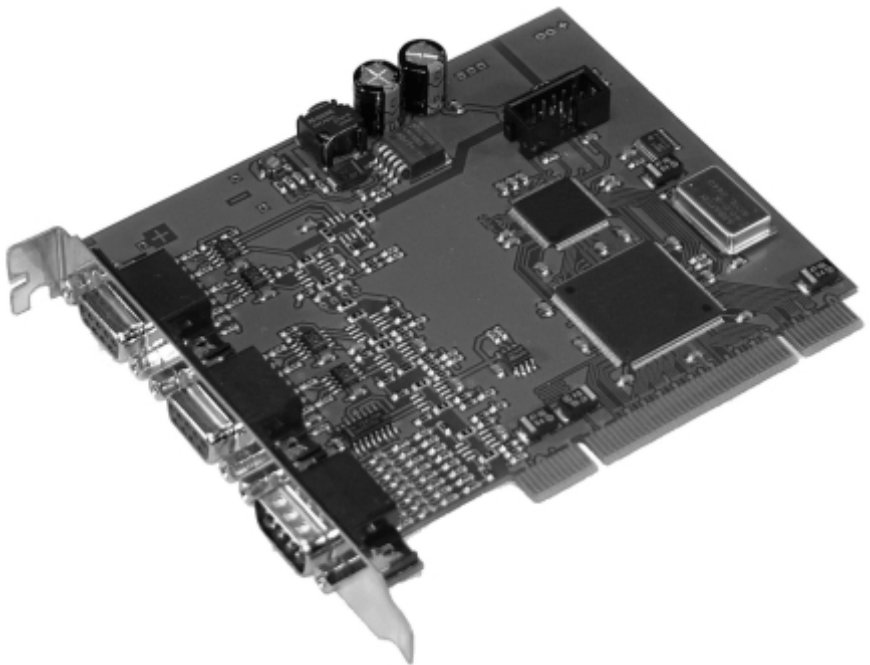# SSI 1417-S04

PCI-Card with SSI-Outputs

Instruction Manual

ERMA

Electronic GmbH

Warranty

For delivered products our "Allgemeine Lieferungs- und Zahlungsbedingungen" are effective. In no event ERMA-Electronic or its suppliers shall be liable for any other damages whatsoever (including, without limitation, damages for loss of business profits, business interruption or other pecuniary loss) arising out of or inability to use this product.

All products from ERMA-Electronic are warranted against defective material and workmanship for a period of two (2) years from date of delivery. If it is necessary to return the product to ERMA, the sender is responsible for shipping charges, freight, insurance and proper packaging to prevent breakage in transit. ERMA's warranty does not apply to defects resulting from action of thebuyer, such mishandling, improper interfacing, operation outside of design limits, improper repair or unauthorized modification.

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CONTENTS

1.   Safety Instructions

This instrument is produced in accordance with Class II of IEC 348 and VDE 0411. When delivered the intrument has been tested to meet all functions described. Before installing the instrument please read the mounting and servicing instructions. We have no liability or responsibility to customer or any other person or entity with respect to any liablity, loss or damage caused or alleged to be caused directly or indirectly by equipment or software sold or furnished by us. Read the installation instruction carefully. No liability will be assumed for any damage caused by improper installation.
Inspect the instrument module carton for obvious damage. Be shure there are no shipping and handling damages on the module before processing. Do not apply power to the instrument if it has damaged.
The warranty does not apply to defects resulting from action of buyer, such as mishandling, improper interfacing, operation outside of design limits, improper repair or unauthorized modifications.

2.   Symbol Explanation

Caution   **Attention**   **Instruction**   **Tip**

Caution: Will be used at **dangerous for life and health !**

Attention: Will cause **damage.**

Instruction: If not noticed, **Trouble** may occur.

Tip: Useful hints for **better operation.**

3.   General

The SSI 1417-S04 is a PCI-card which presents 2 SSI-outputs.

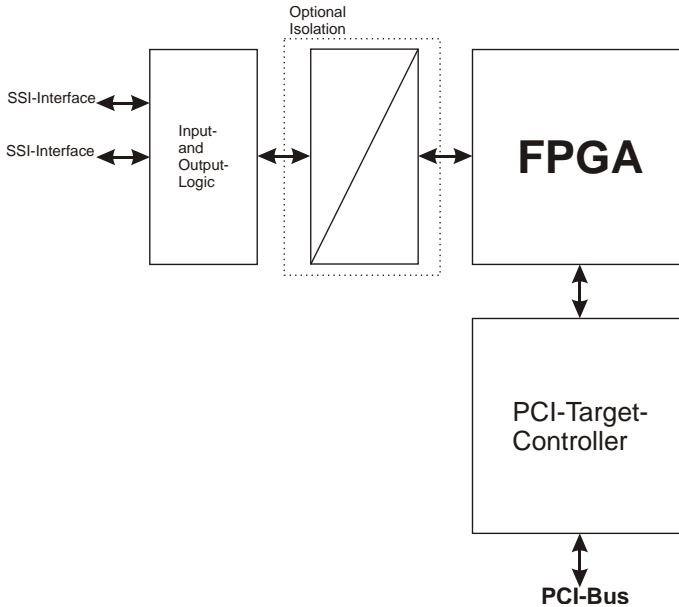Available options:

• Opto-isolation

4.   Function

The SSI 1417-S04 will use one PCI-slot within the pc. Because the PCI-bus supports plug and play, there are no jumpers or switches to change configuration. The card will use 8 x 32-bit-IO-addresses for the function and 16 x 32-bit-IO-addresses for the PCI-target-controller. You can use any number of SSI 1417-S04 within one pc (depends on number of PCI-slots). The standard drivers supports up to 4 cards. If more than 4 cards should be used, you can ask for a driver for more cards. The card has one 9-pin SUB-D male connector for the inputs and two 9-pin SUB-D female connectors for the encoders.

The functions of the card will be handled in a FPGA. This free programable device makes it possible to support customer specific functions without changing the hardware. It is possible to implement additional special functions or fast controllers within the FPGA.

5. Block diagram

Optional Isolation

SSI-Interface

SSI-Interface

Input- and Output- Logic

FPGA

PCI-Target- Controller

PCI-Bus

6. Hints against noisy environment

All inputs and outputs are protected against noisy environment and high voltage spikes. Nevertheless the location should be selected to ensure that no capacitive or inductive interference can have an effect on the instrument or connection lines.

It is advisable:

- To use shielded, twisted pair cables.

- The wiring of shields and ground (0V) should be star-shaped.

- The distance to interference sources should be as far as possible. If necessary, protective screen or metal enclosures must be provided.

- Coils of relays must be supplied with filters.

- Parallel wiring of input signals and AC power lines should be avoided.

7. Installation

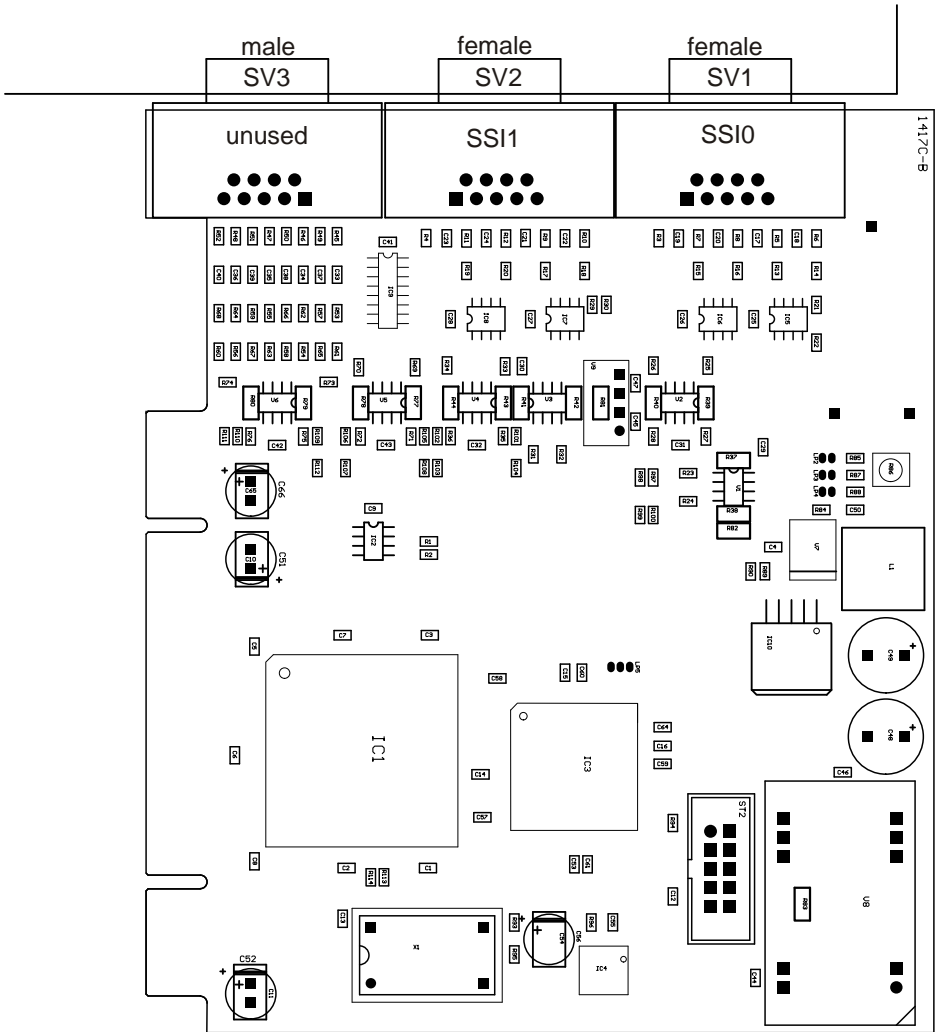 The installation of the card should only be done by qualified personal only. Before installation all components have to be disconnected from power supply. Because within PC's and the peripherals are high voltages it is dangerous to life!

7.1. Hardware configuration

The SSI 1417-S04 uses plug and play and so there is no need for any settings.

7.1.1. Component layout

component layout

7.1.2. Connection of SSI-Outputs

User designation

SUB-D 9-pol. female

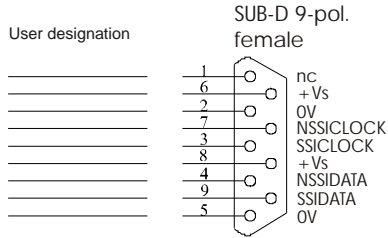|	
1	nc
6	+Vs
2	0V
7	NSSICLOCK
3	SSICLOCK
8	+Vs
4	NSSIDATA
9	SSIDATA
5	0V

Illustration 1 Pinning of
SSI-female-connector

7.2. Open PC

Before opening the pc-case disconnect power supply! The case should be opened as described by the manufacturer of the PC.

7.3. Card insertion

While nserting the card you could be hurt. This is because all components on the cards and in the PC have sharp pins. So this work have to be done carefully. Thee SSI 1417-S04 should be placed in a free PCI-Slot. The card should be installed vertically from above. Afterwards the slot plate of the card have to be screwed to the backside of the PC-case.
The slot plate is used for mounting and also for shielding. Keep in mind that removal of the plate will result in loss of shielding and card and PC will be more sensitive to EMC. Additionaly the card won't be held in slot-position when external force will happen to the connected cables. Then the card could move within the slot and that can result in damage to the SSI 1417-S04 and the PC! So, don't remove the slot plate!

7.4. Close PC

The case should be closed as described by the manufacturer of the PC.

7.5.   Driver installation

On most Windows-versions you must have administrator rights to install drivers.

7.5.1.   Windows 2000 / XP

Windows will recognize the new card and ask for the driver. The driver is on the disc within the directory Driver\WinXP or Driver\Win2000.

8.   Programming

8.1.   Programming under Windows

To build applications for Windows the disc includes different drivers for all Windows-versions. To keep the programming of the SSI 1417-S04 as easy as possible, all functions of the drivers are handled within one DLL. So all programming of the card is done by using the DLL.
The file S1417S04_DLL.DLL should be copied to the Windows system directory or the application directory.

8.2.   Programming with S1417S04_DLL-DLL

The DLL S1417S04_DLL.DLL includes all functions necessary for the work with the SSI 1417-S04. The return value of all functions reports an error-code. A return value of **SSI_ERR_OK** will show successful execution. Otherwise the code will show the type of error.

8.2.1. Functions

S1417S04_InitDevice
The function SSIInit must be called once at the beginning of the program. The function initialises the DLL and the driver and the output drivers will be activated.

S1417S04_DeInitDevice
The function SSIDeInit must be called once at the end of the program. The output drivers will be deactivated.

S1417S04_GetCardCount
This function returns the number of installed SSI 1417-S04 cards.

S1417S04_GetCardNumber
This function returns the serial number of the SSI 1417-S04 card with the desired index. Index starts with 0 for the first card!.

S1417S04_GetLastError
This function returns the last happened error code.

Available error codes:

- S1417S04_ERR_OK= 0

- S1417S04_ERR_ALREADYOPEN   = 1

- S1417S04_ERR_NOTOPEN   = 2

- S1417S04_ERR_NOCARD   = 3

- S1417S04_ERR_VXDNOTFOUND   = 7

- S1417S04_ERR_INTERNALERROR   = 8

- S1417S04_ERR_WRONGVALUE   = 10

- S1417S04_ERR_NOTCONFIGURED = 14

S1417S04_SetConf

This function sets the configuration of the card with the desired index. Index starts with 0 for the first card!

The outputs will be activated after configuration of the card.

The value is bit coded and has the following meaning:

Bit 0 - 5	Number of bits for output SSI0 (min. 1 to max. 32)
Bit 6 - 11	Monofloptime for output SSI0 in us (min. 1 to max. 63)
Bit 12	Enable for multiplereading of SSI0 (ring register mode)
Bit 13	Gray-Binary-Conversion for SSI0 (only used in driver/softwarefunction)
Bit 14 + 15	unused
Bit 16 - 21	Number of bits for output SSI1 (min. 1 to max. 32)
Bit 22 - 27	Monofloptime for output SSI1 in us (min. 1 to max. 63)
Bit 28	Enable for multiplereading of SSI1 (ring register mode)
Bit 29	Gray-Binary-Conversion for SSI1 (only used in driver/softwarefunction)
Bit 30 + 31	unused

S1417S04_GetConf

This function will return the configuration of the card with the desired index. Index starts with 0 for the first card!

The meaning of the bits for the value is the same as for S1417S04_SetConf.

S1417S04_SetSSI0Value
S1417S04_SetSSI1Value

These functions will set the absolute value for the corresponding SSI output 0 or 1 of the card with the desired index. Index starts with 0 for the frst card!

S1417S04_GetSSI0Value
S1417S04_GetSSI1Value

These functions will return the absolute value for the corresponding SSI output 0 or 1 of the card with the desired index. Index starts with 0 for the frst card!

8.3.   Usage within own applications

8.3.1.   VisualBasic6

Within directory Include\VB6 on the cd there is the file s1417s04_dll.bas. If this file is included within a VisualBasic-project, all DLL functions for SSI 1417-S04 are available in the project.

8.3.2.   VisualBasic 2005 (.net)

Within directory Include\VB_2005 on the cd there is the file s1417s04_dll.vb. If this file is included within a VisualBasic-project, all DLL functions for SSI 1417-S04 are available in the project.

8.3.3.   Visual C++/ LabWindowsCVI

For C/C++ applications there are an import library S1417S04_DLL.LIB and a header-file S1417S04.H. The library has to be inserted in the linker-options of the project-settings (see documentation of VisualC++/LabWindowsCVI). Include the header-file in all source-files where SSI 1417-S04 functions are needed.

An additional method is to use the Windows-function LoadLibrary to connect the application to the DLL. See documentation of VisualC++ / LabWindowsCVI for further information.

8.3.4.   C#

In the directory Include\Csharp of the cd there is the file S1417S04_DLL.cs. If this file is inserted within a C#-project all DLL-functions of the SSI 1417S04-are available.

8.3.5.   LabView

In the directory LabView of the cd there are an example and VIs for using the SSI 1417-S04 in LabView.

8.4. Direct programming

For use of the SSI 1417-S04 on other operting systems or to get faster reaction times or special reactions other drivers should be implemented. Therefore all needed information follows.

Addresses and interrupts of the card

The SSI 1417-S04 uses 2 IO-addressranges. Because of the plug-and-play of the PCI-bus these data should be found out. Therefore functions of the BIOS has to be used like described in "PCI BIOS SPECIFICATION Revision 2.1".

The SSI 1417-S04 uses a configuration space header type 00h. The datas could be found in the PCI-configuration space on BaseAddress0 and BaseAddress1. With BIOS-function the data could be read out of the configuration space. BaseAddress0 is used for the PCI-target controller, BaseAddress1 for the SSI-functions of the card.

For the BIOS-functions the following informations are necessary:

- VendorID = 0x10E8 (AMCC)
- DeviceID = 0x5920 (S5920Q)
- SubVendorID = 0x1485 (ERMA - Electronic GmbH)
- SubSystemID = 0x0009 (SSI 1417-S04)

Functions of the PCI-target

Initialisation of the PCI-target

Write value 0x87878787 to address BaseAddr0 + 0x60

8.4.1.   Registers of SSI 1417

Position-register

read only

BaseAddr1 + 0x00	Position SSI0
BaseAddr1 + 0x04	Position SSI1

Configuration-registers

Read/Write BaseAddr1 + 0x08

Bit 0 - 5	Number of bits for output SSI0 (min. 1 to max. 32)
Bit 6 - 11	Monofloptime for output SSI0 in us (min. 1 to max. 63)
Bit 12	Enable for multiplereading of SSI0 (ring register mode)
Bit 13 + 15	unused
Bit 16 - 21	Number of bits for output SSI1 (min. 1 to max. 32)
Bit 22 - 27	Monofloptime for output SSI1 in us (min. 1 to max. 63)
Bit 28	Enable for multiplereading of SSI1 (ring register mode)
Bit 29	unused
Bit 30	Global Enable of SSI output registers
Bit 31	Global Enable of the card (enable output drivers)

8.4.2.   Tips and Tricks

• If drivers are developed, the following points should be considered:
   - While writing to registers, set all unused bits to 0
   - While reading registers, mask out all unused bits.
   This will safe compatibility with future changes.

9.   Troubleshooting

All PC-boards of ERMA-Electronic GmbH are tested during manufacturing as well as when delivered. Nevertheless it can occur that a new board doesn't work. That must not be a failure of the board. There are many minor details when a new board doesn't work. In that case at first some points should be paid attention to.

- One of the most frequent failures are dirty slots. It is recommended to clean the connector of the board with a cloth and a little spirit.

- Further it can happen that the board doesn't fit correctly into the slot or into the PC case. The dimensions of the board are standardized. But the dimension of the PC cases are sometimes out of the prescribed dimensions.

- The cable of the peripherie should be tested.

If you have observed the hints above and the board doesn't work at all call the ERMA - Team. The ERMA-Team will help you.

10. Technical datas

Interfaces	: 2 x SSI-outputs
Inputs	: EIA RS422
Max. Resolution	: 32 Bit, programable separately for each interface
Clock Outputs	: EIA RS422
Max. Clock	: 5 MHz, programmable seperately for each interface
Monofloptime	: 1 μs to 63 μs, programmable seperately for each interface
Ecoder Power Supply	: Optional 5 V / 2 x 300 mA or 12 V / 2 x 125 mA or 24 V / 2 x 60 mA
Isolation	: 500 VDC (only with option galv. isolation)
Connectors	: 2 x 9-pol. SUB-D-female for SSI 1 x 9-pol. SUB-D-male unused
EMC	: corresponding to 2004/108/EG
Operating Temperature	: 0 bis 40 °C
Storage Temperature	: -25 bis +85°C
Dimensions	: 132 x 105 mm

11. Ordering information

SSI 1417/	x/	0/	xx	-S04
			Encoder Power Supply	
		0	00	Without power supply
		0	05	With 5 V power supply
		0	12	With 12 V power supply
		0	24	With 24 V power supply
	Galvanic (opto) Isolation			
	0	Without galvanic isolation		
	1	With galvanic isolation		

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