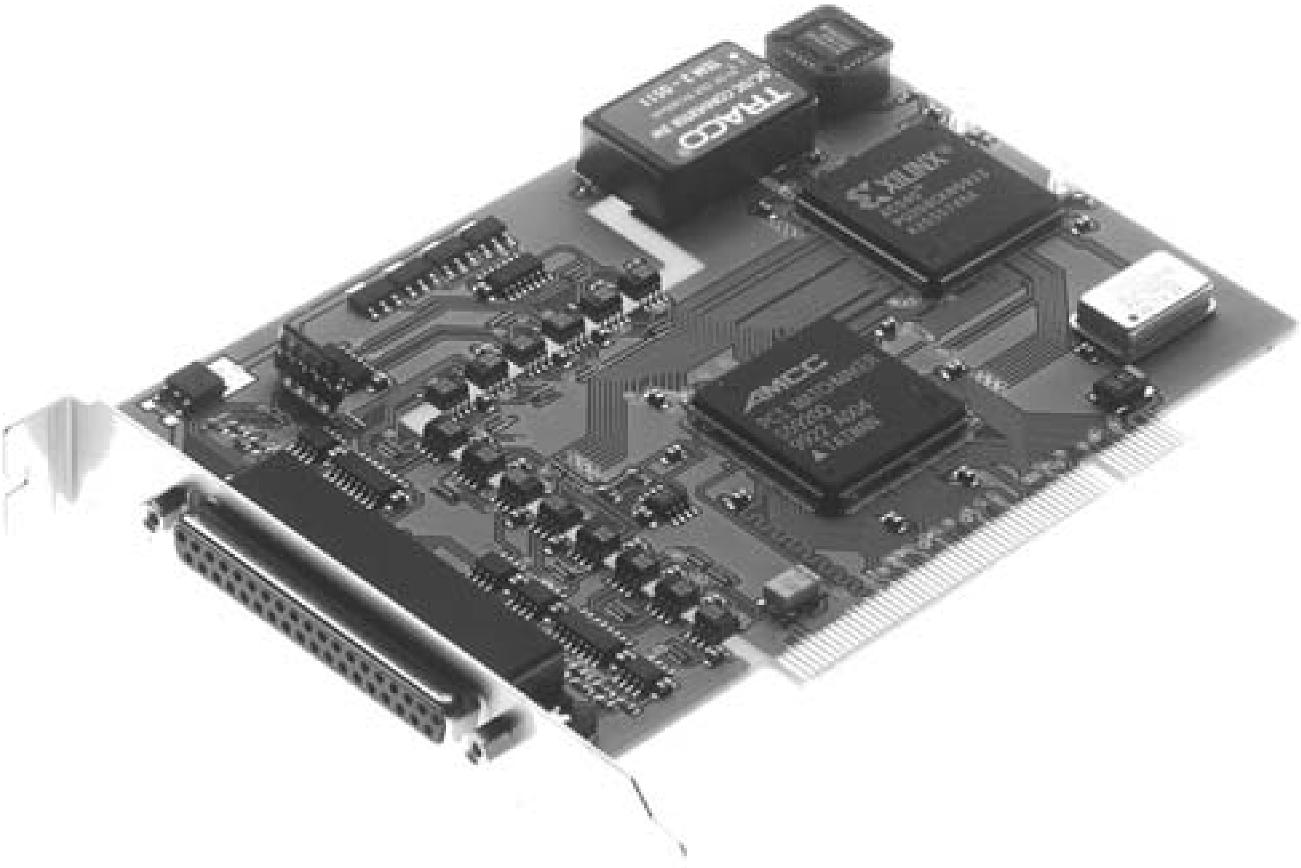
PCI 1389-S02
Incremental Counter Card

Special Application

Instruction Manual



ERMA
Electronic GmbH

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Stand : Mai, 2003
PCI1389A.PUB (PCI1389AS02)
Technical subjects to change

1. Safety Instructions

This pc-card is produced in accordance with Class II of IEC 348 and VDE 0411. When delivered the card has been tested to meet all functions described. Before installing the card 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 liability, 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 pc-cards carton for obvious damages. Be sure there are no shipping and handling damages on the card before processing. Do not apply power to the card if it has damages.

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. Repair

Maintenance and repair have to be done by qualified persons only. This persons have to be familiar with the risks of this kind of work and have to know the warranty regulations.

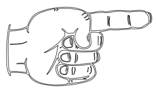
It is recommended to keep the original package of the card. The anti static plastic foam within the package gives the card an perfect protection. The package can be used for storage or shipment of the card.

3. 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.**

4. General

The counter card PCI 1389-S02 has two 32-Bit incremental up/down counter. The input channels of these counters are provided with isolated RS422 interfaces. In addition there is one 16-Bit reference counter with a RS422 interface which is also isolated.
For controlling tasks there are 4 isolated digital input channels and 4 isolated digital output channels.
The two up/down counter can be programmed for 1-, 2-, or 4-fold mode counting. It is also possible to use the counters as event counters. Alternatively there is the possibility to measure the time event of each increment with a resolution of 5 MHz or 10 MHz. Additional it is possible to trigger on the change of the counting direction.
The reference counter is able to trigger the two up/down counters. With the aid of the reference counter it is also possible to generate constant time intervals for measurements.
The digital input and output channels can be used for controlling tasks. In addition the digital input channel 0 can be used to trigger the two up/down counters either with the raising edge or the falling edge of the input signal.

5. Function

The PCI 1389-S02 has a PCI-Target-Controller to connect to the PCI-bus, a FPGA which contains the whole functionality of the card, and also 4 bidirectional RS422-Ports, 8 unidirectional RS422-Ports, 4 digital inputs and 4 digital outputs. To prevent damage, the card contains a galvanic (optical) isolation to the pc.

After a reset the FPGA will boot his configuration out of an serial PROM. The FPGA-functions are not implemented as software, they are implemented as hardware! So extremely high working speeds are possible. The functions of the card can be totally changed only by exchanging the PROM.

Special-function -S01

The PCI 1389-S02 has 2 x 32-Bit-Incremental-counter/timer with RS422-Inputs, 1 x 16-Bit-Reference-counter/timer with RS422-Input, 4 digital, short circuit protected outputs and 4 digital inputs.

The 32-Bit-counters could be used as incremental counter with 1-, 2-, 4-fold evaluation or as event-counter with max. 10 MHz input frequency. It is also possible to use these counters as timers with a timebase of 5/10 MHz. In this mode the counter-value will be stored with each input-pulse. Because of the 1-, 2- and 4-fold mode it is possible to measure the time between all possible signal edges. Each 32-Bit-counter has a 32 value deep FIFO to store the triggered values. The triggering can be programmed separatly for each counter to softwaretriggering, reference-counter-triggering, digital-input-triggering or time-triggered mode. It is possible to measure up to 10.000 values per second, depending on the long latency of Microsoft Windows. On faster PC’s the number of measurements per second increases.

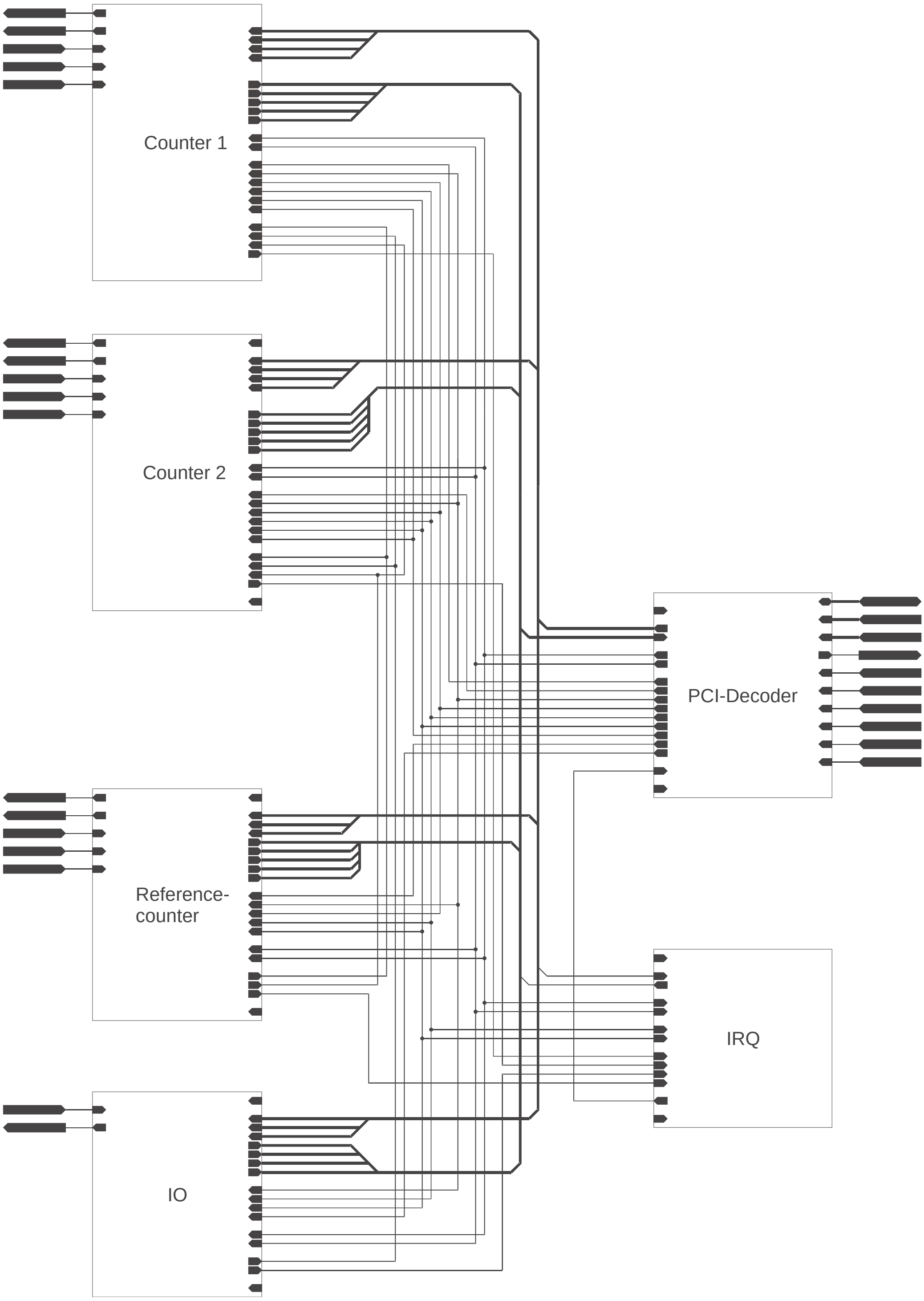
The triggering on the change of the counting direction allows the measuring of the minimum and maximum angle and the repeatability of this angles.

The reference-counter serves for synchronous data aquisition. It can be used as incremental counter to trigger the main-counters at always the same machine-position. Therefore a trigger is generated each incremental step (1-, 2-, 4-fold evaluation) beginning after the first index-pulse (zero-pulse) of the reference-counter. In another mode the reference-counter is used as a programmable timer with up to 20 kHz to aquire the counter-values in equidistant time steps.

The digital in- and outputs can be used for controlling tasks. Digital input 0 could also be used as external trigger input for one or both main-counter.

The PCI 1389-S02 has several additional parameters. With these parameters it is possible to change polarity of reset-inputs, change rotation direction, data aquisition on rising or falling edge and so on. So the card can be configured in most environments and applications without changes on wiring. Because of the RS422-inputs the card can be used in rough industrial environment.

5.1. Block diagram



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 interferences 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.

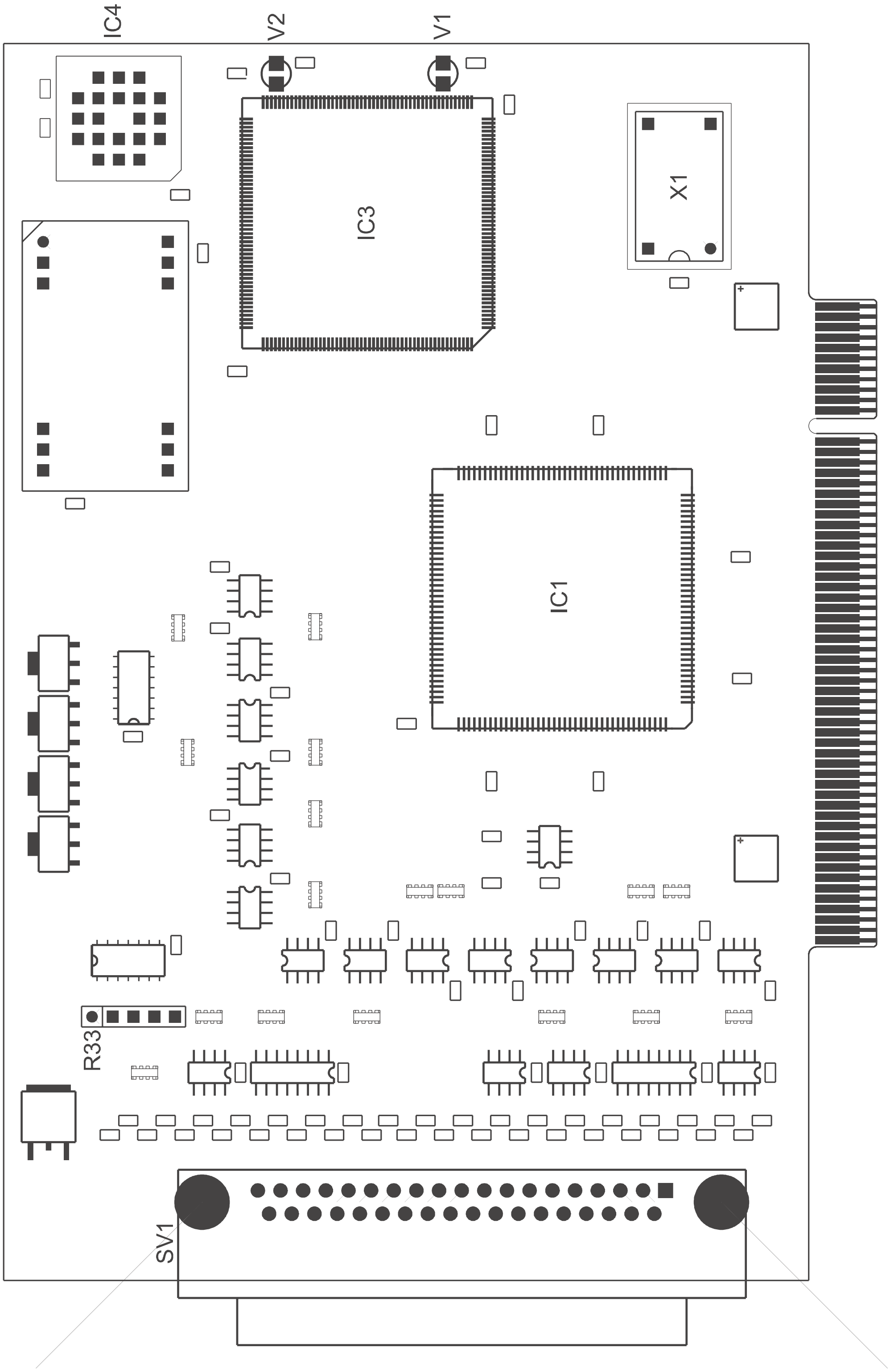
7. Installation

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 PCI 1389-S02 uses plug and play and so there is no need for any settings.

7.1.1. Component layout



7.1.2. Connection of encoders

The signals A, A#, B, B#, Z, Z# of the encoder must be connected to the card. The signals A#, B# und Z# are the inverted signals of A, B and Z. Because the PCI 1389-S02 uses RS422-receiver, the non inverting and the inverting signals have to be connected.

The input A (non inverting and inverting!) should be connected to encoder-output A (0°), the input B (non inverting and inverting!) to encoder-output B (90°). The input Z (non inverting and inverting!) could be connected to the zero-output of the encoder. The counter will then be reset at the index position of the encoder each turn. Alternativly the Z input could be connected to an external zero position of a machine or left open.

7.1.3. Connection of digital inputs

The PCI 1389-S02 contains 4 digital inputs. These inputs are highside driven and high-activ. The input circuit is build as voltage divider (100kΩ fixed resistor and R33).

7.1.4. Connection of digital outputs

The PCI 1389-S02 contains 4 digital outputs. These outputs are short circuit protected highside switches with a voltage range of 7 - 30 VDC.

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 inserting 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. The PCI 1389-S02 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 PCI1389-S02 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 95 / 98 / ME

Windows will recognize the new card and ask for the driver. The driver is on the disc within the directory Win9x.
ATTENTION: Windows 95 does not support PCI-SubvendorID. So you can’t use different cards with AMCC S5920Q. If that happens, please use Windows 98 instead.

7.5.2. Windows NT4.0

You have to start the program SETUP.EXE. The program is on the disc within the directory WINNT40. The program will install the driver and the DLL.

7.5.3. Windows 2000

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

7.6. Configure software

All example-programs are shipped as executable and source-code.

7.7. Test of the card

After installation the card could be tested. Therefor you can use the example-programs on the disc or the frontpanel-software.

8. The registers of the PCI 1389-S02

The PCI 1389-S02 uses 2 IO-address-ranges and 1 interrupt. Because of the plug-and-play of the PCI-bus these data should be found out for direct programming. Therefore functions of the BIOS has to be used like described in "PCI BIOS SPECIFICATION Revision 2.1" or later.

The PCI 1389-S02 uses a configuration space header type 00h. The datas could be found in the PCI-configuration space on BaseAddress0, BaseAddress1 and InterruptLine. With BIOS-functions the data could be read out of the configuration space. BaseAddress0 is used for the PCI-target controller, BaseAddress1 for the functions of the card.

If the PCI1389S02.DLL is used (described later), these informations are handled within the dll.

8.1. Counterregisters for Counter 1 and 2

Read

BaseAddress1 + 0	Read fifo of counter 1
BaseAddress1 + 4	Read fifo of counter 2

Write

BaseAddress1 + 0	Set counter 1 value
BaseAddress1 + 4	Set counter 2 value

The 32-Bit counter registers of counter 1 and 2 are used to read and write the counters. To set a counter value, the counter must be stopped! The counter values can only be read out of the fifo. Therefore the counter has to be triggered or latched.

8.2. Mode register

The mode register controls the modes of the PCI 1389-S02 and is used to start and stop the counters. Unused bits should be masked or set to 0. The bits are used as follows:

Read and write BaseAddress1 + 8

Bit 1 .. 0	Mode of counter 1 00 Incremental evaluation 1-fold 01 Incremental evaluation 2-fold 10 Incremental evaluation 4-fold 11 Event counting
Bit 3 .. 2	Trigger mode of counter 1 00 Softwaretrigger 01 Trigger on change of counting direction 10 Trigger on reference counter 11 Trigger on digital input 0
Bit 5 .. 4	Mode of counter 1 00 Inkremental evaluation 01 Inkremental evaluation 10 Time measuring (5 MHz) 11 Time measuring (10 MHz)
Bit 6	Direction of incremental counter 1 0 “normal" count direction 1 reverse count direction
Bit 7	Polariy of reset input of counter 1 0 High resets counter 1 Low resets counter
Bit 8	Counter 1 enable 0 Counter stopped 1 Counter started
Bit 9	Resetof counter 1 through reference counter enable 0 Disabled 1 Enabled
Bit 13 .. 12	Mode of counter 2 00 Inkremental evaluation 1-fold 01 Inkremental evaluation 2-fold 10 Inkremental evaluation 4-fold 11 Event counting
Bit 15 .. 14	Trigger mode of counter 2 00 Softwaretrigger 01 Trigger on changing the counting direction 10 Trigger on reference counter 11 Trigger on digital input 0
Bit 17 .. 16	Mode of counter 2 00 Inkremental evaluation 01 Inkremental evaluation 10 Time measuring (5 MHz) 11 Time measuring (10 MHz)

Bit 18	Direction of incremental counter 2 0 “normal" Direction 1 reverse direction
Bit 19	Polarity of reset input of counter 2 0 High resets counter 1 Low resets counter
Bit 20	Counter 2 enable 0 Counter stopped 1 Counter started
Bit 21	Reset counter 2 through reference counter enable 0 Disabled 1 Enabled
Bit 22	Trigger mode of digital input 0 0 Trigger on rising edge 1 Trigger on falling edge
Bit 27 .. 26	Mode of reference counter (Counter 4) 00 Inkremental evaluation 1-fold 01 Inkremental evaluation 2-fold 10 Inkremental evaluation 4-fold 11 Event counting
Bit 28	Direction of reference counter (Counter 4) 0 “normal" direction 1 reverse direction
Bit 29	Polarity of reset input of reference counter (Counter 4) 0 High resets counter 1 Low resets counter
Bit 30	Mode of reference counter (Counter 4) 0 Inkremental evaluation 1 Timer
Bit 31	Reference counter enable (Counter 4) 0 Counter stopped 1 Counter started

8.3. Status-/Latchregister

The status-/latchregister is used to latch the counters (softwaretrigger) and to inspect the status of the card.

Read BaseAddress1 + 12

Bit 0	Status “Counter 1 waiting”
Bit 1	Status “Counter 1 running”
Bit 2	Status “Counter 1 stopped”
Bit 3	Status “Counter 1 fifo not empty (data present)"
Bit 4	Status “Counter 1 fifo overflow (data lost)”
Bit 5	Status “Incremental step error on Counter 1 (missing increment)"
Bit 12	Status “Counter 2 waiting”
Bit 13	Status “Counter 2 running”
Bit 14	Status “Counter 2 stopped”
Bit 15	Status “Counter 2 fifo not empty (data present)"
Bit 16	Status “Counter 2 fifo overflow (data lost)”
Bit 17	Status “Incremental step error on counter 2 (missing increment)"
Bit 26	Status “Reference counter waiting”
Bit 27	Status “Reference counter running”
Bit 28	Status “Reference counter stopped”
Bit 29	Status “Incremental step error on Reference counter (missing increment)”

Write BaseAddress1 + 12

Bit 0	Latch counter 1 (store counter value in fifo)
Bit 1	Latch counter 2 (store counter value in fifo)

8.4. Interrupt-Enable-Register

The interrupt-enable-register is used to enable or disable some or all interrupt sources. Interrupts are enabled if the corresponding bit is set.

Read and write BaseAddress1 + 16

Bit 0	Interrupt if status changes to “Counter 1 running”
Bit 1	Interrupt if status changes to “Counter 1 stopped”
Bit 2	Interrupt if status changes to “Counter 1 fifo not empty"
Bit 3	Interrupt if fifo overflow on counter 1
Bit 4	Interrupt if incremental step error on counter 1
Bit 12	Interrupt if status changes to “Counter 2 running”
Bit 13	Interrupt if status changes to “Counter 2 stopped”
Bit 14	Interrupt if status changes to “Counter 2 fifo not empty"
Bit 15	Interruptif fifo overflow on counter 2
Bit 16	Interrupt if incremental step error on counter 2
Bit 22	Interrupt on changes at digital input 0
Bit 23	Interrupt on changes at digital input 1
Bit 24	Interrupt on changes at digital input 2
Bit 25	Interrupt on changes at digital input 3
Bit 26	Interrupt if status changes to “Reference counter running”
Bit 27	Interrupt if status changes to “Reference counter stopped”
Bit 28	Interrupt if incremental step error on reference counter
Bit 31	Global interrupt enable 0 All interrupts disabled 1 Interrupts enabled

8.5. *Interrupt-Status-Register*

The interrupt-status-register is used to get the source of an interrupt. All interrupts enabled or disabled are shown!

Read BaseAddress1 + 20

Bit 0	Status has changed to “Counter 1 running”
Bit 1	Status has changed to “Counter 1 stopped”
Bit 2	Status has changed to “Counter 1 fifo not empty"
Bit 3	Counter 1 fifo overflow
Bit 4	Counter 1 incremental step error
Bit 12	Status has changed to “Counter 2 running”
Bit 13	Status has changed to “Counter 2 stopped”
Bit 14	Status has changed to “Counter 2 fifo not empty"
Bit 15	Counter 2 fifo overflow
Bit 16	Counter 2 incremental step error
Bit 22	Digital input 0 changed
Bit 23	Digital input 1 changed
Bit 24	Digital input 2 changed
Bit 25	Digital input 3 changed
Bit 26	Status has changed to “Reference counter running”
Bit 27	Status has changed to “Reference counter stopped”
Bit 28	Reference counter incremental step error

8.6. *Reference register*

The reference register contains the time divider for timer mode of the reference counter. The maximum possible rate 20 kHz (divider = 1) will be divided by the programmed divider. Divider = 0 is not possible!

Read and write BaseAddress1 + 24

Bit 15 .. 0	Time divider for reference counter in timer mode

8.7. IO-register

The IO-register is used to set or read the status of the digital IO’s.

Read BaseAddress1 + 28

Bit 0	State of digital output 0 (read back)
Bit 1	State of digital output 1 (read back)
Bit 2	State of digital output 2 (read back)
Bit 3	State of digital output 3 (read back)
Bit 4	State of digital input 0
Bit 5	State of digital input 1
Bit 6	State of digital input 2
Bit 7	State of digital input 3

Write BaseAddress1 + 28

Bit 0	Set digital output 0
Bit 1	Set digital output 1
Bit 2	Set digital output 2
Bit 3	Set digital output 3

9. Programming

9.1. Programming under Windows 95/98/ME

For the programming under windows 95/98/ME the card comes with a appropriate driver. To keep the programming as easy as possible, all functions for the PCI 1389-S02 are placed in a dll. So there is no need to program the PCI 1389-S02 directly.

This dll contains 2 types of functions. At first there are low-level function which can be used to handle the cards register. The second set of functions are high-level functions. These high-level functions are using a bigger software-fifo to handle higher trigger rates.

The PCI1389S02.DLL should be copied out of the corresponding driver directory into the system folder or the project folder of the application.

9.2. Programming under Windows NT4.0/2000

For the programming under windows NT4.0/2000 the card comes with a appropriate driver. To keep the programming as easy as possible, all functions for the PCI 1389-S02 are placed in a dll. So there is no need to program the PCI 1389-S02 directly.

This dll contains 2 types of functions. At first there are low-level function which can be used to handle the cards register. The second set of functions are high-level functions. These high-level functions are using a bigger software-fifo to handle higher trigger rates.

The PCI1389S02.DLL should be copied out of the corresponding driver directory into the system folder or the project folder of the application.

9.3. Programming via the PCI1389S02-DLL

The DLL PCI1389S02.DLL provides the basic and the extended functions for the work with the PCI 1389-S02. The low-level and high-level functions should not be mixed, because this can result in mistakes. The return value of all functions will show an incorrect execution if a 0 is returned. The function GetLastError can be used to get a more detailed error message. Programs designed for PCI1389S02-DLL can be used on Windows 9x/ME and also on NT 4.0/2000, if the corresponding DLL is used.

General functions of the dll's:

- *char PCI1389S02_InitDriver (void);*
  This function will initialise the dll and the cards. It has to be called once before the use of all other dll-functions.

- *char PCI1389S02_DeInitDriver (void);*
  This function will reset the dll and the cards. It has to be called once at the end of the application.

- *char PCI1389S02_GetCardCount (unsigned char *Anzahl);*
  This functions returns the number of installed PCI 1389-S02. Driver and dll can handle up to 4 cards.

- *int PCI1389S02_GetLastError (unsigned char Card);*
  This function will show the last happened error. Possible values can be seen in PCI1389S02.H.

Low-level-functionsare using the register-values as parameters. The following functions are implemented:

- *char PCI1389S02_WriteCNT1 (unsigned char Card, unsigned long Value);*

- *char PCI1389S02_ReadCNT1 (unsigned char Card, unsigned long *Value);*

- *char PCI1389S02_WriteCNT2 (unsigned char Card, unsigned long Value);*

- *char PCI1389S02_ReadCNT2 (unsigned char Card, unsigned long *Value);*

- *char PCI1389S02_WriteMode (unsigned char Card, unsigned long Mode);*

- *char PCI1389S02_ReadMode (unsigned char Card, unsigned long *Mode);*

- *char PCI1389S02_ReadStatus (unsigned char Card, unsigned long *State);*

- *char PCI1389S02_Latch (unsigned char Card, unsigned char Flags);*

- *char PCI1389S02_WriteIntEn (unsigned char Card, unsigned long IEN);*

- *char PCI1389S02_ReadIntEn (unsigned char Card, unsigned long *IEN);*

- *char PCI1389S02_ReadIntStat (unsigned char Card, unsigned long *IStat);*

- *char PCI1389S02_WriteRef (unsigned char Card, unsigned short Value);*
- *char PCI1389S02_ReadRef (unsigned char Card, unsigned short *Value);*
- *char PCI1389S02_WriteIO (unsigned char Card, unsigned char Value);*
- *char PCI1389S02_ReadIO (unsigned char Card, unsigned char *Value);*

These functions and their values correspond to the direct programming.
The use of the low-level-functions can disturb the work of the high-level-functions. For example if the counter value is read with PCI1389S02_ReadCNT1 the value is not inserted into the software-fifo of the dll!

The **high-level-functions** are using other parameters as the low-level-functions! This is used for easier programming. The used parameters and structures can be seen in the file PCI1389S02.H. The following functions are implemented:

- *char PCI1389S02_SetMode (unsigned char Card, struct _PCI1389S02_MODE *Mode);*
  This functions will set the mode of the counters with a single call. To keep the programming easy, all possible values are predefined and kept the same for all counters. Which value can be used for which counter can be seen in the file PCI1389S02.H. The values can be ORed together.

- *char PCI1389S02_GetMode (unsigned char Card, struct _PCI1389S02_MODE *Mode);*
  This function will read the modes of the card. See PCI1389S02_SetMode for explanation of the parameters.

- *char PCI1389S02_SetTimeOuts (unsigned char Card, struct _PCI1389S02_TO *TimeOuts);*
  This function will set the timeouts of the card. The timeout can be enabled separatly for each counter (Enable != 0) and can hold different values for each counter. The timeouts will work after the start of the counter.

- *char PCI1389S02_GetTimeOuts (unsigned char Card, struct _PCI1389S02_TO *TimeOuts);*
  Read back the timeout values.

- *char PCI1389S02_StartCounter (unsigned char Card, unsigned char Flags)*;
  This function will start the counters. The counters can be started separatly or together if ORed. See file PCI1389S02.H.

- *char PCI1389S02_StopCounter (unsigned char Card, unsigned char Flags);*
  This function will stop the counter. As described in StartCounter, the counters can be stopped separatly or together.

- *char PCI1389S02_GetStatus (unsigned char Card, struct _PCI1389S02_STAT *Status);*
  This function reads the state of all 3 counters. The meaning of the bits can be seen in the file PCI1389S02.H.

- *char PCI1389S02_GetCNT1Values (unsigned char Card, long (*buffer)[], unsigned long buffersize, unsigned long *n);*
  This function will read counter-values out of the fifo. If no values are saved, n will be set to 0. If values are read, n will show the amount of values (not bytes!).

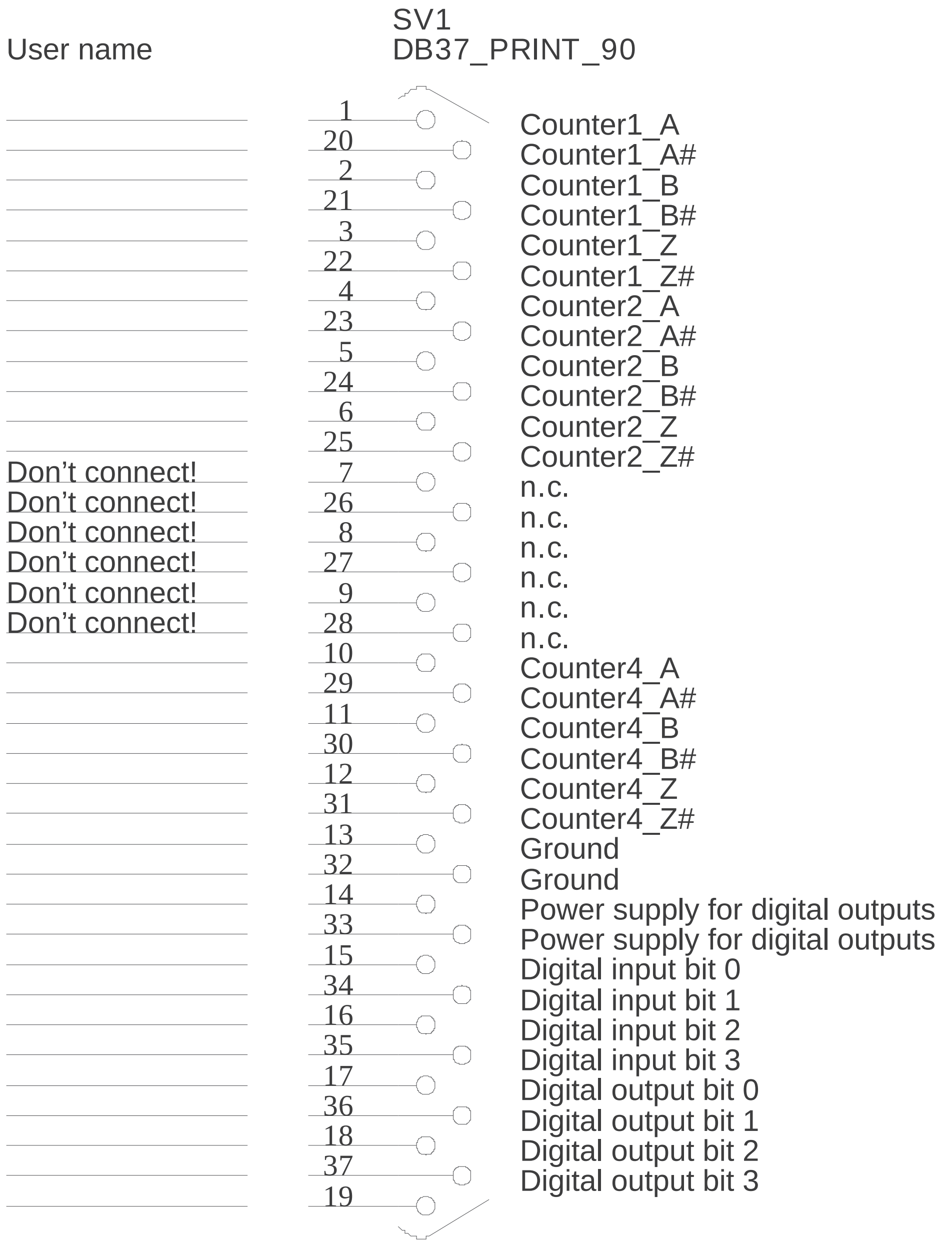
- *char PCI1389S02_GetCNT2Values (unsigned char Card, long (*buffer)[], unsigned long buffersize, unsigned long *n);*
  See function GetCNT1Values, but used for counter 2.

- *char PCI1389S02_LatchCounter (unsigned char Card, unsigned char Flags);*
  This function will latch the counters if softwaretrigger is enabled. The counters can be latched separately or together.

- *char PCI1389S02_SetPorts (unsigned char Card, unsigned char Flags);*
  This function will set the digital outputs (bit 3 to 0).

- *char PCI1389S02_GetPorts (unsigned char Card, unsigned char *Flags);*
  This function will read the digital inputs (bit 7 to 4) and will read back the digital outputs (bit 3 to 0).

10. Pin assignment



User name	SV1 DB37_PRINT_90	
	1	Counter1_A
	20	Counter1_A#
	2	Counter1_B
	21	Counter1_B#
	3	Counter1_Z
	22	Counter1_Z#
	4	Counter2_A
	23	Counter2_A#
	5	Counter2_B
	24	Counter2_B#
	6	Counter2_Z
	25	Counter2_Z#
Don’t connect!	7	n.c.
Don’t connect!	26	n.c.
Don’t connect!	8	n.c.
Don’t connect!	27	n.c.
Don’t connect!	9	n.c.
Don’t connect!	28	n.c.
	10	Counter4_A
	29	Counter4_A#
	11	Counter4_B
	30	Counter4_B#
	12	Counter4_Z
	31	Counter4_Z#
	13	Ground
	32	Ground
	14	Power supply for digital outputs
	33	Power supply for digital outputs
	15	Digital input bit 0
	34	Digital input bit 1
	16	Digital input bit 2
	35	Digital input bit 3
	17	Digital output bit 0
	36	Digital output bit 1
	18	Digital output bit 2
	37	Digital output bit 3
	19	

Figure 1

Figure 1 shows the pin assignment of the 37- SUB-D-female connector of the PCI 1389-S02.

11. 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.

- The LED’s V1 and V2 will show the state of the FPGA. If both are off after booting, this will show an error of IC3 (FPGA). If V1 keeps on after booting while V2 is off, this will show an error on the PROM (IC4). If that happens, you have to send the card for repair.

- The input voltage should be verified. On 5 V-input the switching level is at 4 V, so the 5 V-inputs are not TTL compatible! R33 can be used to vary the switching level.

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.

12. Technical datas

The technical datas are maximum operating conditions. Exceeding these conditions can result in damage on PCI 1389-S02 and all connected components.

RS422-Ports	: 4 bidirectional 8 unidirectional
Isolation voltage	: 500 V DC
Outputs	: 4 digital outputs, highside switches
Output voltages	: 7 - 30 V DC
Output current	: max. 1A (current limited to about 1,5 A)
Isolation voltage	: 500 V DC
Inputs	: 4 digital inputs, high-activ
Input voltage	: 5 V
Input resistance	: > 100 kΩ
Isolation voltage	: 500 VDC
Connectors	: 37-SUB-D-female
EMC	: corresponding to 89/336/EWG
Operating temperature	: 0 to 40 °C
Storage temperature	: -25 to +85°C
Dimensions	: 200 x 113 mm

13. Ordering information

PCI 1389-S02

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