RAYLASE
focus on laser

Hardware Manual
SPI Interface Board (Extended)
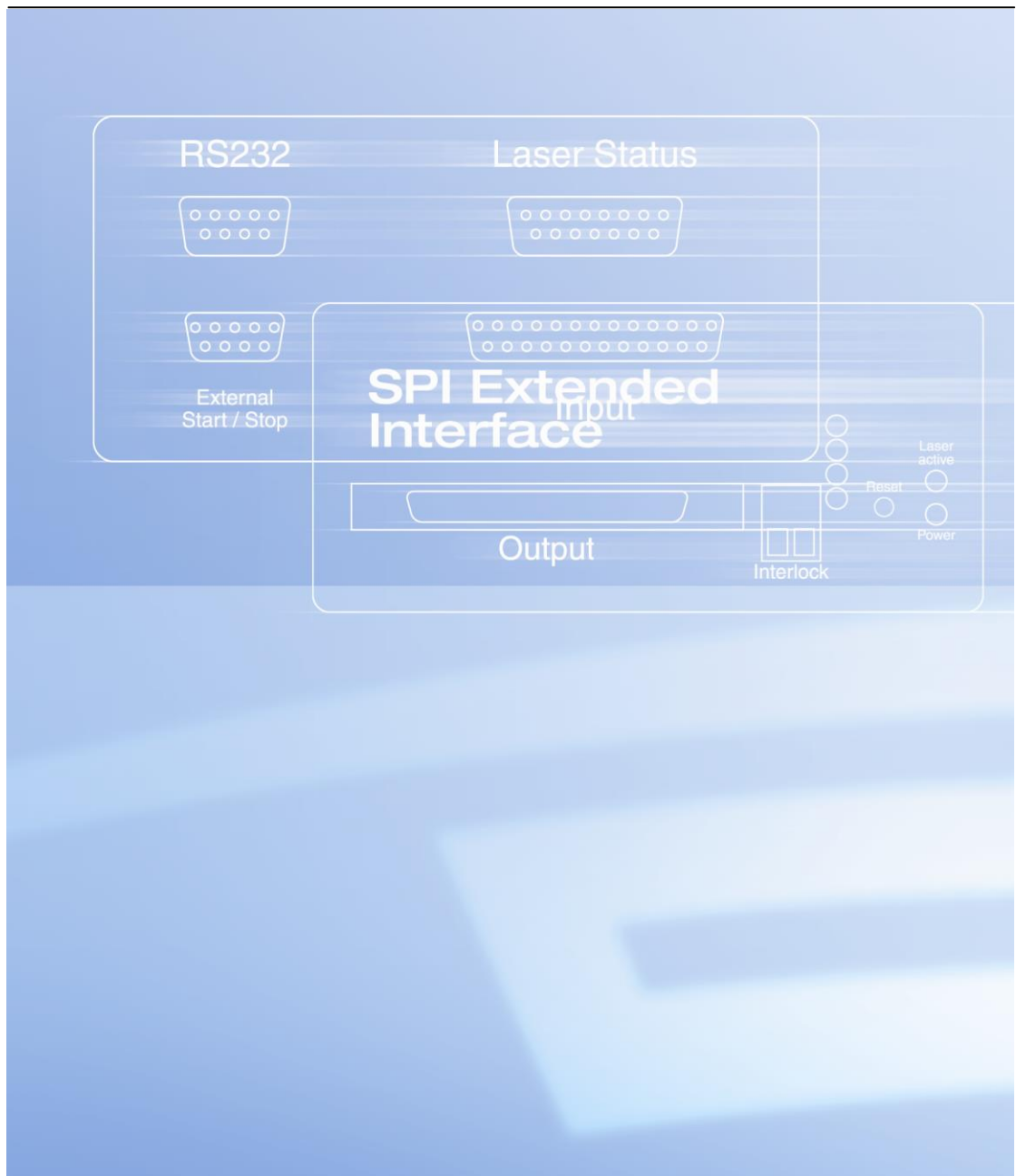
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1   BASIC INFORMATION

The RAYLASE SPI interface board is used to control a pulsed SPI laser in combination with RAYLASE control cards SP-ICE, RLC-PCI or RLC-USB.

Features

- Interface to Ytterbium pulsed SPI Fiber Lasers according to interface types G3 or RM (basic interface)
- SCSI connector for 1:1 connection to SPI laser
- Detection, if the laser is attached or switched on
- Detection of laser error conditions
- Support of integrated visible pointer

1.1   Delivery Scope

- SPI interface board (Extended interface)
- Connecting cable between SPI interface board and control card (laser adapter)

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.

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.

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   Signs

The following signs must be attached to the Interface Board. These signs may not be removed. Signs that have become illegible must be replaced.
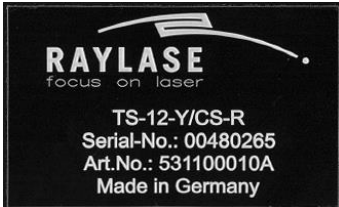
The **rating plate** and the identification code printed on it allow the determination of the Interface Board type.

The **CE symbol** confirms the compliance of the Interface Board with European directives. It indicates that the Board is approved for free trade within the EU.
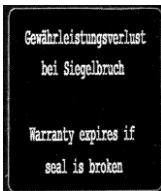
The **seal label** warns against unauthorized opening of the Interface Board. If the seal is broken, all warranty claims against RAYLASE are void.

1.4   Conformity with directives

The Interface Board conforms to the requirements of the following directives:

- EU Directive 2004/108/EC (EMC)
- WEEE Directive 2012/19/EC
- RoHS II 2011/65/EU

For details of conformity with other directives, contact RAYLASE.

1.5   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.

WARNING:

Switch on the PC first, before switching on the laser system. In this way you can avoid an uncontrolled action of the laser when starting the control card.

1.6   Manufacturer

RAYLASE AG
Argelsrieder Feld 2+4
82234 Wessling
Germany
Tel.: +49 (0) 81 53 - 88 98 - 0
Fax: +49 (0) 81 53 - 88 98 - 10
http://www.raylase.de
E-mail: info@raylase.de

1.7   Customer Support

The RAYLASE support services are available for your problems either in respect to the product or the accompanying manual. Before calling for support, please make sure you refer to any appropriate sections in the manuals on the supplied CD that may answer your questions.

If you need further assistance call RAYLASE customer service department, Monday through Friday between 8 A.M. and 6 P.M. (Middle European Time).

The customer service personnel will be able to give you direct assistance and answers to your questions.

Germany (Wessling)
+49 (0) 81 53 - 88 98 - 0

... ask for the customer service department

1.8   Disposal

For the disposal of the Interface Board, note local policies, regulations and laws.

2   TECHNICAL DATA

2.1   Dimension and Weight

Dimensions: W 104mm, L 130mm, H 50mm

Weight: 440g

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   SET-UP Procedure

Make sure that all requirements for laser safety, as described in the scan head manuals, are fulfilled. It is the user's responsibility to follow the regulations on laser safety.
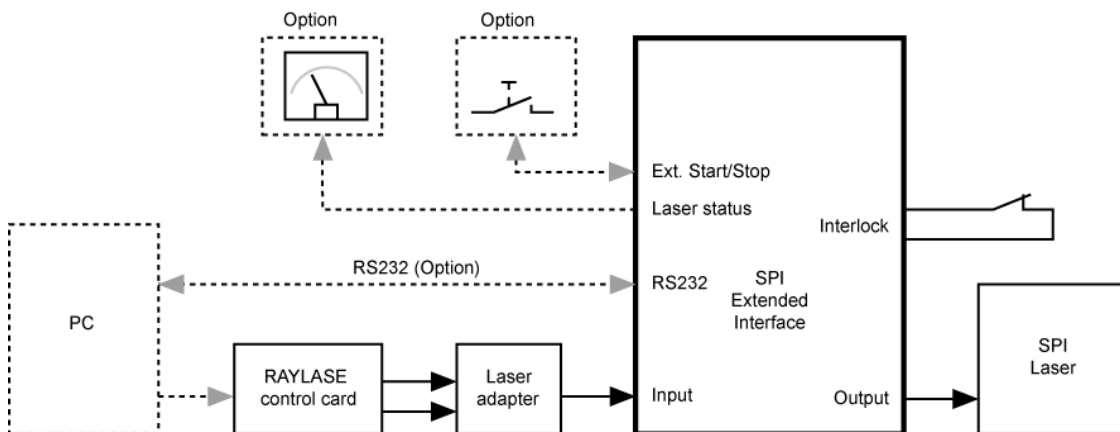
Fig. 1
Block diagram

Installation
- Connect power supply for laser.
- Connect RAYLASE control card via adapter to SPI interface board.
- Switch on laser power supply.

Please note: Interlock must be bridged for switching on the laser.

2.4   Connections

Fig. 2
SPI interface
board, overview
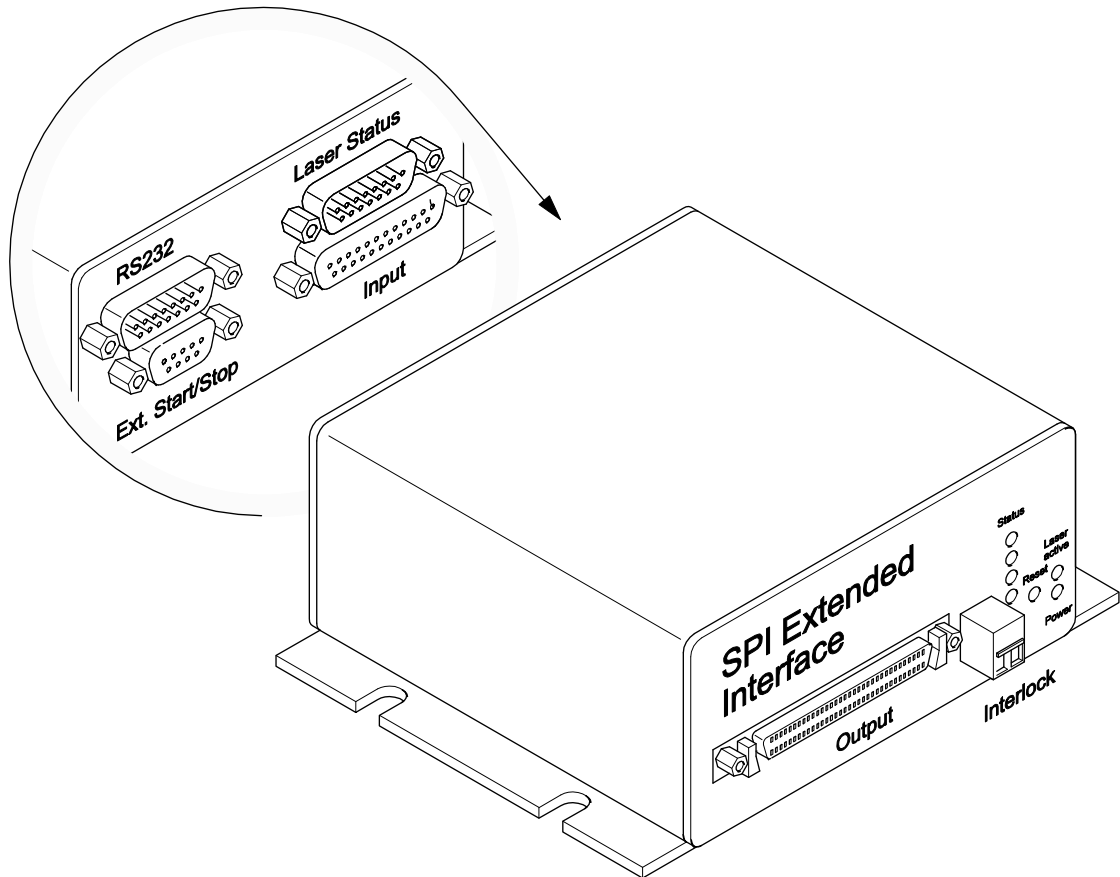
Designation	Description	Details
Input	RAYLASE control card (laser adapter)	---
Interlock	Safety switch	Must be bridged for switching in the laser
External Start/Stop	START MARK / STOP MARK input	Pin assignment ⇨ page 11
Laser Status	Status output	Pin assignment ⇨ page 10
RS232	Communication with PC	Pin assignment ⇨ page 10
Output	SPI laser interface	Pin assignment ⇨ page 9
Reset	Button for resetting the SPI interface board	---
Status LED's		⇨ page 12

2.4.1   SPI Laser Interface

J4	PIN	Signal		PIN	Signal	
68 PIN SCSI	1	nc		35	nc	
	2	Laser has pulsed	I	36	GND	
	3	Monitor.	I	37	GND	
	4	nc		38	nc	
	5	Laser Emission Gate	O	39	GND	
	6	Pilot Laser Enable	O	40	GND	
	7	Global Enable	O	41	GND	
	8	Laser Temperature	I	42	GND	
	9	Alarm	I	43	GND	
	10	System_Fault	I	44	GND	
	11	Beam Delivery	I	45	GND	
	12	Laser Deactivated	I	46	GND	
	13	Pulse Trigger	O	47	GND	
	14	Laser is on	I	48	GND	
	15	Laser Disable	O	49	GND	
	16	Laser Emission Warning	I	50	GND	
	17	DI 0	O	51	DI 4	O
	18	DI 1	O	52	DI 5	O
	19	DI 2	O	53	DI 6	O
	20	DI 3	O	54	DI 7	O
	21	Laser Pulse/CW	O	55	GND	
	22	nc		56	GND	
	23	nc		57	nc	
	24	nc		58	GND	
	25	TX	O	59	DGND	
	26	RX	I	60	DGND	
	27	nc		61	nc	
	28	AGND		62	nc	
	29	AGND		63	nc	
	30	AGND		64	AI_2	O
	31	AGND		65	AI_1	O
	32	AGND		66	nc	
	33	nc		67	nc	
	34	nc		68	nc	

I = Input, O = Output, nc = not connected

Specifications

Output		
Output PNP open collector	5V	200mA

Input	
Input low	0.8V max.
Input high	2V min.

2.4.2   RS232

J6	Signal		PIN	Signal
1	nc		6	nc
2	RX	I	7	nc
3	TX	O	8	nc
4	nc		9	nc
5	GND		-	

I = Input, O = Output, nc = not connected

2.4.3   Laser Status

J7	Signal		PIN	Signal	
1	nc		9	Laser has pulsed	O
2	Monitor	O	10	Laser Temperature	O
3	Alarm	O	11	System Fault	O
4	Beam Delivery	O	12	Laser Deactivated	O
5	Laser is on	O	13	Laser Emission Warning	O
6	GND		14	AGND	
7	nc		15	nc	
8	nc				

I = Input, O = Output

2.4.4   External Start/Stop

PIN	Signal		PIN	Signal	
1	/LM	O	6	+5V	
2	/LMGATE	O	7	/MIP	O
3	/FPS	O	8	/Start-Mark	I
4	nc		9	/Stop-Mark	I
5	GND		-		

I = Input, O = Output, nc = not connected

Spezifications

Output		
Output low	0.55V max.	64mA
Output high	2 - 5V	32mA

| Input	
Input low	Refer to specifications of the RAYLASE control card
Input high	Refer to specifications of the RAYLASE control card

2.4.5   Cable Specifications

Connection	Length
SPI Interface Board to SPI Laser	max. 2m
External Start/Stop	max. 2m

2.4.6   Status LEDs

🟢🟢🟢🟢	Normal
🟡🟢🟢🟡	Interlock open
⚪✳🟡⚪⚪	Laser not connected

🟢🟢✳🟢	Laser temperature
🟢✳🟢🟢	Beam delivery
🟢🟢✳🟢	System fault
🟢🟢🟢✳	Alarm

⚫🔵	Normal
⚪🔵	Laser active

3   PROGRAMMING

The following sections describe how to program an SPI laser for use with RAYLASE control card and RAYLASE SPI interface board.

3.1   Signals

Use the following signals to program the SPI interface board:

Signals of control card	Description
/LM	Setting Pulse Repetition Rate of SPI Laser
/MIP	Switching On/Off the Global Enable Input of SPI Laser
/Analog Output	Setting Analog 0-10V Simmer Current of SPI Laser
/LMGATE	Switching On/Off the Laser Emission Input of SPI Laser
/PA 6	Monitoring of combined Error Outputs of SPI Laser
/PB0 … /PB6	Laser Power
/PB0 … /PB7	State Select
/PB7	Pulsed/CW-Mode
/Remote_Execute_1	Switch off Pilot Laser

3.2   Commands

To program the SPI interface board use the following commands:

- Set_Delays_7_8, Set_Delays_9_10
- Write_DA_List, Write_Port_List
- Long_Delay
- Read_Port
- Write_Port
- YAG1-Mode is required, Bit 4 = 0, Bit 5 = 1

See also the manual „Commands and Functions" for details.

3.3   Programming sequence

Initialisation:
```
Init_Scan_Card ();                    // Initialise Scan Card
Load_Cor (lpstrFileName);             // Load Correction File
Set_Mode (0x0420);                    // Set YAG1-mode (Bit 5 = 1, Bit
                                      4 = 0)
```

Setting Master Oscillator input of SPI Laser with Control Commands:
```
Set_Start_List_1();                   // Filling Job Data into List 1
Set_Delays_7_8 (t1, t2);              // Set Laser Modulation Signal
Set_Delays_9_10 (t3, t4);             // t4 = 0
Write_DA_List (value);                // Set Laser Power
...                                   // List Commands for Marking
Set_End_Of_List();
...                                   // Start Marking
Write_Port (0x0C, 0x0010);            // Switch-On Global Enable of SPI
                                      Laser
...                                   // Wait 10msec
Execute_List_1();                     // Execute Job
...
Write_Port (0x0C, 0x0000);            // Switch-Off Global Enable of
                                      SPI Laser
```

Setting Master Oscillator input of SPI Laser with List Commands:
```
Set_Start_List_1();                   // Filling Job Data into List 1

Write_Port_List (0x0C, 0x0010);       // Switch-On Global Enable of SPI
                                      Laser

Long_Delay 1000();                    // Wait 10msec
Set_Delays_7_8 (t1, t2);              // Set Laser Modulation Signal
Set_Delays_9_10 (t3, t4);             // t4 = 0
Write_DA_List (value);                // Set Laser Power
...                                   // List Commands for Marking
Write_Port_List (0x0C, 0x0);          // Switch-Off Global Enable of
                                      SPI Laser

Set_End_Of_List();
...
Execute_List_1();                     // Execute Job
```

Checking Laser Alarms and Resetting of SPI Laser:
```
Read_Port (0x08);                     // Read Bit 6 of Port A for
                                      checking of Laser Alarm
                                      // If Bit 6 set to FALSE then an
                                      error occured
...
Write_Port (0x0C, 0x0020);            // Set Signal Remote_Execute_1 to
                                      TRUE
...                                   // Wait 1ms
Write_Port (0x0C, 0x0);               // Set Signal Remote_Execute_1 to
                                      FALSE
```

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