Ramses I V3

User's Manual

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1. Introduction

RAMSES I V3 is a very powerful framegrabber, to upgrade a customary in trade personal computer with PCI-interface, Compact PCI-systems and industry computer in PC104+ size to a workstation for image processing.

This product with its proven technology of the previous versions Pictureboy and RAMSES I V2, was developed further and optimized, to ensure best image quality and to allow many fields of application.

The RAMSES-card is an active framegrabber, which means the board is equipped with a microcontroller and FPGA in addition with very fast synchronous SRAM to allow extensive image processing onboard. So application with many images per second can be served and the potential for reduction of date can be used in an optimal manner. Due to the two completely independent input-channels (no multiplexing) and the parallel video-data processing, you can build applications with one or to monochrome/colour cameras or with multi-tap-cameras. In addition 3D-applications are also possible, where it is necessary to process data of two cameras together.

Over the PCI-bus the image data, possibly pre-processed, can be transferred to host-memory very quickly, without using the host's cpu. Then a PC-based vision application can go on with processing this data. Additional you can connect the RAMSES-board with a CAN-field bus, to communicate directly with PLCs, independent from the host PC. This offers the possibility to use this board as well for evaluation purposes in the development process, as for PC-based vision applications in production environments.

Many operation ranges are possible, like

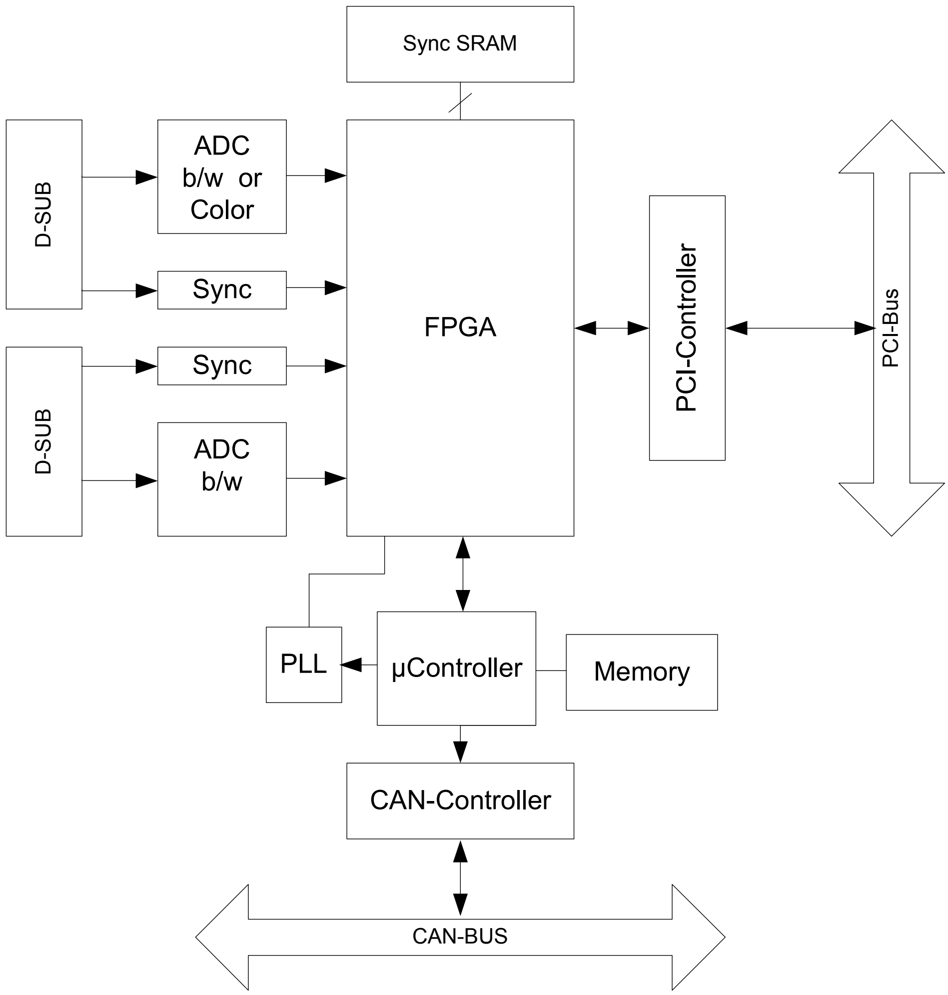
- ♦ Measurement and position detection
- ♦ Medicine, microscopy and structure analysis
- ♦ Optical inspections and security
- ♦ Quality assurance

This board can be adapted to your needs quickly and inexpensively. At this, the company Feith Sensor to Image likes to advise and help to realize an optimal application.

2. Functionality and technical Properties

2.1. Functionality

The working of RAMSES I V3 in general, is being explained with the following block diagram.

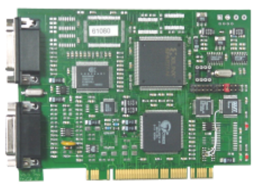


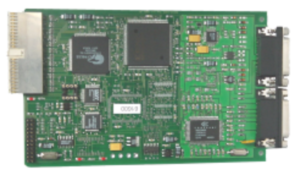
The analogue video signals of the cameras come to the board via the two DSUB-connectors. There they will be digitized independent from each other and therefore in a parallel manner. In addition the camera's control signals can be used. With the FPGA the image date can be (pre-)processed. The µController is used for card specific functions, camera-control, control of image transfer and as a helper for the host CPU. Because Windows is not a real-time operating system many time critical tasks can be done by the onboard controller. Via PCI-chip the possibly pre-processed data will be transferred into a reserved memory area of the PC, where they can be processed further on. Because of allocating the memory as an unfragemented block, no wasteful mappings of logical memory to physical memory are necessary. To expand the integration capabilities, it is possible to connect the vision system with a CAN-bus via the CAN interface, to communicate directly with systems, which are involved in the production process.

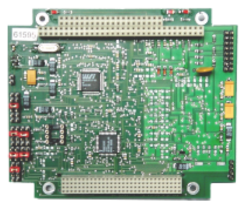
2.2. Technical Facts

- Color and monochrome framegrabber for high resolution industrial image processing
- Analog and digital camera interfaces
- PAL/NTSC, progressive scan, line scan-cameras and further individual camera-adjustments
- Video and sensor connection via 15-pole DSUB socket
- Firmware- and FPGA-update directly in the system
- Realtime image processing with onboard FPGA and 2MB of synch. SRAM
- Driver software and programming library available for Windows and Linux
- FIFO-Interface to the PCI-bus with capacity of 16kByte (optional 2-32kByte)
- Onboard µcontroller delivers 4 external TTL-IO-control circuits per channel and serves as sensorcontroller and communication interface to the PC.
- 10-bit A/D converter operating at 30MHz
- Power requirements: +5V/1A, +12V for CCD-camera
- RAMSES I V3 is completely compatible with PCI/V2.1
- Up to 5 boards per PC

Features of the different board variants







	PCI	Compact PCI	PC104+
Video IN (alternativ)	B/W 2 + Color 0 B/W 1 + Color 1	B/W 2 + Color 0 B/W 1 + Color 1	B/W 1 + Color 0 B/W 0 + Color 1
Data Transfer	approx. 100 MB/s	approx. 100 MB/s	approx.100 MB/s
Interfaces:			
• **RS 485**	yes	yes	no
• **RS 232**	yes	yes	yes
• **LVDS**	In + Out	In + Out	In
• **CameraLink**	In design	In design	In design
• **CAN-Bus**	yes	yes	no
Camera type	all	all	all
I/O	4 per channel	4 per channel	4
2 CCD the same time	yes	yes	no
Resolution	10 Bit	10 Bit	10 Bit
Shades of gray	1024 oder 256	1024 oder 256	1024 oder 256
Temperature range	0 – 70 °C	0 – 70 °C	0 – 70 °C
Dimension	104 x 144 mm	3HU	116 x 98 mm

3. Setup

Following components are delivered:

- ♦ PCI-board RAMSES I V3 for standard PCs

or

- ♦ Compact PCI board RAMSES I V3 for Compact 19“ chassis

or

- ♦ PC104+ PCI board for space saving industrial PCs in PC104+ formfactor

- ♦ Manual
- ♦ Cable for camera
- ♦ 3½“-floppy disc

Notice the system requirements:

- ♦ min. Pentium 100 MHz with 32MByte SVGA
  One PCI-Slot for Ramses I V3
- ♦ Microsoft Windows Version 98/ME/NT/2000/XP

- ♦ Advice: Pentium III/600, 512MB with Windows 2000/XP

In general: The faster your PC-system, the greater will be the performance of the vision system.

3.1. Hardware-Setup

The setup is dependent on formfactor of the used RAMSES I V3 – board. Do the following steps during the hardware setup:

3.1.1. PCI

- ♦ Power down PC and remove cover.
- ♦ Plug PCI Ramses I V3 board into a PCI-slot and screw on.
- ♦ Mount cover.
- ♦ Connect camera with PCI-board.
- ♦ Power on PC

3.1.2. Compact PCI

- ♦ Power down PC and remove cover.
- ♦ Plug Compact PCI Ramses I V3 board into a PCI-slot and screw on.
- ♦ Mount cover.
- ♦ Connect camera with PCI-board.
- ♦ Power on PC

3.1.3. PC104+

- ♦ Power down PC and remove cover.

◆ Plug PCI Ramses I V3 board onto the motherboard or above and screw on.
◆ Configure the jumper (see appendix)
◆ Connect camera with PCI-board.
◆ Mount cover.
◆ Power on PC

3.2. Driver-Installation

3.2.1. Windows 98/ME/2000/XP

If you work with Windows 98/ME/2000/XP, following steps have to be done:

◆ Windows automatically detects the new PCI-board.
◆ Your are asked to install the driver for the PCI-board.
◆ Put in the delivered floppy or CD.
◆ Then choose the file RA1V3.INF in the folder Win98_ME_2000_XP and start the installation.
◆ Finally Windows has to be rebooted.

3.2.2. Windows NT

If you work with Windows NT 4.0, following steps have to be done:

◆ Run \WinNT\setup.exe from floppy or cd.
◆ Confirm with OK.

Finally Windows has to be rebooted.

Important Note

During Windows start-up the device driver for RAMSES I V3 (Ra1v3.sys) will be started. He allocates continuous memory, to save the grabbed image data. If it was allocated later, memory is fragmented, what slows down performance. Therefore after each change of memory buffer a reboot is required.

4. Sampleapplication for Windows

4.1. Installation

The delivered application software consists of source files and the compiled version, called VisionAppDemo.

1. Installation of the framegrabber and the driver (see chapter 3)
2. Make a directoy like c:\program files\VisionApplication
3. Copy the content of the folder SDK of the delivered disc into that folder.

4.2. Framegrabber Test

With the application VisionAppDemo.exe you can test the functions of the framegrabber.

At start-up following errors can occur:

Error	Action
1:PCI BIOS not present	PC-vendor / contact Feith
2:DEVICE ID not found	Check Ramses I V3 board (contact Feith)
3:Wrong Vendor ID	Check Ramses I V3 board (contact Feith)
4:Reset Controller not active	Shutdown Windows , power off PC and restart
5:Memory not allocated	Check registry-keys. See appendix
10:Board already initialized	Start application only once, possibly reboot Windows

4.3. Sourcefiles

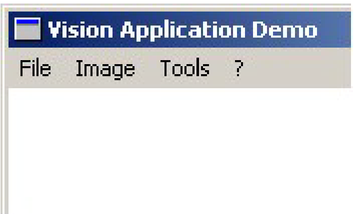
The program *Vision Application Demo* consists of following source files:

File	Function
VisionApplication.c	Routines of the main program
VisionApplication.h	Headerfile for VisionApplication.c
Grabber.c	Routines to realize image grabbing and display
Grabber.h	Headerfile for Grabber.c
VisionApplication.rc	Ressourcefile
Ra1V3.lib	Link-library
Ra1V3.h	Headerfile for the function library
Ra1V3.dll	The dll contains the function library and is copied into the system32-directoy, during driver setup.
VisionAppDemo.exe	Compiled application

4.4. Description of the sample application

The program is designed quite simple and uses a menu and different scrollbars to control the framegrabber.

The application menu consists of three main entries, File – Image and Tools



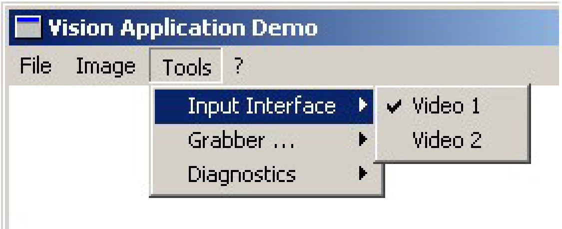
With File – Exit you can quit the program.

Image is responsible for starting and stopping the grab.

In addition the image can be inverted using the look-up table and saved to disc. Press Clear to reset the image, by setting all pixels to i.e. 255, meaning white, what seems to be a deletion of the last image.

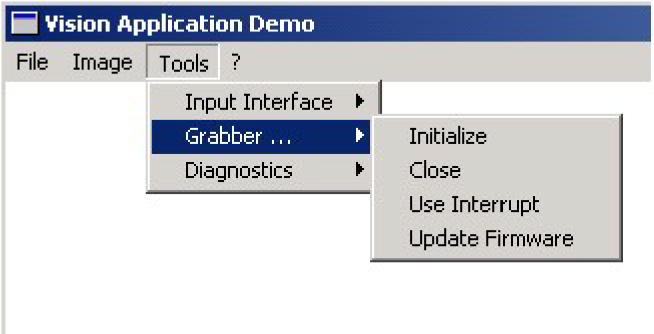
In Tools there is access to different control and diagnostic commands.

In Input Interface the used video-in is marked and can be set.

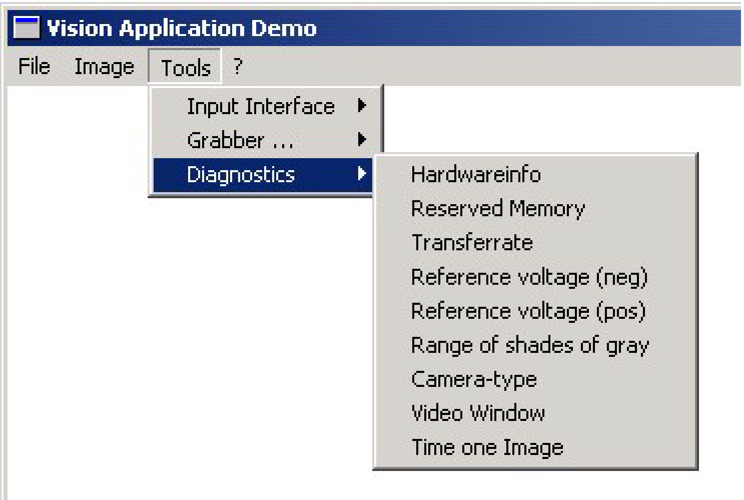


Through Grabber the PCI-board can be initilized and closed. In addition it is possible to use interrupts fpr communication purposes. This reduces cpu-load. Update Firmware is provided for updating the framegrabber's firmware.

Attention: Incorrect usage of the update-function can make the board unusable!



Diagnostics provides different information on the card and the connected camera:



Hardwareinfo displays soft- and hardwaredata of the used Ramses PCI-board.

Reserved Memory returns the amount of allocated memory.

Transferrate detects the current Transfer rate between PC and framegrabber. The value is dependent on the PC motherboard, other used PCI-boards and the system's load.

Reference voltage (neg) returns the negative reference voltage of the AD-converter.

Reference voltage (pos) returns the positive reference voltage of the AD-converter.

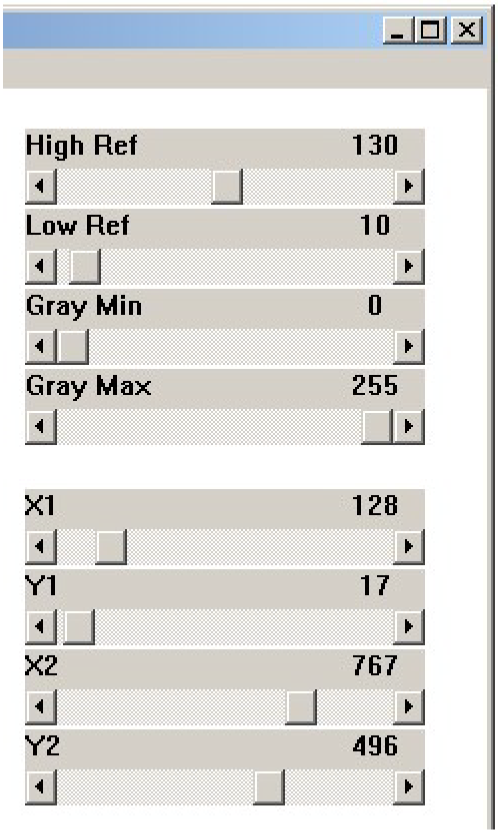
Range of shades of gray displays the returns the shades of gray settings of the AD-converter.

Camera-type returns an identification of the cameratype, connected with the current video-in. (see libraryfunction get_camera_type)

Video Window returns the current video window's coordinates.

Time one Image returns the time used to grab an image. Works only after grabbing images.

With the different scroll-bars the behaviour of the AD-converter can be controlled:



High Ref changes the positive reference voltage of the AD-converter.

Low Ref changes the negative reference voltage of the AD-converter.

Gray min sets the minimal value of the shades of gray, generated by the AD-converter.

Gray max sets the maximal value of the shades of gray, generated by the AD-converter.

With X1,Y1; X2,Y2 the video window can be set.

5. Function Library

In this chapter the different functions of the RA1V3.DLL are explained in alphabetic order. Following example shows the function description:

Sample function

Function: A short description of the function.

Syntax: The function's syntax description in C/C++.

Description: This section contains the job and the usage of the function. Also the parameters are descripted.

Return: Here you find the type and range of the return values.

Reference: List of other routines, which have a relationship with the current function.

Note
A sample how to program the Ramses I V3 board is found in the source files of the sample application VisionAppDemo. See chapter 4

The functions marked as intern, are not used in application development normally. But they are used by other functions and special custom commands.

5.1. General Functions

clear_irq

Function: Deactivates interrupthandler

Syntax: `BYTE clear_irq(BYTE card_nr);`

Description: This function deactivates the interrupthandler for the given card.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return: 0: Success
1: Deactivation not possible

close_ramses1

Function: Close Ramses I V3

Syntax: `BYTE close_ramses1(BYTE card_nr);`

Description: When a card was initialized with the function init_ramses1(), it has to be closed by this function. With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return: 0: Success
10: Card was not initialized

Reference: init_ramses1

get_hardware_info

Function: Returns information about the hardware.

Syntax: BYTE `get_hardware_info(BYTE card_nr, BYTE *sw_m, BYTE *sw_y,BYTE *hw_mode,BYTE *hw_submode, BYTE *hw_fpga);`

Description: This function returns information about the soft- and hardware using the parameter sw_m, sw_y, hw_mode and hw_fpga. With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

sw_m :	Software Release	Month	
sw_y:	Software Release	Year	
hw_mode:	Hardware Mode	0	= Area scan cameras
		1	= Line scan cameras
		>128	= Custom specific
hw_submode:	Hardware Sub-Mode	0	= Standard
		>0	= Custom specific
		255	= no start-up made
hw_fpga:	FPGA Module	50	= X2S50
		100	= X2S100
		150	= X2S150
		200	= X2S200

Return: 0: Success
1: Command & parameter not send, error while sending
2: No data fetched
10: Card not initialized

get_memory_size

Function: Returns the size of reserved memory.

Syntax: `BYTE get_memory_size(BYTE card_nr, DWORD *mem_size);`

Description: This functions returns the size of allocated memory in the variable mem_size zurück.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return: 0: Success
1: No memory allocated
10: Card not initialized

get_pixel_adr (intern)

Function: Return physical address of a memory page.

Syntax:
```
BYTE get_pixel_adr(BYTE card_nr, BYTE page, DWORD
*phy_adr);
```

Description: This functions returns the physical address of the memory pages, given in page.

The page count is dependent on the size of allocated memory. One page needs 64 KB.

Calculation of the pages:
You find the size of allocated memory (in byte) in the registry.
(see appendix *Registry Keys*)
The division of this value through 64 kbyte delivers the count of pages.
If the memory size of card 1 has to be changed, the new value has to be written to MemSize1. Then restart Windows.

With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return:
0: Success
1: Referred page does not exist.
10: Card not initialized

get_pixel_ptr

Function: Returns address of memory page.

Syntax:
```
BYTE get_pixel_ptr(BYTE card_nr, Byte page, DWORD
*ptradr);
```

Description: This functions returns the logical address of the memory pages, given in page. With the pointer there is access to the pixeldata.

The page count is dependent on the size of allocated memory. One page needs 64 KB.

Calculation of the pages:
You find the size of allocated memory (in byte) in the registry.
(see appendix *Registry Keys*)
The division of this value through 64 kbyte delivers the count of pages.
If the memory size of card 1 has to be changed, the new value has to be written to MemSize1. Then restart Windows.

With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Example:
```
get_pixel_ptr(1,0, &ptradr);
GPixel = (BYTE *)ptradr;
```

Return: 0: Success
1: Referred page does not exist.
10: Card not initialized

get_transfer_rate

Function: Get the mainboard's data transferrate

Syntax: `BYTE get_transfer_rate(BYTE card_nr, float *rate);`

Description: This function returns the motherboard's transferrate over the pci-bus. Result value is given in the variable rate in Mbyte/s.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return: 0: Success
1: Command & parameter not send, error while sending
2: No data fetched
10: Card not initialized

init_ramses1

Function: Initialize PCI-board Ramses1

Syntax: `BYTE init_ramses1(BYTE card_nr);`

Description: This function initializes the board. It will be checked if there is a PCI-BIOS, then the Device ID, the Reset Controller and the video-ins are tested.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return: 0: Success
1: PCI BIOS not present
2: DEVICE ID not present
3: Wrong Vendor ID
4: Microcontroller does not respond
5: Memory not allocated
10: Card already initialized.

Reference: close_ramses1

pci_read_byte (intern)

Function: Read one BYTE from PCI-controller

Syntax: `BYTE pci_read_byte(BYTE card_nr, WORD offset);`

Description: Reads one BYTE at the offset from PCI-controller.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return: Read BYTE

Reference: pci_read_word, pci_read_dword, pci_write_byte, pci_write_word, pci_write_dword

pci_read_word (intern)

Function: Read one WORD from PCI-controller

Syntax: `WORD pci_read_word(BYTE card_nr, WORD offset);`

Description: Reads one WORD at the offset from PCI-controller.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return: Read WORD

Reference: pci_read_byte, pci_read_dword, pci_write_byte, pci_write_word, pci_write_dword

pci_read_dword (intern)

Function: Read one DWORD from PCI-controller

Syntax: `DWORD pci_read_dword(BYTE card_nr, WORD offset);`

Description: Reads one DWORD at the offset from PCI-controller.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return: Read DWORD

Reference: pci_read_byte, pci_read_word, pci_write_byte, pci_write_word, pci_write_dword

pci_write_byte (intern)

Function: Write one BYTE to PCI-controller

Syntax: `void pci_write_byte(BYTE card_nr, WORD offset, BYTE value);`

Description: Writes one BYTE at offset to the PCI-controller. The value to be written is given in value.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return: ----

Reference: pci_read_byte, pci_read_word, pci_read_dword, pci_write_word, pci_write_dword

pci_write_word (intern)

Function: Write one WORD to PCI-Controller

Syntax:
```
void pci_write_word(BYTE card_nr, WORD offset, WORD value);
```

Description: Writes one WORD at offset to the PCI-Controller. The value to be written is given in value.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return: ----

Reference: pci_read_byte, pci_read_word, pci_read_dword, pci_write_byte, pci_write_dword

pci_write_dword (intern)

Function: Write one DWORD to PCI-controller

Syntax:
```
void pci_write_dword(BYTE card_nr, WORD offset, DWORD value);
```

Description: Writes one DWORD at offset to the PCI-controller The value to be written is given in value.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return: ----

Reference: pci_read_byte, pci_read_word, pci_read_dword, pci_write_byte, pci_write_word

receive

Function: Receive data from Ramses board

Syntax:
```
BYTE receive(BYTE card_nr, DWORD *pptr);
```

Description: This function reads DWORD data from Ramses' PCI-controller. With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5)

Return:

0...127:	Count of DWORDs, written in pptr
128:	no answer
130:	Card not initialized

receive_fast

Function: Receive DWORD from Ramses board

Syntax:
```
BYTE receive_fast(BYTE card_nr);
```

Description: This function reads one DWORD from Ramses' PCI-controller and return the first byte.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).
This function is used in conjunction with the grabb-functions. The return value indicated, whether the grabb was successful.

Return:
0: Success
1: Error during transferring data over the PCI - bus
8: Timeout
10: Card not initialized

Reference: grabb_image_full, grabb_image_half

receive_status

Function: Check if there are data from Ramses board

Syntax: `BYTE receive_status(BYTE card_nr);`

Description: With this function is checked, whether there are data from Ramses board.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return:
0: no answer
1: answer
10: Card not initialized

set_irq

Function: Activates interrupthandler

Syntax: `BYTE set_irq(BYTE card_nr);`

Description: This function activates the interrupthandler for the given card.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return:
0: Success
1: Activation not possible

Reference: clear_irq, set_irq_event, grabb_image_half, grabb_image_full

set_irq_event

Function: Submit eventobject to driver

Syntax: `BYTE set_irq_event(BYTE card_nr, ULONG Event);`

Description: This function submits an eventobject to the driver, which is set, when an interrupt occurs. So it is possible to wait for the grabb without polling a CPU-load.

Event is the prior created eventobject
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Example:

```
hEvent = CreateEvent    (NULL, //Security Setting
                         FALSE, //auto reset
                         FALSE, //initial state non-signaled
                         NULL); //name string
error = set_irq_event(CARD, hEvent);
```

Return:
0: Success
1: Command & parameter not send, error while sending
10: Card not initialized

Reference: grabb_image_half, grabb_image_full, set_irq, clear_irq

send_val (intern)

Function: Send data to Ramses-board

Syntax:

```
BYTE send_val(BYTE card_nr, BYTE cmd, BYTE cnt DWORD *pptr);
```

Description: With this function parameter and command are sent to the Ramses-board.

The command is found in cmd.
The count of parameters is set in cnt.
The parameters itself are accessible through the pointer pptr
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Example:

```
error = send_val(card_nr,
                 cmd,
                 cnt,
                 pptr);
```

Return:
0: Success
1: Command & parameter not send, error while sending
10: Card not initialized

set_memory_size

Function: Change memory size to allocate

Syntax:

```
BYTE set_memory_size(BYTE card_nr, DWORD mem_size);
```

Description: With this function the memory size to allocate is set. Parameter mem_size contains the new size in byte. After this command, Windows has to be rebooted.

With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return: 0: Success
1: Command & parameter not send, error while sending
10: Card not initialized

update_firmware

Function: Update firmware of the Ramses board

Syntax:
```
BYTE update_firmware(BYTE card_nr, char *fname,
CALLBACK_FUNC c_func);
```

Description: This function updates the firmware of the Ramses I V3 – board.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).
fname is a pointer to the update file (*.bin)
With the callback-function, it is possible to realize a monitoring function.

Example:

```
BYTE WINAPI callback_func(int s_cnt)
{
      char l_str[100];
      sprintf(l_str,"%d %%",s_cnt);
      SetDlgItemText(StatusHWND, IDC_STATUS, l_str);

      SendDlgItemMessage(StatusHWND, IDC_PROGRESS1,
      PBM_SETPOS, (WPARAM)s_cnt, 0);
return(0);
}
```

Return: 0: Success
1: Timeout reset hardware
2: Programming not ready
3: Memory cannot be erased
4: Programmer file is missing
5: Programmer file is too small
6: Timeout on PCI-board
7: Data error while transferring data to PCI-board
8: Programming error in local flash
10: Card not initialized

Attention: If the update fails, the board could be unusable and has to be sent to the vendor. Only firmware files, delivered from Feith, are allowed to be flashed!

5.2. Area scan camera functions

get_ad_nref

Function: Returns the negative reference voltage of the AD converter.

Syntax: `BYTE get_ad_nref(BYTE card_nr, BYTE *ref);`

Description: Returns the negative reference voltage of the current video-in's AD converter via the parameter ref.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return:
0: Success
1: Command & parameter not send, error while sending
2: No data fetched
10: Card not initialized

Reference: set_ad_nref, get_ad_pref,set_ad_pref

get_ad_pref

Function: Returns the positive reference voltage of the AD converter..

Syntax: `BYTE get_ad_pref(BYTE card_nr, BYTE *ref);`

Description: Returns the positive reference voltage of the current video-in's AD converter via the parameter ref.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return:
0: Success
1: Command & parameter not send, error while sending
2: No data fetched
10: Card not initialized

Reference: set_ad_nref, get_ad_nref,set_ad_pref

get_ad_range

Function: Read the AD-converter's range of the shades of gray

Syntax: `BYTE get_ad_range(BYTE card_nr, BYTE *gray_min, BYTE *gray_max);`

Description: This function return the minimal (gray_min) and maximal (gray_max) value of gray of the current video-in's AD-converter in the range of 0..255.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return:
0: Success
1: Command & parameter not send, error while sending

2: No data fetched
10: Card not initialized

Reference: set_ad_range, get_ad_nref, get_ad_pref

get_camera_type

Function: Returns detected or set camera

Syntax: `BYTE get_camera_type(BYTE card_nr, BYTE *cam_type);`

Description: Returns the detected or set camera via the parameter cam_type.
cam_type 0 = PAL
1 = NTSC
2 = XC55
3 = Jai-M1
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).
Before executing, the function video_present has to be called.

Return:
0: Success
1: Command & parameter not send, error while sending
2: No data fetched
10: Card not initialized

Reference: video_present

get_inlut

Function: Read input lookup table

Syntax: `BYTE get_inlut(BYTE card_nr,BYTE tindex, BYTE *tval);`

Description: This function reads one value of the lookup-table of the current video-in from the FPGA.
Parameter tindex is the table-index to read from. Valid indexes are from 0 to 255.
In tval the selected table-value is written
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return:
0: Success
1: Command & parameter not send, error while sending
2: No data fetched
10: Card not initialized

Reference: set_inlut; set_video_input, get_video_input

get_video_window

Function: Gets the coordinates of the present video-window.

Syntax:
```
BYTE get_video_window(BYTE card_nr, WORD *x1, WORD
*y1, WORD *x2, WORD *y2);
```

Description: Gets the coordinates of the current video-in's video-window and stores them in the following parameters:
x1, y1: coordinate of the upper left corner
x2, y2: coordinate of the lower right corner

Example:
```
get_video_window(1,&x1,&y1,&x2,&y2);
Width = x2 - x1 + 1;
Height = y2 - y1 + 1;
```

With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return:
0: Success
1: Command & parameter not send, error while sending
2: No data fetched
10: Card not initialized

Reference: set_video_window

get_video_input

Function: Return current video-in

Syntax: `BYTE get_video_input(BYTE card_nr, BYTE *video_in);`

Description: Read current video-in of the Ramses I V3 – board and write it with the values 0, 1 in the variable video_in.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return:
0: Success
1: Command & parameter not send, error while sending
2: No data fetched
10: Card not initialized

Reference: set_video_input

grabb_image_full

Funktion: Grab an image from an interlaced camera and store it to PC-memory

Syntax: `BYTE grabb_image_full(BYTE card_nr, BYTE page, BYTE lflag);`

Beschreibung: Grab an image from an interlaced camera at the current video-in and store it to PC-memory. The PC-memory is reserved during Windows-start-up from the Ramses driver.
With parameter page is controlled, in which memory page the image is stored.
If the function set_irq is called before, after the transfer of the image to PC-memory an interrupt will be generated. When working with

interrupts, it is possible to wait on the interrupt with an eventobject and the API-function WaitForSingleObject. During this time the running thread is not running and so it needs no CPU-power.
The parameter lflag controls whether to wait until the command finishes (lfalg=0) or not. (lfalg=1). Then the calling routine gets back the flowcontrol and must check with receive_fast(), whether the grab returns errors or has finished. Lflag should be always 0 and is only set to 1, when using switched image memory.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Attention: During execution no functions to read or change the configuration must be called (i.e. get_transfer_rate, get_video_window, set_n_ref, etc.)

Example for lflag = 1, without interrupt:

```
 error = grabb_image_full(card_nr,0,1);// Grab image to
                                       // page 0 and return
                                       // control back to PC
                                       //
 if(error)                             // on error exit
   return(error);

 ...                                   // Display image of
                                       // page 1 or
 ...                                   // process it

while (receive_status(CARD) == 0)      // Wait until the
{ ... }                                // grab-function
                                       // finishes

 error = receive_fast();               // Get result of the
                                       // grab-function
                                 //
 if(error)                             // on error exit
   return(error);

 error = grabb_image_full(card_nr,1,1);// Grab image to
                                       // page 1 and return
                                       // control back to PC
                                       //
 if(error)                             // on error exit
   return(error);

 ...                                   // Display image of
                                       // page 0 or
 ...                                   // process it

while (receive_status(CARD) == 0)      // Wait until the
{ ... }                                // grab-function
                                       // finishes

 error = receive_fast();               // Get result of the
                                       // grab-function
                                 //
 if(error)                             // on error exit
   return(error);
```

Return:
0: Success
1: Command & parameter not send, error while sending

2: No data fetched
3: Window too large
4: Transfer error
10: Card not initialized

Reference: set_irq, clear_irq, set_irq_event, grabb_image_half

grabb_image_half

Funktion: Grab an image from a progressive camera and store it to PC-memory

Syntax:
```
BYTE grabb_image_half(BYTE card_nr, BYTE page, BYTE lflag);
```

Beschreibung: Grab an image from a progressive camera current video-in and store it to PC-memory. The PC-memory is reserved during Windows-start-up from the Ramses driver.
With parameter page is controlled, in which memory page the image is stored.
If the function set_irq is called before, after the transfer of the image to PC-memory an interrupt will be generated. When working with interrupts, it is possible to wait on the interrupt with an eventobject and the API-function WaitForSingleObject. During this time the running thread is not running and so it needs no CPU-power.
The parameter lflag controls whether to wait until the command finishes (lfalg=0) or not. (lfalg=1). Then the calling routine gets back the flowcontrol and must check with receive_fast(), whether the grab returns errors or has finished. Lflag should be always 0 and is only set to 1, when using switched image memory.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Attention: During execution no functions to read or change the configuration must be called (i.e. get_transfer_rate, get_video_window, set_n_ref, etc.)

Example for lflag = 1, with Interrupt:

```
hEvent = CreateEvent(NULL,          //Security Setting
                 FALSE,             //Auto Reset
                 FALSE,       //initial state non-signaled
                 NULL);             //name string
error = set_irq_event(CARD, hEvent);
set_irq;                      // activate interrupthandler


error = grabb_image_half(card_nr,0,1);// Grab image to
                                   // page 0 and return
                                   // control back to PC
                                   //
if(error)                          // on error exit
  return(error);

...                                // Display image of
                                   // page 1 or
...                                // process it

wait = 10000;                      // Timeout 10sec
WaitForSingleObject(hEvent,wait)   // Wait until grab
```

```
                                  // finishes
                                  //

error = receive_fast();           // Get result of the
                                  // grab-function
                            //
if(error)                         // on error exit
  return(error);

error = grabb_image_half(card_nr,1,1);// Grab image to
                                  // page 1 and return
                                  // control back to PC
                                  //
if(error)                         // on error exit
  return(error);

...                               // Display image of
                                  // page 0 or
...                               // process it

wait = 10000;                     // Timeout 10sec
WaitForSingleObject(hEvent,wait)  // Wait until grab
                                  // finishes
                                  //

error = receive_fast();           // Get result of the
                                  // grab-function
                                  //
if(error)                         // on error exit
  return(error);

clear_irq;             // deactivate interrupthandler
```

Return:

0: Success
1: Command & parameter not send, error while sending
2: No data fetched
3: Window too large
4: Transfer error
10: Card not initialized

Reference: grabb_image_full, set_irq_event, set_irq, clear_irq

set_ad_nref

Function: Set negative reference voltage of the AD converter.

Syntax: BYTE `set_ad_nref(BYTE card_nr, BYTE ref);`

Description: This function sets the negative reference voltage of the current video-in's AD-converter with ref (0..255). The minimal voltage is 0V, the maximum 1,2V. The function can be used to improve contrast. Attention: The negative voltage must not be greater than the positive.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return:

0: Success
1: Command & parameter not send, error while sending

2: No data fetched
10: Card not initialized

Reference: set_ad_pref, get_ad_nref, get_ad_pref

set_ad_pref

Function: Set positive reference voltage of the AD converter.

Syntax: `BYTE set_ad_pref(BYTE card_nr, BYTE ref);`

Description: This function sets the positive reference voltage of the current video-in's AD-converter with ref (0..255). The minimal voltage is 0V, the maximum 1,2V. The function can be used to improve contrast. Attention: The positive voltage must not be greater than the negative.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return:
0: Success
1: Command & parameter not send, error while sending
2: No data fetched
10: Card not initialized

Reference: set_ad_nref, get_ad_nref, get_ad_pref

set_ad_range

Function: Set the AD-converter's range of the shades of gray

Syntax: `BYTE set_ad_range(BYTE card_nr, BYTE gray_min, BYTE gray_max);`

Description: This function sets the minimal (gray_min) and maximal (gray_max) value of gray of the current video-in's AD-converter in the range of 0..255, where gray_min < gray_max.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return:
0: Success
1: Command & parameter not send, error while sending
2: No data fetched
10: Card not initialized

Reference: get_ad_range, get_ad_nref, get_ad_pref

set_inlut

Function: Set input lookup table

Syntax: `BYTE set_inlut(BYTE card_nr, BYTE tindex, BYTE tval, BYTE write_flag);`

Description: This function sets the lookup-table of the current video-in in the FPGA. The data have to be sent sequentially and are cached on the Ramses-

board until write_flag is switched from 0 to 1.
Paramter tindex is the table-index of the value tval.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Example to invert image:

```
for (i=0; i<255;i++)
{
      set_inlut(CARD,i,~i,0); //send table values
}                             //from index 0..254
error = set_inlut(CARD,i,~i,1);//send table value 255
                              //and commit
```

Return:
0: Success
1: Command & parameter not send, error while sending
2: No data fetched
10: Card not initialized

Reference: get_inlut, set_video_input, get_video_input

set_video_input

Function: Set video-in channel

Syntax: `BYTE set_video_input(BYTE card_nr, BYTE video_in);`

Description: Set the video-in of the Ramses I V3 – board to the channel given in the parameter video_in (values: 0, 1). This channel is implicitly used by many other functions.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return:
0: Success
1: Command & parameter not send, error while sending
2: No data fetched
10: Card not initialized

Reference: get video_input

set_video_window

Function: Sets the coordinates of the current video-window.

Syntax: `BYTE set_video_window(BYTE card_nr, WORD x1, WORD y1, WORD x2, WORD y2);`

Description: Sets the coordinates of the current video-in's video-window.
x1, y1: coordinate of the upper left corner
x2, y2: coordinate of the lower right corner

The x-coordinates for für PAL/CCIR have a range from 0 to 767, the y-coordinates from 0 to 575.

(X2 – X1 +1) has to be divisible through 4, due to a limitation of of the PCI-bus.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Example:

```
// 768 x 576 grab image
x1 = 160;   //skip unusable edges
y1 = 44;
x2 = 927;   // x1 + 768 - 1
y2 = 619;   // y1 + 576 - 1

set_video_window(1,x1,y1,x2,y2);
grabb_image_full(1,0,1,0);



// 768 x 288 grab images
x1 = 160;
y1 = 44;
x2 = 927;   // x1 + 768 - 1
y2 = 331;   // y1 + 288 - 1

set_video_window(1,x1,y1,x2,y2);
grabb_image_full(1,0,1,0);
```

With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Attention: Values will be reset to the standard, if function video_present is called!

If interlaced cameras are used, the y-coordinates are rounded back to the last full image. So it is only possible to change the y-coordinates in steps of 2.

Return:
0: Success
1: Command & parameter not send, error while sending
2: No data fetched
3: Width not modulo 4
10: Card not initialized

Reference: get_video_window, video_present

video_present

Function: Check current video-in

Syntax: `BYTE video_present(BYTE card_nr);`

Description: This function checks the current video-in, if there is a video-signal. If so, the parameter fitting the detected camera are set:
Video-window: Can be checked with get_video_window.

PAL	= 768 x 576
NTSC	= 640 x 480
XC55	= 640 x 480
HR70	= 1024 x 768
Jai-M1	= 1280 x 1024

Camera-type: Can bechecked with get_camera_type.
With the parameter card_nr the Ramses I V3 card to talk to is specified (1..5).

Return:
0: Success
1: timeout
2: no vsync-signal
3: no hsync-signal
10: Card not initialized

Reference: get_video_window, get_camera_type, get_video_input, set_video_input

6. Glossary

BNC

Shortform for "Bayonet Neill Concelmann". The BNC connector is a bayonett connector to connect two coax cable.. BNC-connectors are designed for RG-58-cables (Ethernet) and RG-59-cables (Video) The abbreviation stands also for Bayonet-Navy-Connector, British-Naval-Connector and Baby-N-Connector.

Busmastering

Enables a device, connected to the PCI-bus, to control its traffic itself. So it is possible for certain devices, for example the harddisc-controller or a framegrabber, to transfer data over the PCI-bus into main memory without using the host-CPU. This increases performance, because the processor can do some other jobs during the transfer.

CameraLink

Definition for high performance datatransfer. In contrast to LVDS, connectors are defined too. CameraLink is used increasingly for communication purposes (includes data transfer) with camera systems.

CCD

This abbreviation stands for Charge Coupled Device. These photosensitive, microelectronical components transform light to proportinal electrical signals. A CCD- sensor consists of several CCD-elements, either in a line (for scanners or linescan cameras) or in a matrix (for area scan cameras). CCD-elements only react with brightness, so for every ground color a filter has to be applied.

CCIR

A former standard to digitize images.

DMA

Direct Memory Access describes a possibility for certain devices like harddisc-controller, sounddevices or even framegrabber, to access main memory without using the host’s cpu.

D-SUB

Heteropolar plug connector

FPGA

Field Programmable Gate Array, an electronical component, which can be programmed free.

Framegrabber

Addon board for PCs, which records a video signal, digitizes it and writes the digital image into the host’s memory. Powerful framegrabber additionally offer onboard image processing.

LVDS

Short for Low Voltage Digital Signal and describes a standard for high speed data transfer. LVDS is common to use for communication purposes with cameras.

NTSC

Color coding process commonly used in USA and Japan. In contrast to PAL, pase errors cannot be corrected from receiver. This leads to considerable color jumps between different channels.

PAL

Color coding process, which reduces the color errors, originated during transmission, to smaller, less conspicuous color saturation errors

PCI

A 1991 introduced standard for PC-board, which expands vastly the possibilties. The bus has a width of 32 bit with frequency of 33 MHz, what enables transfer rates up to 133mbytes/s. Extensions like Plug & Play are possible and additional boards are able to access main memory without using the host's cpu (DMA, Busmaster).

RS232

Interface for serial data transfer up to 20 kbit/Second in both direction. Maximal cablelength 15m.

RS422

Interface for serial data transfer up to 10 mbit/s in both direction. Maximal cablelength 1200m.

RS485

Extension to RS422 with more transceivers.

TTL

Short for Transistor-Transistor-Logic and stands for circuit family.

VSYNC/HSYNC

Video signals for horizontal and vertical synchronisation.

WDM

Short for "Windows Driver Model". It describes the way to develop und integrate new drivers for Windows.

Appendix A

A.1 Registry Keys

A.1.1 Memory

Windows NT

HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\Ra1V3\Parameters\

MemSize1	Memorysize for card 1 in byte
MemSize2	Memorysize for card 2 in byte
MemSize3	Memorysize for card 3 in byte
MemSize4	Memorysize for card 4 in byte
MemSize5	Memorysize for card 5 in byte

Windows 98/ME/2000/XP

HKEY_LOCAL_MACHINE\System\CurrentControlSet\Services\Ramses1V3\Parameters\

MemSize1	Memorysize for card 1 in byte
MemSize2	Memorysize for card 2 in byte
MemSize3	Memorysize for card 3 in byte
MemSize4	Memorysize for card 4 in byte
MemSize5	Memorysize for card 5 in byte

A.2 Pin Layout

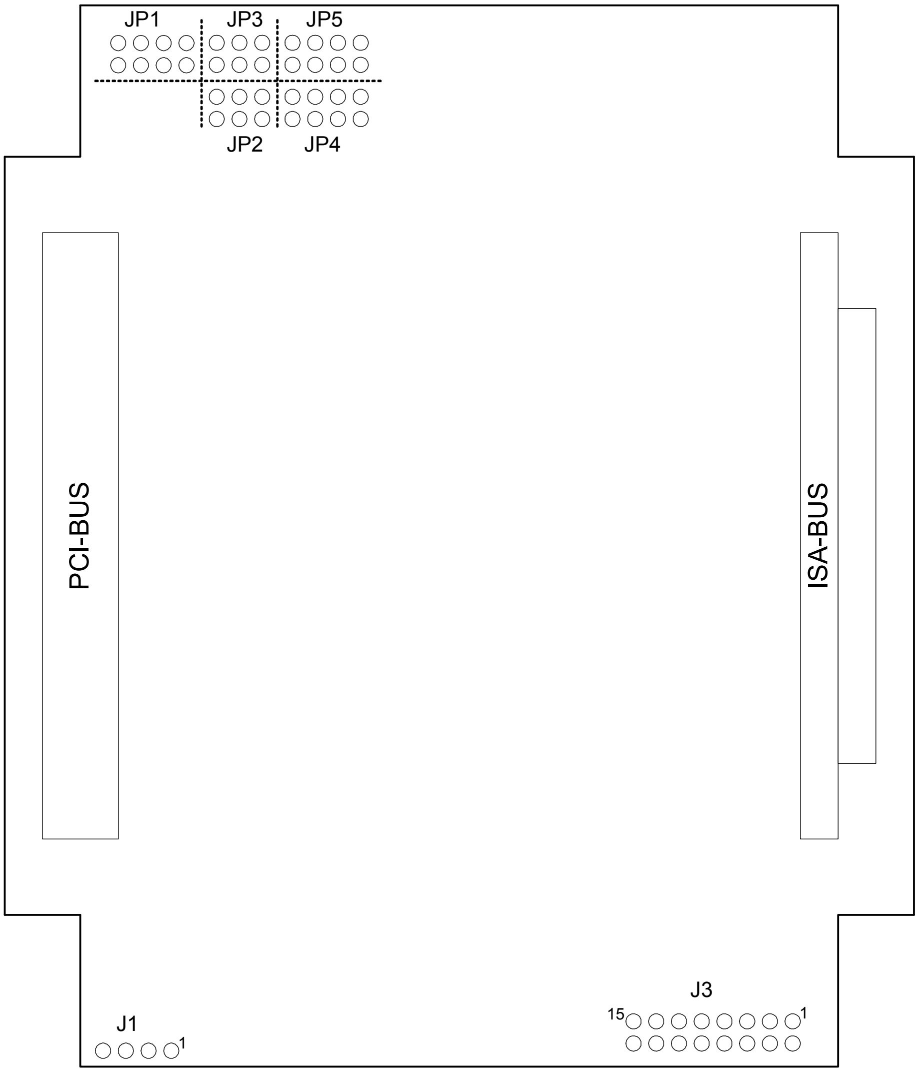
A.2.1 DSUB15, 15-pol. socket

PIN	Description
1	Signal A
2	*Signal A
3	Signal B
4	Video In
5	*Signal B
6	GND
7	+12 Volt
8	-12 Volt
9	Vcc
10	Signal C (TTL - Out0)
11	*Signal C (TTL - Out1)
12	Signal D (TTL - Out2)
13	*Signal D (TTL- In 0)
14	TxD (TTL - In 1)
15	RxD (TTL - In 2)

TTL - In/Out are not supported in the standard version. But it is possible to integrated that.

A.2.2 Jumper and signallines on PC104+

To work correctly, there must be set some jumpers on the PC104-board. In the following the position of the jumpers visible:



A.2.2.1 Configurationjumper JP1 – JP5:

In every block only one connector between first and second line has to be set. In the following is assumed, that the right pin pair is bridge 1. Dependent on the mount level, following jumpers have to be set:

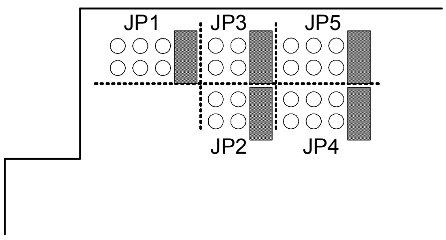
Level	JP1	JP2	JP3	JP4	JP5
1	1	1	1	1	1
2	2	2	2	2	2
3	3	3	3	3	3
4	4	3*)	3*)	4	4

JP1: Definition Interrupt line

JP2: Grant Signal
JP3: Bus-Request Signal
JP4: Device-Select
JP5: PCI-Clock

*)If the board<is mount on level 4, the device on level 3 must not need the signals for Bus-Request and Grant.

Example:
Board is mount on level 1, that means directly on the motherboard. So the jumpers have to be set as follows:



A.2.2.2 Connector J1 and J3

Signalconnector J1 for additinal power supply:

PIN	Description
1	12V
2	*GND
3	GND
4	Vcc

Signalconnector J3 to connect camera:

PIN	Description
1	Signal A
2	Vcc
3	*SignalA
4	Signal C
5	Signal B
6	*Signal C
7	Video In
8	Signal D
9	*Signal B
10	*Signal D
11	GND

12	TxD
13	12V
14	RxD
15	-12V
16	GND

DECLARATION OF CONFORMITY

EU-KONFORMITÄTSERKLÄRUNG
DECLARATION DE CONFORMITÉ

Wir (Name des Anbieters) We (Suppliers Name) Nous (Nom du Fournisseur)	Feith Sensor to Image GmbH
Anschrift Address Adress	Lechtorstrasse 20 D-86956 Schongau

erklären in alleiniger Verantwortung, daß das Produkt:
declare under sole responsibility, that the product:
déclarons sous notre responsibilité, que le produit:

Bezeichnung Name Nom	**Ramses 1 V3 PCI Frame Grabber**
Typ, Modell, Artikel-Nr. Type, Model, Article No. Type, Modèle, No. d' Article	**RA1V3**
mit den Anforderungen der Normen fullfills the requirements of the standard satisfait aux exigences des normes	**EN 55022** **EN 50081-1/2** **EN 50082-11/2**

übereinstimmt und damit den Bestimmungen der EU-Richtlinie 89/336/EWG entspricht.
and therefore corresponds to the regulations of the EU-Directive 89/336/EEC.
et, ainsi, correspond aux reglement de la Directive du Conseil 89/336/CCE.

Schongau, 01.07.2003	W. Feith (Geschäftsführer)
Ort und Datum der Ausstellung Place and Date of Issue Lieu et date d ' établissement	Name und Anschrift des Befugten Name and Signature of authorized person Nom et signature de la personne autorisée