W8	GND	/MIP
	W6	/LM_GATE	LM_GATE
	W7	GND	5V
	W4	/LM	LM

FPS = first pulse suppression, LM = laser modulation, MIP = mark in progress

Analog Output

The analog output is dedicated to control the diode or lamp current of an Nd:YAG laser. The output voltage range can be adjusted via software (commands Write_DA and Write_DA_List).

Specifications

TTL Input24V	
Input low	max. 1.3V
Input high	1.6V to 24.0V
Hysteresis	typ. 1.1V
Input impedance	approx. 3kΩ
ESD protection	± 10kV

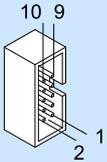
TTL Outputs		
TTL low	0.5V max.	max. 4mA
TTL high	3.84V to 5.0V	max. 4mA

Analog output	
Amplitude	0V to +10V ± 1%
Output current	5mA max.
Bandwidth	1kHz
DAC resolution	16Bit
Noise ratio (≤1 GHz)	60dB min.

TTL hc Outputs		
TTL low	max. 0,5V	max. 40mA
TTL high	min 2V	max. 40mA

2.4.3 RS-232 Serial Interface

The RS-232 interface can be used as a communication interface for stand-alone applications.

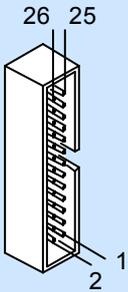
I3	PIN	Signal	PIN	Signal
 10PIN ITC	10	GND	9	GND
	8	RI	7	DTR
	6	CTS	5	TXD
	4	RTS	3	RXD
	2	DSR	1	DCD

In order to use the RS-232 serial interface DLL-drivers have to be installed on the host PC. Data transmission rate is 115.2kBaud.

For more information on how the RS-232 serial interface can be linked to your application, please contact the RAYLASE staff.

2.4.4 Laser Control Interface

This connection provides a complete interface for laser control with the following signals.

I8	PIN	Signal	PIN	Signal		
 26PIN ITC	26	GND	25	GND		
	24	TTL Outp.	/REMOTE_EXE_2	23	Analog Output	ANA_OUT_1
	22	TTL Outp.	/REMOTE_EXE_1	21	TTL Outp.	/MIP
	20	TTL Input 24V	/STOP_MARK	19	TTL Input 24V	/PC2
	18	TTL Input 24V	/PC1	17	TTL Input 24V	/START_MARK
	16	TTL Input 24V	/PA7	15	TTL Input 24V	/PA6
	14	TTL Input 24V	/PA5	13	TTL Input 24V	/PA4
	12	TTL Input 24V	/PA3	11	TTL Input 24V	/PA2
	10	TTL Input 24V	/PA1	9	TTL Input 24V	/PA0
	8	Diff. Outp.+	FPS	7	Diff. Outp.-	/FPS
	6	Diff. Outp.+	LM_GATE	5	Diff. Outp.-	/LM_GATE
	4	Diff. Outp.+	LM	3	Diff. Outp.-	/LM
	2	Output	+5V (VDD)	1	Analog Output	ANA_OUT_2

FPS = first pulse suppression, LM = laser modulation, MIP = mark in progress

CAUTION: A short-circuit on a signal line will immediately destroy the SP-ICE-1 PCI PRO control card!

Please note: Some of the input functions can be applied additionally at Laser / I/O Interface (J2). The request of these signals is performed via an OR-function.

Specifications

Analog Output	
Amplitude	0V to +10V ±1%
Output current	max. 5mA
Bandwidth	1kHz
DAC resolution	16 Bits
Noise ratio (≤1 GHz)	min. 60dB

TTL Outputs		
TTL low	max. 0.5V	max. 4 mA
TTL high	3.84 to 5V	max. 4 mA

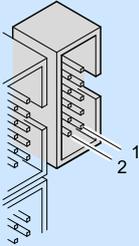
TTL Input 24V	
Input low	max. 1.3V
Input high	1.6 bis 24.0V
Hysteresis	typ. 1.1V
Input impedance	ca. 3kΩ
ESD protection	±8kV

Diff.Output-, Diff.Output+		
Output low	max. 0.5V	max. 40mA
Output high	min. 2V	max. 40mA

2.4.5 Interface for Marking-On-The-Fly-Option (MOTF)

With the option Marking-On-The-Fly objects can be marked in motion, for example when moving along a conveyor. Based on these moving informations, the control card is able to adapt the marking process to the actual motion.

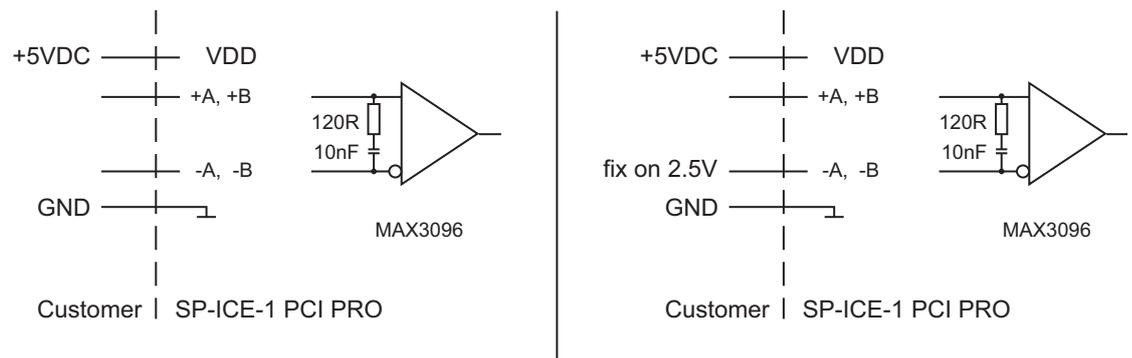
The MOTF signals are transferred to a 9 pin Sub-D male connector on a slot bracket via ribbon cable. This enables the connection of the position encoders at the rear panel of a PC.

X300	PIN	Signal	PIN	Signal
	1	Diff. IN -A	2	Diff. IN +A
	3	Diff. IN -B	4	Diff. IN +B
	5	Diff. IN -C	6	Diff. IN +C
	7	GND	8	GND
	9	VDD +5V	10	NC

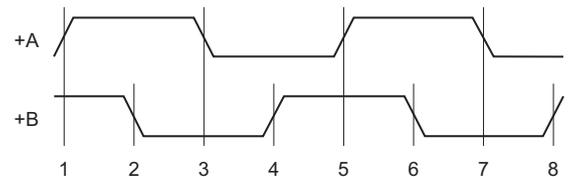
Diff. IN = differential TTL signal, O = output

The MOTF interface of the control card is equipped with differential inputs. It provides the option to use the input signals differential as well as single-ended. When connecting a single-ended encoder inputs -A and -B must be maintained at +2.5V via external components. The inputs +/-C are not in use.

Fig. 2
Input signals
(differential,
single-ended)



The SP-ICE-1 PRO PCI control card evaluates the signals A and B. This results twice the resolution in comparison to previous version (SP-ICE-1) which only evaluates signal A.



Specifications

Threshold	min. -200mV max. 200mV differentially at -7V to +12V Common-mode voltage
Input frequency max.	250kHz
Recommended input level	Low: 0.5V High: 3V (each +A and -A respectively +B and -B opposing)
Input impedance	120Ω
Inputs, ESD protection	≥ 6.5kV
Output current	VDD +5V for position encoder can supply 0.2A max.

Note: The separate RAYLASE manual "Applications Manual", describes in detail the use of MOTF function with examples.

2.5 Voltage Supply

If the SP-ICE-1 PCI PRO control card is used in stand-alone mode, it has to be supplied with voltage via connector I9 as shown in the following figure.

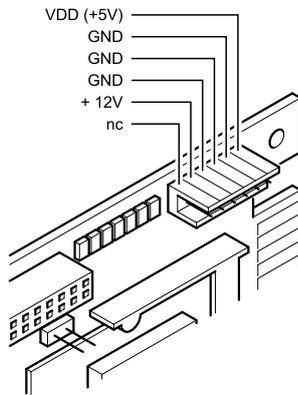


Abb. 3
Voltage inputs

2.6 Status LEDs

LEDs	ID	Color	Tag	LED is on, ...
<p>The diagram shows a multi-pin connector with seven pins. The connections are as follows:</p> <ul style="list-style-type: none"> Pin 1: D1 Pin 2: D2 Pin 3: D3 Pin 4: D4 Pin 5: D5 Pin 6: D6 Pin 7: D7 	D1	red	LM	If the laser modulation output signal is active.
	D2	yellow	STOP_MARK	If the input signal STOP_MARK is set.
	D3	yellow	START_MARK	If the input signal START_MARK is set.
	D4	yellow	REMOTE_EXE	If the output signal REMOTE_EXE is set.
	D5	yellow	MIP	If the output signal Mark_In_Progress is set.
	D6	green	ADV	while the on-board CPU reads or writes data to output logic, during processing vector data and I/O operation.
	D7	green	Power LED	during regular operation. It glows dimmly during on-board processors startup and if an unsuccessful startup was performed.

3 CONFIGURATIONS

3.1 Master-Master Configuration

It is possible to run up to four master SP-ICE-1 PCI PRO control cards in one PC in order to control up to four RAYLASE scan heads independently. All cards are supplied with the on-board processor. Each card controls one scan head and one laser. Each head is associated with its own correction file via software. To switch between the scan cards, the Set_Active_Card control command can be used.

Jumper W3, W1	Signal
	Master SP-ICE-1 PCI PRO control card (default setting)

3.2 Master-Slave Configuration

You can run up to four SP-ICE-1 PCI PRO control cards in one PC interconnected through an data bus of the boards. In this way it is possible to control up to four RAYLASE scan heads synchronously. Each scan head needs its own SP-ICE-1 PCI PRO control card. The card which serves as master must be equipped with an on-board processor. It controls the first head, the laser modulation and the timing. All the other cards serve as slaves and do not need an on-board processor. Each head is associated with its own correction file. This ensures that all heads are executing synchronously.

Jumper W3, W1	Signal
	Master SP-ICE-1 PCI PRO control card*
	First Slave SP-ICE-1 PCI PRO control card
	Second Slave SP-ICE-1 PCI PRO control card
	Third Slave SP-ICE-1 PCI PRO control card

* In master-slave mode only the master may use AD1.

Please note: A master control card can not be used as slave (v. v.) because of a different hardware configuration.

3.3 MOTF Configurations

Jumper J300	Signal
	By the jumper the internal MOTF function is activated. Without this jumper, the external RAYLASE MOTF card can be used. If this Jumper is set, Port E can not be used.

4 INSTALLATION

As the SP-ICE-1 PCI PRO control card is designed for PCI-bus with Plug-and-Play capabilities, the necessary settings are done automatically when the software drivers are installed.

4.1 Preparation

Make sure that all requirements for laser safety, as described in the scan head manuals, are fulfilled. It is the users responsibility to follow the regulations on laser safety.

CAUTION: There are components on the control card and within the PC which can be destroyed by electrostatic discharge. Please ask a specialist for the installation of the board, if you are not familiar with the necessary protective measures.

4.2 Installation Procedures

According to the desired operation mode perform one of the following SP-ICE-1 PCI PRO control card(s) installation procedures.

4.2.1 Standard Mode

To install a single control card for standard mode, proceed as follows:

Driver Installation (Windows® XP/ Windows® Vista/ Windows® 7)

First install the drivers. Please note the description for installing the SP-ICE-1 PCI PRO software delivered on the installation CD.

Installation of the SP-ICE-1 PCI PRO Control Card

- Switch off the PC.
- Disconnect the PC from the mains supply outlet.
- Open the housing of the PC.
- Plug the SP-ICE-1 PCI PRO control card in a free PCI slot and fasten the board with screw.
- Close the housing of the PC.
- When booting the PC the SP-ICE-1 PCI PRO control card is detected and set up automatically.

4.2.2 Master-Slave Mode

To install the SP-ICE-1 PCI PRO control card in the PC for master-slave mode:

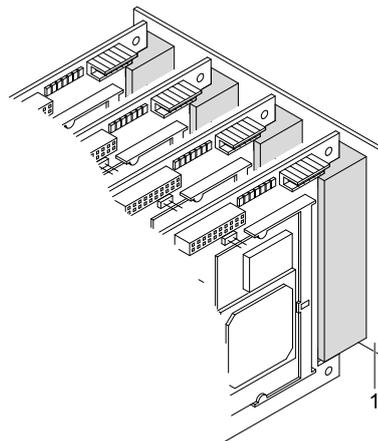
Driver Installation (Windows® XP/ Windows® Vista/ Windows® 7)

First install the drivers. Please note the description for installing the SP-ICE-1 PCI PRO software delivered on the installation CD.

Installation of the SP-ICE-1 PCI PRO Control Card

- Switch off the PC.
- Disconnect the PC from the mains supply outlet.
- Open the housing of the PC.
- Plug the SP-ICE-1 PCI PRO control cards in free PCI slots and fasten the boards with screw.
- Connect the SP-ICE-1 PCI PRO control cards via a backplane adapter as shown below. As well a dual and a quad adapter is available.
- Close the housing of the PC.
- When booting the PC the SP-ICE-1 PCI PRO control card is detected and set up automatically.

Abb. 4
Master-Slave-
Mode



4.2.3 Master-Master Mode

To install the SP-ICE-1 PCI PRO control cards in the PC for master-master mode, proceed as follows:

Driver Installation (Windows® XP/ Windows® Vista/ Windows® 7)

First install the drivers. Please note the description for installing the SP-ICE-1 PCI PRO software delivered on the installation CD.

Installation of the first SP-ICE-1 PCI PRO Control Card

- Switch off the PC.
- Disconnect the PC from the mains supply outlet.
- Open the housing of the PC.
- Plug the first SP-ICE-1 PCI PRO control card in a free PCI slot and fasten the board with screw. Please be aware, that all other SP-ICE-1 PCI PRO control cards will be installed later on.
- Close the housing of the PC.
- When booting the PC the SP-ICE-1 PCI PRO control card is detected and set up automatically.

Installation of further SP-ICE-1 PCI PRO Control Cards

The following procedure has to be performed for any further SP-ICE-1 PCI PRO control card, i.e. up to three times.

- Shut down the operating system and switch off the PC.
- Disconnect the PC from the mains supply outlet and open the housing of the PC.
- Insert a further SP-ICE-1 PCI PRO control card and proceed as described in section “Installation of the first SP-ICE-1 PCI PRO control card” (see above).
- Restart the PC. The second (and all other) SP-ICE-1 PCI PRO control cards are detected and set up automatically.

Completion of installation

After all SP-ICE-1 PCI PRO control cards are installed properly, start the „SP-ICE Config“ program via Start → Programs → RAYLASE → Tools („SpiceCfg.exe“ program located in \programme\raylase\sp-ice\bin) and select the total numbers of SP-ICE-1 PCI PRO control cards installed.

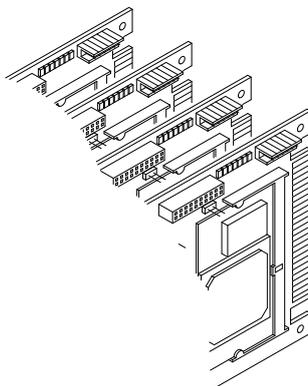


Abb. 5
Master-Master-
Modus

4.2.4 Stand-Alone Mode

For stand-alone operation please contact the RAYLASE staff (⇒ “Customer Support” on page 7).

5 TROUBLESHOOTING

CAUTION: Separate the PC always from power supply before opening!

PROBLEM	POSSIBLE SOLUTION
PC is not booting	Is the SP-ICE-1 PCI PRO control card properly mounted in the PCI slot?
	Did any metallic parts fall into the housing of the PC when mounting the SP-ICE-1 PCI PRO control card?
	Are any connectors connected improperly?
SP-ICE-1 PCI PRO is not responding	Are "SP-ICE-1 PCI PRO Serial Port" and "SP-ICE-1 PCI PRO Parallel Port" listed in the Device Manager under "Ports (COM & LPT)"? If necessary, install the drivers for the SP-ICE-1 PCI PRO control card from the installation CD. If necessary, uninstall and install the control card again, with PC turned off, to make sure that the control card is inserted correctly. Click the Device Manager on "Update" and follow the prompts from Windows to install the driver.
	Are the SP-ICE-1 PCI PRO control card drivers/DLL installed? The version of the SP-ICE.dll must be at least 12.8.74.0 (c:\Program Files\RAYLASE\SP-ICE\bin). It can be checked by right-click Properties>version. You may uninstall the old drivers and install the drivers for the SP-ICE-1 PCI PRO from the installation CD.
	Uses a different application (eg SpiceCfg.exe) the SP-ICE-1 PCI PRO control card(s)? Only one application can access at the same time the SP-ICE.dll, even when multiple cards are installed. Quit all applications that access the SP-ICE-1 PCI PRO card and run only one such application.
	The application program has an error? Close all application programs that could use the SP-ICE-1 PRO PCI control card and test with SpiceCfg.exe whether the card is recognized.
Failure in application software	Calls the application the correct SP ICE.DLL?
	Is an old version of the SP-ICE.DLL located in the application directory or in the search path of the application?
	Function calls are properly integrated? For help, see the handbook RAYLASE "commands and functions."
Control of scan head fails	Is there a proper connection and appropriate cable between scan head and the SP-ICE-1 PCI PRO control card?
	Is the scan head supplied with the correct voltage / current? Please refer to the scan head manual.
	Are there any faults in the application software? Please check the control of scan head and laser with the software QUICKTEST.EXE, delivered with the SP-ICE-1 PCI PRO control card.
	WARNING: QUICKTEST.EXE controls the scan head and the laser. Never look into the laser beam and take care that no part of your body is exposed to it. Even reflections of the laser beam can cause serious injuries.
Control of laser fails	Is there a correct interface between the SP-ICE-1 PCI PRO control card and the laser?
	Are the delays set correctly?
	Is the laser and its mode properly set with the command Set_Mode?

If the problem cannot be solved, please contact RAYLASE customer service department.

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