RTV Series

Multi-Channel Real-Time Video

Frame Grabber Series

User's Manual

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1 Introduction

The RTV series acquisition board is designed without compromise for security and video surveillance applications as a PC-based multiple channel digital video recorder.

This 32-bit/64bit, 33MHz/66MHz PCI/cPCI/PMC bus frame grabber simultaneously captures four video analog streams in real-time. It accepts standard composite color (PAL, NTSC) or monochrome video formats (CCIR, EIA).

The square-pixel and broadcast resolutions are programmable (640 x 480 or 768 x 576). Before images are transferred into the PC's memory, the resolution can be scaled down using selectable ratios.

Arbitrary cropping to regions of interest is supported. The RTV series generates bitmaps in all popular color formats such as RGB.

System integrators will benefit from a watchdog timer for fault-tolerant applications and from the easy-to-use standard connectors.

1.1 Features

1.1.1 Image Acquisition

Acquisition Speed

NTSC	1 Camera	2 Cameras	3 Cameras	4 Cameras	8 Cameras
Fields	60	120	180	240	240
Frames	30	60	90	120	120
PAL	**1 Camera**	**2 Cameras**	**3 Cameras**	**4 Cameras**	**8 Cameras**
Fields	50	100	150	200	200
Frames	25	50	75	100	100

Table 1-1: RTV Series Acquisition Speed

Note: The PMC-RTV21 is capable of only up to 30 frames (60 fields) in total acquisition speed.

Color Image

The color video format is compatible with the following composite video input formats: NTSC-M, NTSC-Japan, PCL-B, PAL-D, PAL-G, PAL-H, PAL-I, PAM-M, PAL-N, and SECAM

Monochrome Image

The monochrome video acquisition is compatible with CCIR and EIA (RS-170)

Optional Scaling

Optional scaling of acquired image or portions of an image.

- Acquisition of a programmable area of interest.
- Scaling of the image (down to 1:16).
- Adjustment of hue (for NTSC signals), contrast (0 to 200%), brightness and saturation (0 to 200% for U and V signals).
- Automatic chrominance gain control.

1.1.2 I/O Lines

The RTV series is fitted with TTL compatible I/O lines protected against overloads and electrostatic discharges. Each line may be configured as an input or output. They can be used to trigger acquisition or report alarm signals.

1.1.3 Watchdog Timer

A hardware watchdog is available on the RTV-24 that is able to monitor PC application operation and will automatically reset the PC after a programmable inactivity time-out. This ensures reliable operation of remote systems.

1.1.4 Supported Software

WDM driver

The drivers support VC++ / VB / Delphi / C++ Builder programming under Windows NT/98/2000/XP. DLLs and reference sample programs are provided.

ViewCreator

The package will assist in initial test and functional evaluation.

AngeloLVIEW - Angelo-LVIEW is fully compatible with LabView™ 6.0 and above and it provides a full set of VIs that can be used

with the Angelo RTV series (RTV-24, cRTV-24, cRTV-44 and PMC-RTV21/G). VIs for Windows 98/NT/2000/XP operation systems and LabView™ sample programs are provided for users' reference.

1.2 Applications

- PC Based Surveillance System
- Digital Video Recorder (DVR)
- Factory Monitoring System
- Machine Vision Inspection System
- Scientific Research Instrumentation
- Medical Research Instrumentation

1.3 System Requirements

The minimum system requirements for 4-CH real-time NTSC*/ PAL** color image acquisition are:

- Platform: Pentium 4, 2.4GHz CPU, 256MB DDRAM above.
- VGA display: AGP 4X or above (VIA or SiS VGA chipset **NOT** recommended).
- Display setting: 800 x 600 resolution or above, 16-bit color or above.
- OS: if using Windows 2000, please upgrade to Service Pack 4.0 or above.

Note: Lower system configurations will lower acquisition performance.

Note: Please refer to section 1.4 RTV-24 Benchmark for the performance issues due to PCI bus bandwidth limitations.

* NTSC real-time color images – Provides 640 x 480 pixel image resolution at the RGB 16-bit color format. Each channel acquires 30 frames per second with 4-CH totaling up to 120 frames per second.

** PAL real-time color images – Provides 768 x 576 pixel image resolution at the RGB 16-bit color format. Each channel acquires 25 frames per second with 4-CH totaling up to 100 frames per second.

1.4 RTV-24 Benchmarks

1.4.1 PCI-33 Platform

- SBC: ADLINK NuPRO-842
- CPU: Intel Pentium 4, 2.4GHz
- Memory: DDR266 256MB
- PCI Bus: 32-bit, 33MHz
- VGA: AGP 4X
- OS: Windows 2000/SP4

Image Format	RGB16, 4CIF(640*480)				RGB24, 4CIF(640*480)			
Channels	1	2	3	4	1	2	3	4
Real-time*	O	O	O	O	O	O	O	X
Frame Rate (f/s)	30	30	30	30	30	30	30	-
CPU Usage (%)	27	28	44	61	20	35	60	-

Table 1-2: PCI-33 4CIF Benchmarks

Image format	RGB16, CIF (320*240)									RGB24, CIF (320*240)						
Channels	1	2	3	4	5	6	7	8	12	1	2	3	4	5	6	7
Real-time*	O	O	O	O	O	O	O	O	X	O	O	O	O	O	O	X
Frame Rate (f/s)	30	30	30	30	30	30	30	30	-	30	30	30	30	30	30	-
CPU Usage (%)	6	9	13	17	23	28	31	36	-	8	11	16	25	27	31	-

Table 1-3: PCI-33 CIF Benchmarks

Image Format	RGB16, QCIF (160*120)										RGB24, QCIF (160*120)									
Channels	1	2	3	4	5	6	7	8	12	16	1	2	3	4	5	6	7	8	12	16
Real-time*	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Frame Rate (f/s)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
CPU Usage (%)	8	9	8	8	8	9	9	11	16	22	6	6	8	9	9	9	13	14	19	26

Table 1-4: PCI-33 QCIF Benchmarks

* Real-time:

- "O" - All channel images can be captured in real-time with good image quality.
- "X" - All channel images will begin having data loss.

1.4.2 PCI-X Platform

- SBC: ADLINK NuPRO850
- CPU: Intel Pentium 4, Hyper Threading Disable
- Memory: DDR266 1GB
- PCI-X Bus: 32-bit, 66MHz
- VGA: AGP 8X
- OS: Windows 2000/SP4

Image Format	RGB16, 4CIF(640*480)									RGB24, 4CIF(640*480)					
Channel	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6
Real-time*	O	O	O	O	O	O	O	O	X	O	O	O	O	O	X
Frame Rate (f/s)	30	30	30	30	30	30	30	30	-	30	30	30	30	30	-
CPU Usage (%)	13	14	19	23	25	28	32	35	-	9	16	22	28	28	-

Table 1-5: PCI-X 4CIF Benchmarks

Image Format	RGB16, CIF(320*240)										RGB24, CIF(320*240)									
Channels	1	2	3	4	5	6	7	8	12	16	1	2	3	4	5	6	7	8	12	13
Real-time*	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	X
Frame Rate (f/s)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	-
CPU Usage (%)	6	8	11	11	13	14	16	17	23	28	8	8	9	13	14	16	19	20	28	-

Table 1-6: PCI-X CIF Benchmarks

Image Format	RGB16, QCIF (160*120)										RGB24, QCIF (160*120)									
Channels	1	2	3	4	5	6	7	8	12	16	1	2	3	4	5	6	7	8	12	16
Real-time*	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Frame Rate (f/s)	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30
CPU Usage (%)	5	5	5	6	6	6	6	8	9	12	5	5	6	6	6	8	9	9	13	16

Table 1-7: PCI-X QCIF Benchmarks

* Real-time:

- "O" - All channel images can be captured in real-time with good image quality.
- "X" - All channel images will begin having data loss.

1.4.3 PCI Express Platform

- SBC: GIGABYTE GA-8I915PL-G
- CPU: Intel Pentium 4, 2.4GHz
- Memory: DDR266 512MB
- VGA: AGP 4X
- OS: Windows 2000/SP4

Image Format	RGB16, Full(640*480)								RGB24, Full(640*480)							
Card #	Card0				Card1				Card0				Card1			
Channel #	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
Real-Time	O	O	O	O	O	O	O	O	O	O	O	X	O	O	O	X
Frame Rate	30	30	30	30	30	30	30	30	30	30	30	--	30	30	30	--

Image Format	RGB16, CIF(320*240)								RGB24, CIF(320*240)							
Card #	Card0				Card1				Card0				Card1			
Channel #	1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8
Real-Time	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Frame Rate	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30	30

2 Hardware Reference

2.1 RTV series

2.1.1 PCIe-RTV24 Specifications

Video Input

- Four composite video color digitizers
- Video input interface: Four composite BNC connectors
- Coaxial cable suggested

Channel Extension

- Expandable to up to 16 channels
- Channel extension interface:
  - 10-pin ribbon cable to on-board 10-pin header connector for channel extension, each header adds 4 video inputs channels
  - Three 10-pin header connectors on-board

General Purpose I/O Lines

- All I/Os are TTL compatible and support 4 inputs, 4 outputs, and 4 soft trigger lines
- GPIO interface:
  - Two 10-pin header connectors on-board
  - The I/O lines are internally pulled up and have the following characteristics:

Voltage	MIN	MAX
Input high voltage (5μA)	2.0V	5.25V
Input low voltage (-5μA)	0.0V	0.80V
Output high voltage (-1.0mA)	5.0V	-
Output low voltage (100.0mA)	-	0.5V

Table 2-1: GPIO Characteristics

- Watch Dog Timer
- For monitoring applications and will reset the PC after a programmable inactivity time-out.
- Interface: 2-pin header

4-channel software trigger output

- 4-channels programmable trigger scale (60µs – 16ms)

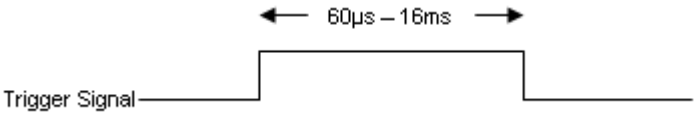


Figure 2-1: Trigger Signal Waveform

User EEPROM

- Includes 1kbit available EEPROM

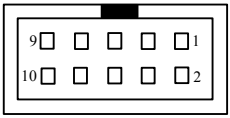
RTV-24 Standard Accessories

- Watchdog reset cable
- GPIO bracket
- User Manual
- All in One CD

RTV-24 Connectors & Pin Definitions

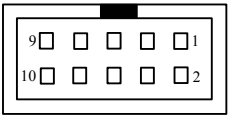
Connector	Definition
	Video IN – CH 0
	Video IN – CH 1
	Video IN – CH 2
	Video IN – CH 3

Table 2-2: RTV Video Inputs



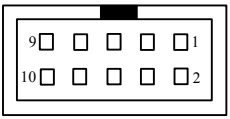
PIN	Function	PIN	Function
1	GND	2	CH4 video in
3	CH5 video in	4	GND
5	GND	6	CH6 video in
7	CH7 video in	8	GND
9	GND	10	GND

Table 2-3: Channel Extension Video Input (CN2)



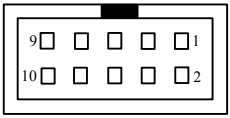
PIN	Function	PIN	Function
1	GND	2	CH8 video in
3	CH9 video in	4	GND
5	GND	6	CH10 video in
7	CH11 video in	8	GND
9	GND	10	GND

Table 2-4: Channel Extension Video Input (CN3)



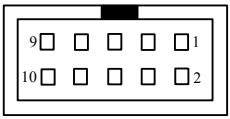
PIN	Function	PIN	Function
1	GND	2	CH12 video in
3	CH13 video in	4	GND
5	GND	6	CH14 video in
7	CH15 video in	8	GND
9	GND	10	GND

Table 2-5: Channel Extension Video Input (CN5)



PIN	Function	PIN	Function
1	IN0 (External interrupt)	2	GND
3	OUT0	4	Software Trigger 0
5	IN1 (External interrupt)	6	Software Trigger 1
7	OUT1	8	+5V
9	GND	10	--

Table 2-6: GPIO (CN8)



PIN	Function	PIN	Function
1	IN2 (External interrupt)	2	GND
3	OUT0	4	Software Trigger 2
5	IN3 (External interrupt)	6	Software Trigger 3
7	OUT1	8	+5V
9	GND	10	--

Table 2-7: GPIO (CN9)

PIN	Function
1	System reset
2	GND

Table 2-8: Watchdog Timer

2.1.2 RTV-24 Specifications

Video Input

- Four composite video color digitizers
- Video input interface: Four composite BNC connectors
- Coaxial cable suggested

Channel Extension

- Expandable to up to 16 channels
- Channel extension interface:
  - 10-pin ribbon cable to on-board 10-pin header connector for channel extension, each header adds 4 video inputs channels
  - Three 10-pin header connectors on-board

General Purpose I/O Lines

- All I/Os are TTL compatible and support 4 inputs, 4 outputs, and 4 soft trigger lines
- GPIO interface:
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  - The I/O lines are internally pulled up and have the following characteristics:

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Input low voltage (-5μA)	0.0V	0.80V
Output high voltage (-1.0mA)	5.0V	-
Output low voltage (100.0mA)	-	0.5V

Table 2-9: GPIO Characteristics

- Watch Dog Timer
- For monitoring applications and will reset the PC after a programmable inactivity time-out.
- Interface: 2-pin header

4-channel software trigger output

- 4-channels programmable trigger scale (60μs – 16ms)

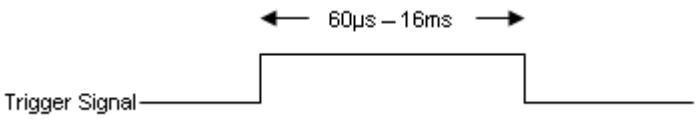


Figure 2-2: Trigger Signal Waveform

User EEPROM

- Includes 1kbit available EEPROM

Form Factor

- 32-bit, 33/66MHz PCI half-size board

Figure 2-3: RTV-24 Appearance

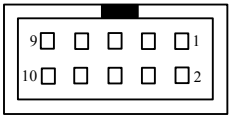
RTV-24 Standard Accessories

- Watchdog reset cable
- GPIO bracket
- User Manual
- All in One CD

RTV-24 Connectors & Pin Definitions

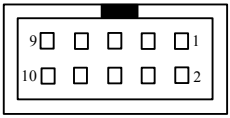
Connector	Definition
	Video IN – CH 0
	Video IN – CH 1
	Video IN – CH 2
	Video IN – CH 3

Table 2-10: RTV Video Inputs



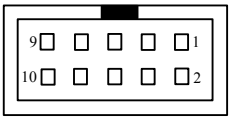
PIN	Function	PIN	Function
1	GND	2	CH4 video in
3	CH5 video in	4	GND
5	GND	6	CH6 video in
7	CH7 video in	8	GND
9	GND	10	GND

Table 2-11: Channel Extension Video Input (CN2)



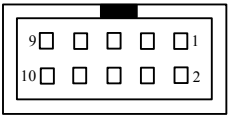
PIN	Function	PIN	Function
1	GND	2	CH8 video in
3	CH9 video in	4	GND
5	GND	6	CH10 video in
7	CH11 video in	8	GND
9	GND	10	GND

Table 2-12: Channel Extension Video Input (CN3)



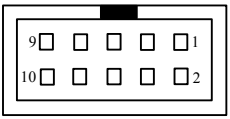
PIN	Function	PIN	Function
1	GND	2	CH12 video in
3	CH13 video in	4	GND
5	GND	6	CH14 video in
7	CH15 video in	8	GND
9	GND	10	GND

Table 2-13: Channel Extension Video Input (CN5)



PIN	Function	PIN	Function
1	IN0 (External interrupt)	2	GND
3	OUT0	4	Software Trigger 0
5	IN1 (External interrupt)	6	Software Trigger 1
7	OUT1	8	+5V
9	GND	10	--

Table 2-14: GPIO (CN8)



PIN	Function	PIN	Function
1	IN2 (External interrupt)	2	GND
3	OUT0	4	Software Trigger 2
5	IN3 (External interrupt)	6	Software Trigger 3
7	OUT1	8	+5V
9	GND	10	--

Table 2-15: GPIO (CN9)

PIN	Function
1	System reset
2	GND

Table 2-16: Watchdog Timer

2.1.3 RTV-E4 Extension board (Optional)

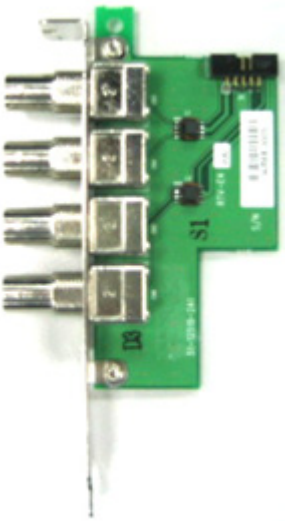
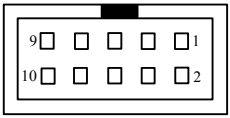


Figure 2-4: RTV-E4 Appearance

RTV-E4 Connectors & Pin Definitions



PIN	Function	PIN	Function
1	GND	2	CH4 video in
3	CH5 video in	4	GND
5	GND	6	CH6 video in
7	CH7 video in	8	GND
9	GND	10	GND

Table 2-17: Channel Extension Video Input (CN11)

2.1.4 RTV-I4 Isolation GPIO board (Optional)

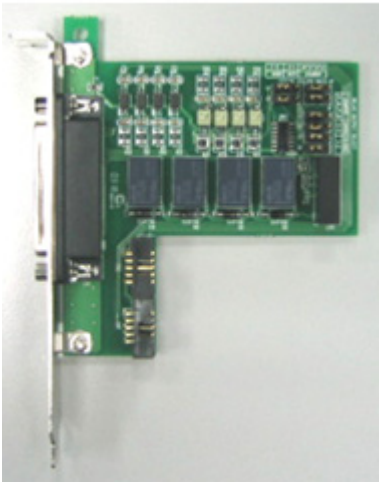


Figure 2-5: RTV-I4 Appearance

RTV-I4 Connectors & Pin Definitions

Relay output signal select:

- Relay output types: Normal open or Normal closed
- Signal names: RY1, RY2, RY3, RY4
- Jumper addresses J5, J6, J7, J8
- Type select: Normal open: 2-3, Normal close: 1-2

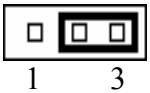
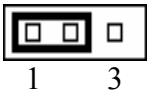
Normal Open	Normal Closed
	

Table 2-18: Relay Jumper Settings

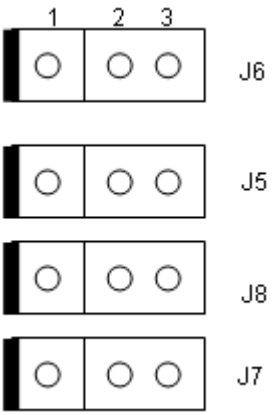


Figure 2-6: Relay Address Jumpers

Relay I/O voltage requirements

- Input:+5V to +24V
- Output:AC: 0.5A/125V, DC: 1A/30V or 0.3A/100V

STRG output signal select:

- STRG output signal types: Active high or Active low
- Signal names: STRG_OUT1, STRG_OUT2, STRG_OUT3, STRG_OUT4
- Jumper addresses: J1, J2, J3, J4
- Trigger output voltage: 0V to +5V
- Type select: Active high =>2-3, Active low =>1-2

Active High	Active Low
	

Table 2-19: STRG Jumper Settings

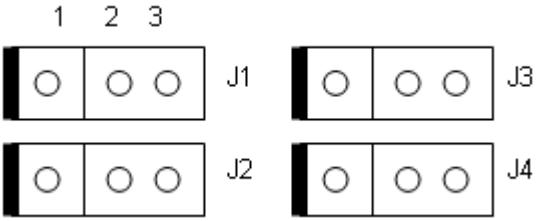
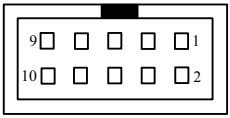


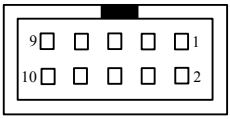
Figure 2-7: STRG Address Jumpers

2R10P Input Pin Header Definitions



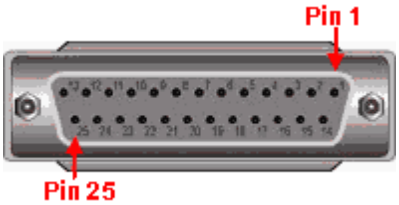
PIN	Function	PIN	Function
1	GPIO Input 1	2	GND
3	GPIO Output 1	4	PORT1 STRG Output
5	GPIO Input 2	6	PORT2 STRG Output
7	GPIO Output 2	8	VCC
9	GND	10	--

Table 2-20: RTV-I4 GPIO (CN1) <--> RTV-24 GPIO (CN8)



PIN	Function	PIN	Function
1	GPIO Input 3	2	GND
3	GPIO Output 3	4	PORT3 STRG Output
5	GPIO Input 4	6	PORT4 STRG Output
7	GPIO Output 4	8	VCC
9	GND	10	--

Table 2-21: RTV-I4 GPIO (CN2) <--> RTV-24 GPIO (CN9)



PIN	Signal	PIN	Signal
1	DI1	14	RY3_COM
2	DI1_COM	15	RY4
3	DI2	16	RY4_COM
4	DI2_COM	17	STRG_OUT1
5	DI3	18	STRG_OUT2
6	DI3_COM	19	STRG_OUT3
7	DI4	20	STRG_OUT4
8	DI4_COM	21	STRG_GND
9	RY1	22	STRG_GNG
10	RY1_COM	23	NC
11	RY2	24	NC
12	RY2_COM	25	NC
13	RY3	26	

Table 2-22: D-sub 25-pin Connector

2.2 cRTV series

2.2.1 cRTV-24 Specifications

Video Input

- Four composite video color digitizers
- Video input interface: Four composite BNC connectors
- Channel status report LED
- Coaxial cable recommended

Channel Extension

- Expandable to up to 8 channels
- Channel extension interface
  - 10-pin ribbon cable to on-board 10-pin header connector for channel extension, each header adds 4 video inputs channels

User EEPROM

- Includes 1kbit usable EEPROM

Form Factor

- 32/64bit, 33/66MHz, 3U Compact PCI board

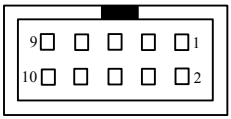
Figure 2-8: cRTV-24 Appearance

cRTV-24 Standard Accessories

- User Manual
- All in One CD

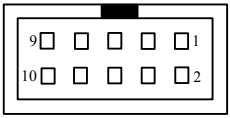
Connector	Definition
	CH0 (Channel 0 BNC)
	CH1 (Channel 1 BNC)
	CH2 (Channel 2 BNC)
	CH3 (Channel 3 BNC)

Table 2-23: cRTV Video Inputs



PIN	Function	PIN	Function
1	GND	2	CH4 video in
3	CH5 video in	4	GND

Table 2-24: Channel Extension Video Input (CN8)



PIN	Function	PIN	Function
5	GND	6	CH6 video in
7	CH7 video in	8	GND
9	GND	10	GND

Table 2-24: Channel Extension Video Input (CN8)

2.2.2 cRTV-44 Specifications

Video Input

- Four composite video color digitizers
- Video input interface: Four composite BNC connectors
- Channel status report LED
- Coaxial cable recommended

General Purpose I/O Lines

- All I/O lines are TTL compatible with 4 input, 4 output, and 4 soft trigger lines.
- GPIO interface:
  - Two 10-pin header connectors on-board
  - The I/O lines are internally pulled up and have the following characteristics:

Voltage	MIN	MAX
Input high voltage (20μA)	2.0V	5.25V
Input low voltage (-0.2μA)	0.0V	0.80V
Output high voltage (-1.0mA)	5.0V	-
Output low voltage (100.0mA)	-	0.5V

Table 2-25: GPIO Characteristics

Channel Extension

- Expandable to up to 8 channels
- Channel extend interface
  - 10-pin ribbon cable to on-board 10-pin header connector for channel extension, each header adds 4 video inputs channels.

User EEPROM

- Includes 1kbit usable EEPROM

Form Factor

- 32/64bit, 33/66MHz, 6U Compact PCI board

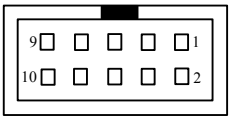
Figure 2-9: cRTV-44 Appearance

cRTV-44 Standard Accessories

- User Manual
- All in One CD

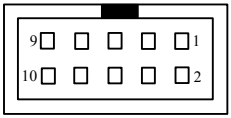
Connector	Definition
	CH0 (Channel 0 BNC)
	CH1 (Channel 1 BNC)
	CH2 (Channel 2 BNC)
	CH3 (Channel 3 BNC)

Table 2-26: cRTV Video Inputs



PIN	Function	PIN	Function
1	GND	2	CH4 video in
3	CH5 video in	4	GND
5	GND	6	CH6 video in
7	CH7 video in	8	GND

Table 2-27: Channel Extension Video Input (CN8)

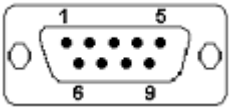


PIN	Function	PIN	Function
9	GND	10	GND

Table 2-27: Channel Extension Video Input (CN8)

GPIO 0

- Pins IN0 and OUT0 are used by channel 0
- Pins IN1 and OUT1 are used by channel 1

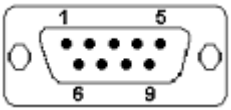


PIN	Function	PIN	Function
1	IN0 (External interrupt)	6	GND
2	OUT0	7	GND
3	IN1 (External interrupt)	8	GND
4	OUT1	9	+5V
5	GND		

Table 2-28: GPIO 0 Pinout

GPIO 1

- Pins IN2 and OUT2 are for channel 2
- Pins IN3 and OUT3 are for channel 3



PIN	Function	PIN	Function
1	IN2 (External interrupt)	6	GND
2	OUT2	7	GND
3	IN3 (External interrupt)	8	GND
4	OUT3	9	+5V
5	GND		

Table 2-29: GPIO 1 Pinout

2.3 PMC-RTV series

2.3.1 PMC-RTV21 Specifications

Video Input

- Four composite video color digitizers
- Video input interface: DB-9 female connectors
- Coaxial cable recommended

General Purpose I/O Lines

- The I/O lines are TTL compatible with 1 input and 1 output
- GPIO interface:
  - One DB-9 male connector
  - The I/O lines are internally pulled up and have the following characteristics:

Voltage	MIN	MAX
Input high voltage (20μA)	2.0V	5.25V

Table 2-30: GPIO Characteristics

Voltage	MIN	MAX
Input low voltage (-0.2μA)	0.0V	0.80V
Output high voltage (-1.0mA)	5.0V	-
Output low voltage (100.0mA)	-	0.5V

Table 2-30: GPIO Characteristics

User EEPROM

- Includes 1kbit available EEPROM

Form Factor

- 32bit/33MHz PMC socket board

Figure 2-10: PMC-RTV21 Appearance

PMC-RTV21 Standard Accessories

- User Manual
- All in One CD

PMC-RTV21 Connectors & Pin Definition

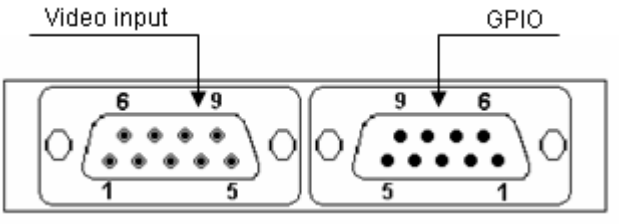
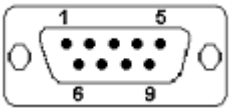
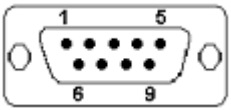


Figure 2-11: PMC-RTV21 Video Input & GPIO



PIN	Function	PIN	Function
1	GND	6	CH0 Video In
2	CH1 Video In	7	GND
3	GND	8	CH2 Video In
4	CH3 Video In	9	GND
5	--		

Table 2-31: Video Input



PIN	Function	PIN	Function
1	IN0 (External interrupt)	6	GND
2	OUT0	7	GND
3	--	8	GND
4	--	9	+5V
5	GND		

Table 2-32: GPIO Pinout

2.3.2 PMC-RTV21G Specifications

Video Input

- Four composite video color digitizers
- Video input interface: 10-pin header connectors
- Coaxial cable recommended

General Purpose I/O Lines

- The I/O lines are TTL compatible with 1 input and 1 output
- GPIO interface:
  - One 10-pin header connector
  - The I/O lines are internally pulled up and have the following characteristics:

Voltage	MIN	MAX
Input high voltage (20μA)	2.0V	5.25V
Input low voltage (-0.2mA)	0.0V	0.80V
Output high voltage (-1.0mA)	5.0V	-

Table 2-33: GPIO Characteristics

Voltage	MIN	MAX
Output low voltage (100.0mA)	-	0.5V

Table 2-33: GPIO Characteristics

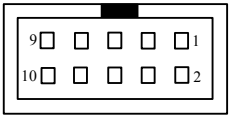
User EEPROM

- Includes 1kbit available EEPROM

Form Factor

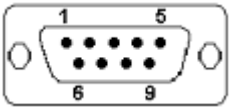
- 32bit/33MHz PMC socket board

PMC-RTV21G Connectors & Pin Definition



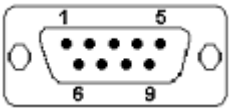
PIN	Function	PIN	Function
1	GND	2	CH0 Video In
3	CH1 Video In	4	GND
5	GND	6	CH2 Video In
7	CH3 Video In	8	GND
9	GND	10	GND

Table 2-34: Video Input



PIN	Function	PIN	Function
1	IN0 (External interrupt)	2	GND

Table 2-35: GPIO Pinout



PIN	Function	PIN	Function
3	OUT0	4	--
5	--	6	GND
7	--	8	+5V
9	GND	10	--

Table 2-35: GPIO Pinout

3 Installation Guide

3.1 Hardware Installation

3.1.1 RTV Series

Use the following steps to install the RTV series board on the PCI bus:

1. Remove the computer cover using the instructions from the computer manual.
2. Check that there is an empty PCI (32-bit) slot t accommodate the board. If there is not an empty slot, remove a PCI board from the computer to make room for the RTV-24 board and take note of the chosen slot number.
3. Remove the blank metal plate located at the back of the selected slot (if any). Keep the removed screw to fasten the RTV-24 board after installation.
4. Carefully position the RTV-24 in the selected PCI slot as illustrated below. If using a tower computer, orient the board to suit the board slots.

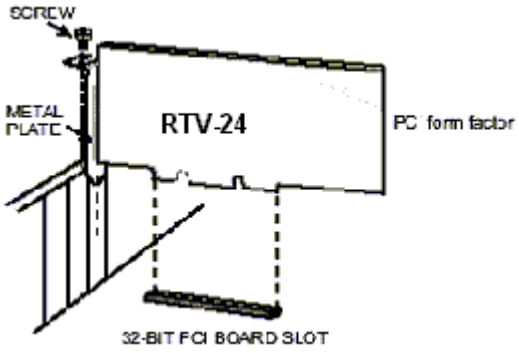


Figure 3-1: RTV-24 Installation

5. Once perfectly aligned with an empty slot, press the board firmly but carefully into the connector.

6. Anchor the board by replacing the screw.
7. Connect your video sources for image acquisition tests. For details, refer to the 'ViewCreator Utility."
8. Turn on the computer. In some cases, when the computer boots up, the "Plug and Play" feature of Windows will detect the new PCI card 8 times (4 videos and 4 audios) and you will require drivers. For details, see the "Installation Guide."

3.1.2 cRTV Series

Use the following steps to install the cRTV series board onto the Compact PCI bus:

1. Remove the computer cover using the instructions from the computer manual.
2. Check that there is an empty cPCI (32-bit/64-bit) slot to accommodate the board. If is not an empty slot, remove a cPCI board to make room for the cRTV-24 (3U) / cRTV-44 (6U) board and take note of the chosen slot number.
3. Remove the blank metal plate located at the front of the selected slot (if present). Keep the removed screw to fasten the cRTV-24 (3U) / cRTV-44 (6U) board.
4. Carefully position the cRTV-24 or cRTV-44 in the selected cPCI slot as illustrated below.

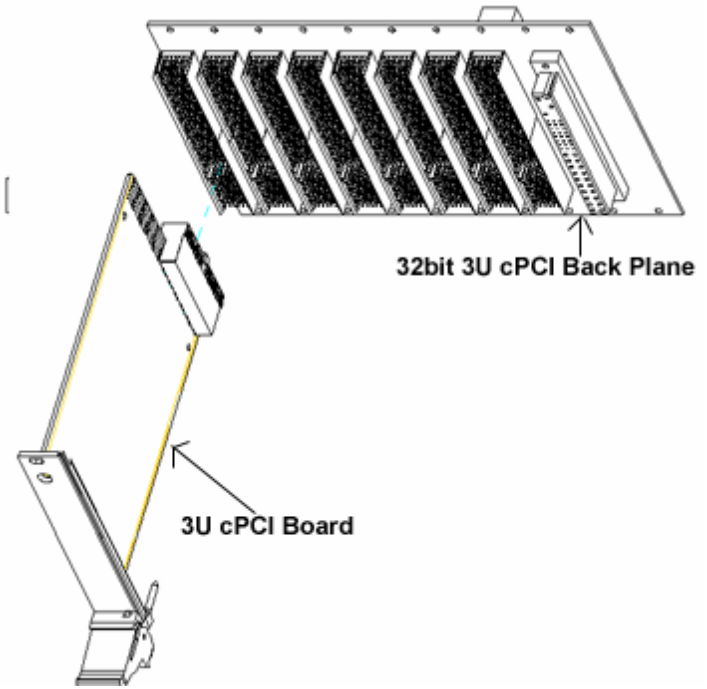


Figure 3-2: cRTV-24 (3U cPCI)

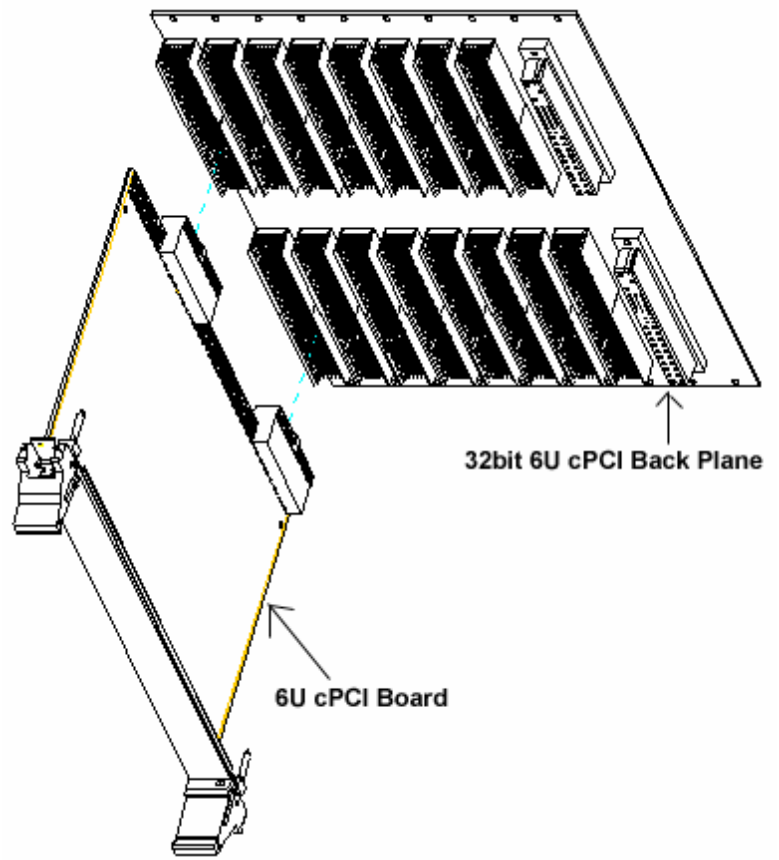


Figure 3-3: cRTV-44 (6U cPCI)

5. Carefully slide the cRTV-24 (3U)/cRTV-44 (6U) along the guide of the chosen slot to the backplane and push the board firmly but carefully into the connector, Lock the board in place by pushing the release lever outwards.
6. 6.Anchor the board by replacing the screw.
7. 7.Connect the video sources for image acquisition tests. For details, refer to the ‘ViewCreator Utility.”

8. 8.Turn on the computer. In some cases, when the computer boots up, the “Plug and Play” feature of Windows will detect the new PCI card 8 times (4 videos and 4 audios) and you will require drivers. For details, see the “Installation Guide.”

3.1.3 PMC-RTV Series

The PMC socket may be integrated with the cPCI CPU board or as a standalone system board for an embedded system. Use the following steps to install the PMC-RTV series board onto the PMC socket:

1. Remove the computer cover using the instructions from the computer manual.
2. Check that there is an empty PMC (32-bit) socket to accommodate the board. If there is not an empty slot, remove a PMC board from your computer to make room.
3. Carefully position PMC-RTV21 onto the PMC socket.
4. Once perfectly aligned with an empty PMC socket, press the board firmly but carefully into the connector.
5. Connect the video sources for image acquisition tests. For details, refer to the ‘ViewCreator Utility.”
6. Turn on the computer. In some cases, when the computer boots up, the “Plug and Play” feature of Windows will detect the new PCI card 8 times (1 video and 1 audio) and you will require drivers. For details, see the “Installation Guide.”

3.1.4 RTV-E4 Extension board (Optional)

1.For main board installation, please refer to ‘RTV series’.

2.Each RTV-E4 will attach one signal cable for connect with RTV-24 as below

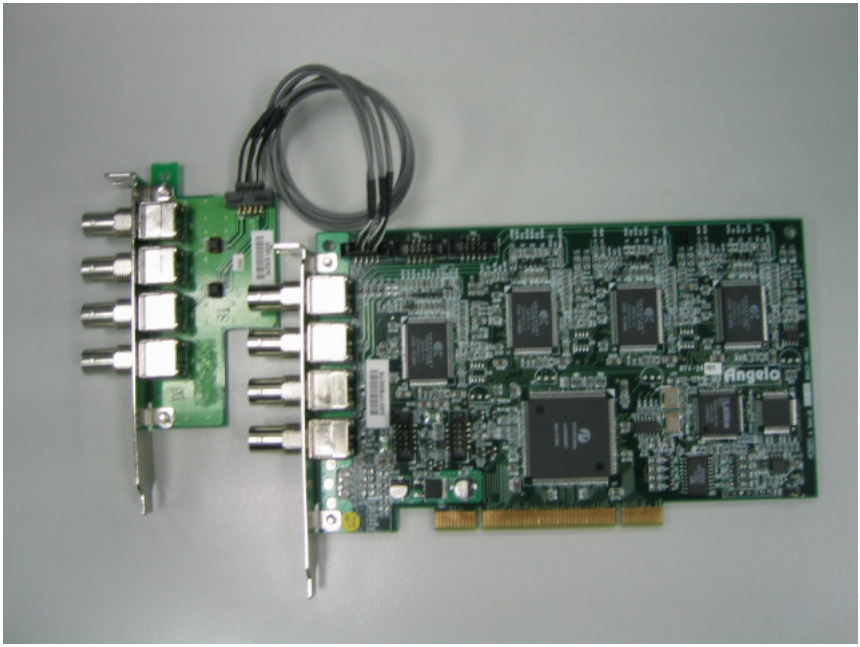


Figure 3-4: RTV-E4 Attachment

3.1.5 RTV-I4 Extension board (Optional)

1.For main board installation, please refer to ‘RTV series’.

2.Each RTV-I4 will attach one signal cable for connect with RTV-24 as below

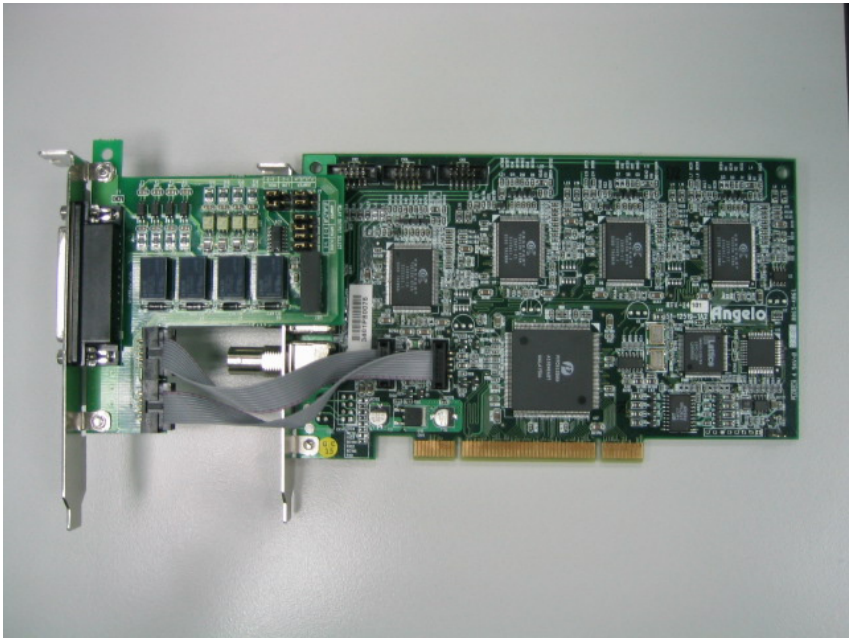


Figure 3-5: RTV-I4 Attachment

3.2 Driver Installation

3.2.1 WDM Driver Installation

Note: Do not plug in any Angelo series frame graber before installing the software driver.

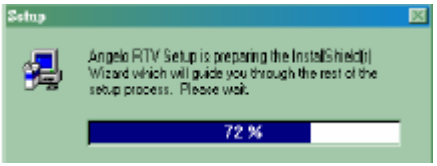
1. Insert the Automation All-in-one CD to CD-ROM drive and click Driver Installation

2. Select Vision

3. Click Angelo

4. Select Windows Driver for Windows 98/NT/2000/XP.

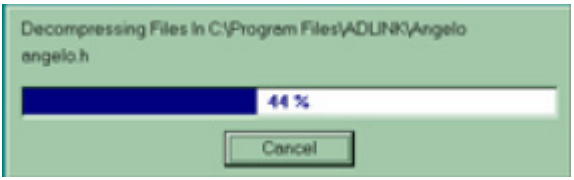
5. The driver will begin installing.



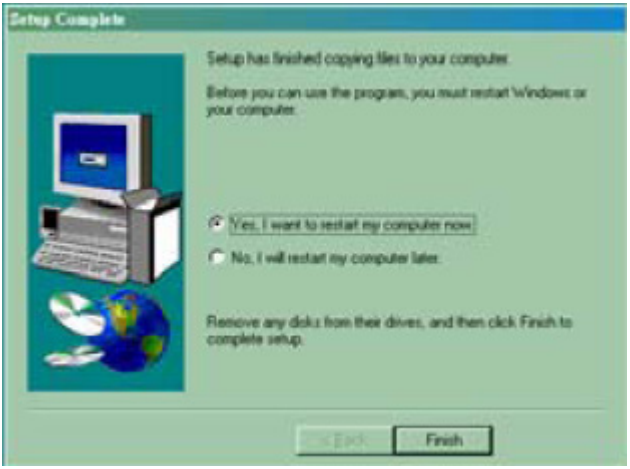
6. Click Next until driver install completely.


Welcome
Welcome to the Angelo RTV Setup program. This program will install Angelo RTV on your computer.
It is strongly recommended that you exit all Windows programs before running this Setup program.
Click Cancel to quit Setup and then close any programs you have running. Click Next to continue with the Setup program.
WARNING: This program is protected by copyright law and international treaties.
Unauthorized reproduction or distribution of this program, or any portion of it, may result in severe civil and criminal penalties, and will be prosecuted to the maximum extent possible under law.
< Back
Next >
Cancel

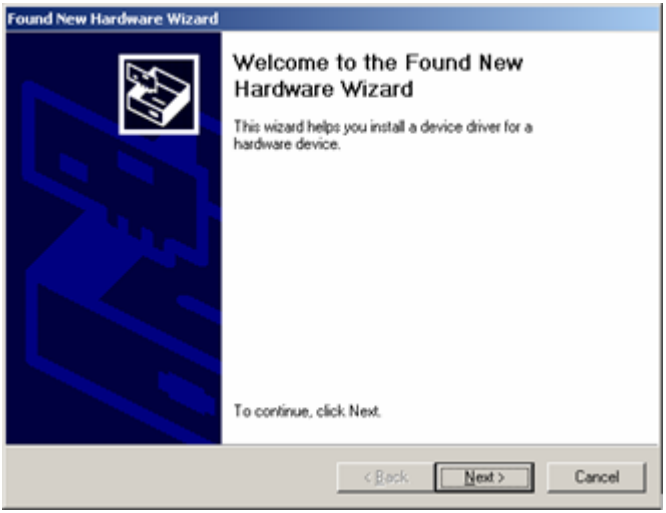

Select Program Folder
Setup will add program icons to the Program Folder listed below. You may type a new folder name, or select one from the existing Folders list. Click Next to continue.
Program Folders:
Existing Folders:
Adobe
Ahead Nero
Angelo
Basler Vision Technologies
Borland C++Builder 5
Euresys eVision
Euresys MultiCam
< Back
Next >
Cancel



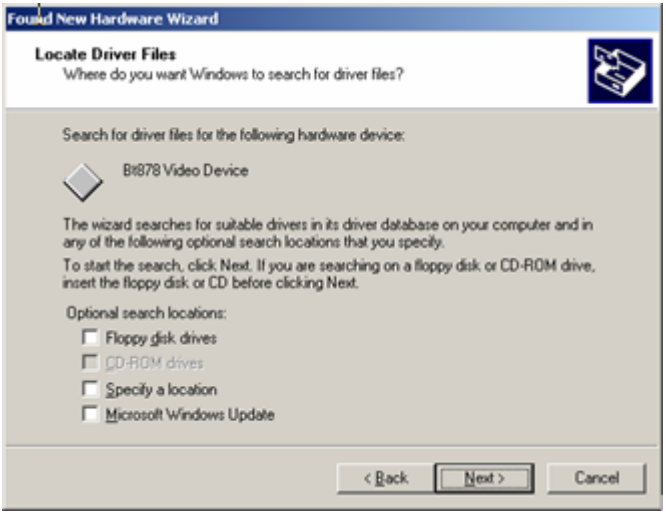
7. Click Finish and restart system.



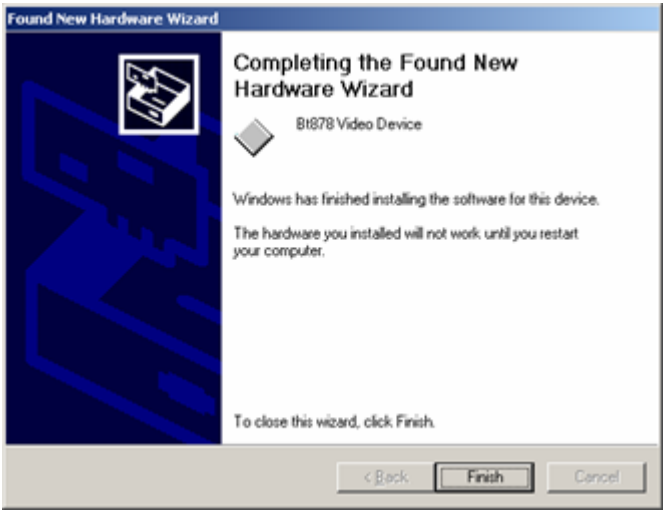
8. The Found New Hardware Wizard window should appear after system restart.Click Next and follow the steps below to complete the new hardware wizard.



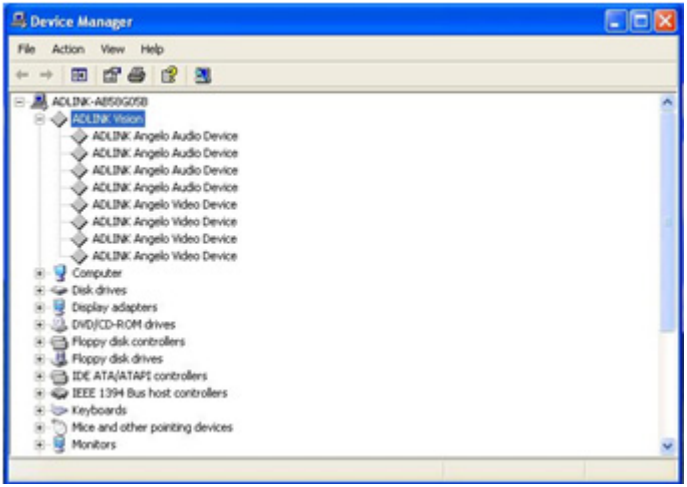
9. Click Next.



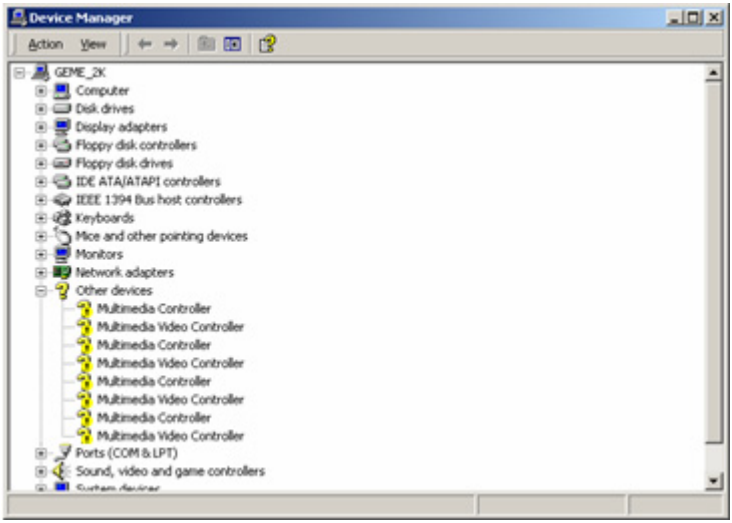
10. Click Next.



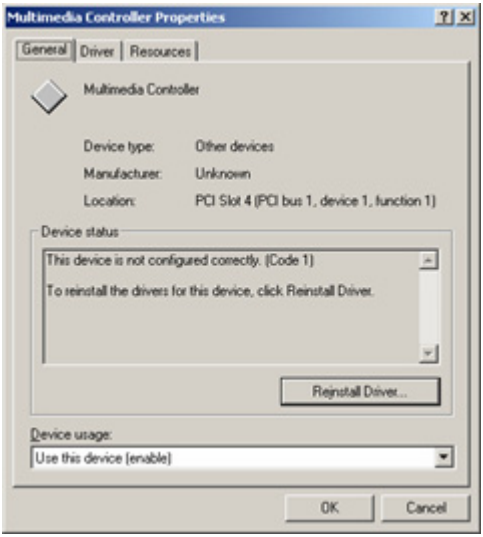
11. Click Finish.
12. Another Found New Hardware Wizard window will appear when the wizard completes. Repeat steps 8-11 until all wizards finish.
13. Go to system control panel and check multimedia devices. There should be be four 'ADLINK Angelo Audio Device' and four 'ADLINK Angelo Video Device' as below.



14. If you see a yellow question mark in front of the new driver name, you need to setup driver manually.



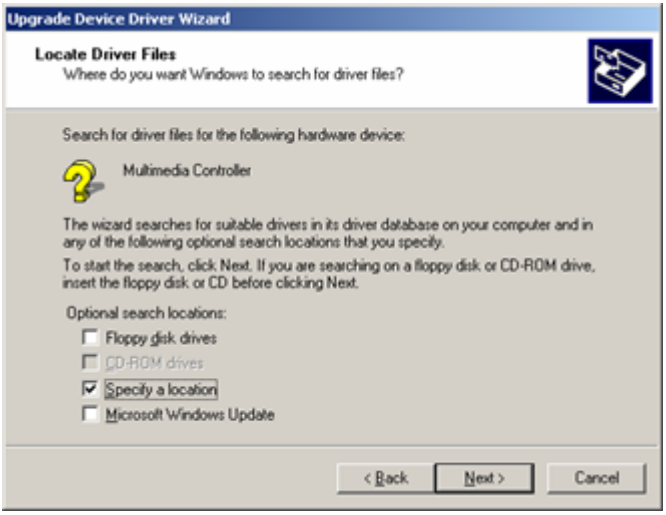
15. Right click on Multimedia Controller (which is a audio device), then select Properties from the popup menu. Follow the following steps to complete the driver reinstalling.



16.Click Reinstall Driver.

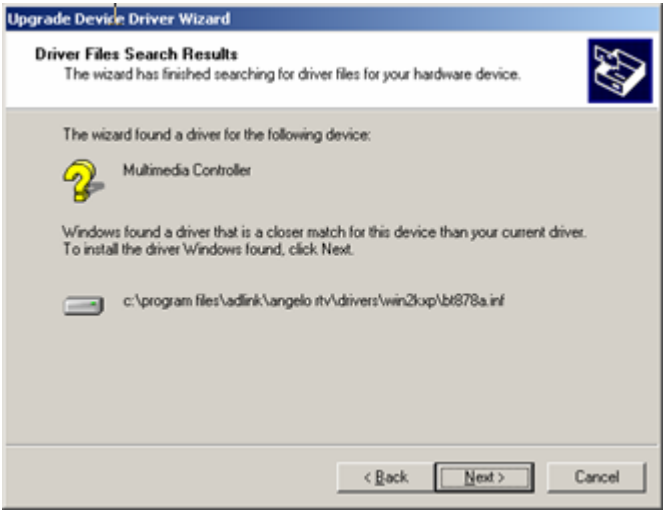
17. Click Next.

18. Click Next.



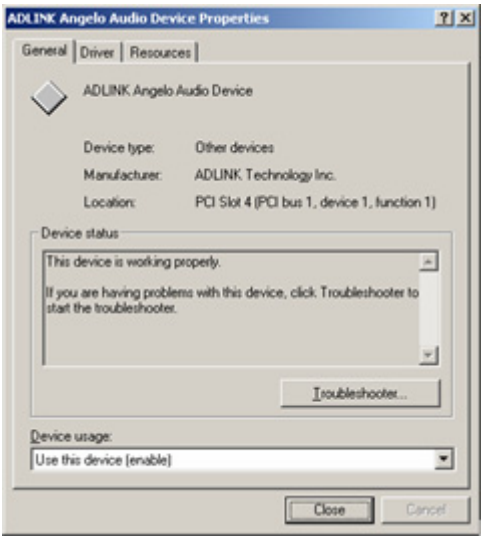
19. Check Specify a location and then click Next.

20. Input the location of driver installed in step 6, for example, 'C:\Program Files\ADLINK\Angelo.RTV\Drivers\Win2KXP'. Click OK.

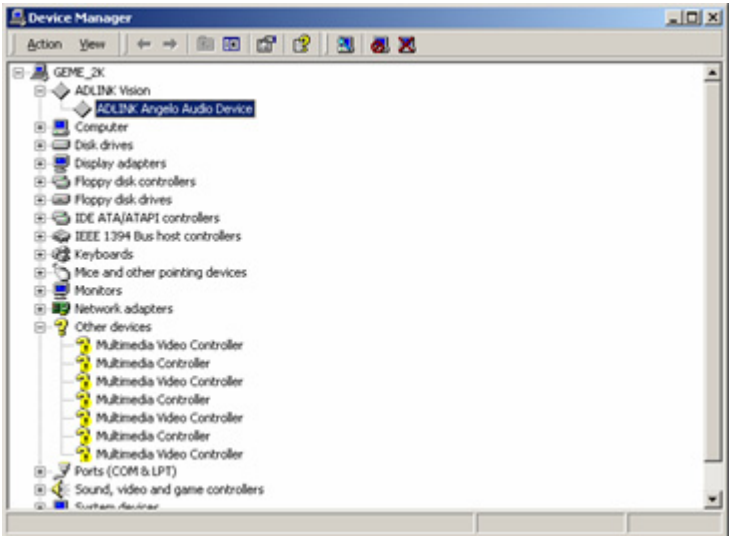


21. Click Next.

22. Click Finish to complete this wizard.



23. This device should be working properly.

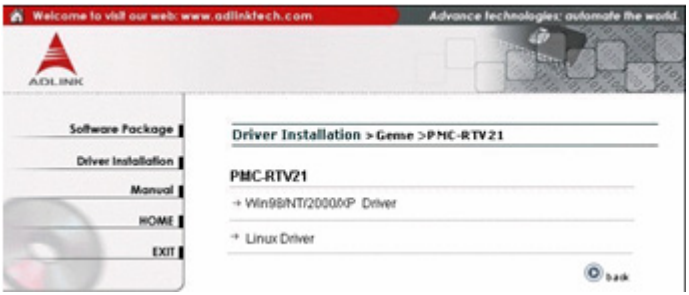


24. And the yellow question mark will disappear.

25. Repeat steps 15-24 for each of the devices to complete manual installation.

Note: If Windows prompts you to restart the computer, select No. Restart only after all devices have been installed.

26. For Angelo PMC-RTV21, please select GEME at the Driver Installation menu and follow the installation steps above.



3.2.2 Linux Driver Installation

The driver is compiled as a kernel module and works for kernel version 2.4.18 with Red Hat 7.3.

Reserve Memory

In order to reserve enough physical memory for the Angelo (Bt878) board, users need to run a command line argument and insert “mem” to boot loader configuration file to kernel (This example is for a system with 128MB RAM and wants to allocate 8MB memory for the Angelo(Bt878) board).

- If using the LILO boot loader, add `append= to /etc/lilo.conf` as below to reserve physical memory:

```
boot=/dev/hda
prompt
image=/boot/vmlinuz-2.4.18-3
label=linux
      initrd=/boot/initrd-2.4.18-3.img
      read-only
      root=/dev/hda9
      append="mem=120M"
```

Adding `append="mem=120M"` will configure the kernel to use 120MB physical memory, reserving the remaining 8MB for Angelo (Bt878).

Note: Be sure to manually execute `/sbin/lilo -v`

- If using the GRUB boot loader, add `mem=` to `/etc/grub.conf`.

```
default=0
timeout=10
splashimage=(hd0,1)/boot/grub/splash.xpm.gz
title Red Hat Linux (2.4.18-3)
root (hd0,1)
kernel /boot/vmlinuz-2.4.18-3 ro root=/dev/hda1
      mem=120M
```

Users can specify command line arguments to the interactive prompt at boot:

- LILO

```
LILO: linux mem=120M
```

- GRUB
  - Press 'a' to modify kernel arguments.

```
root=/dev/hda1 mem=120M
```

Normally, each Angelo board video channel will require around 5MB physical memory space. If 4 channels will be used, then allocate 20MB. If 8 channels will be used, then allocate 40MB.

The GEME-V3000 and GEME-V2000 systems have one Bt878 chip on-board to provide one vision channel. The total physical memory space it needs is 5MB.

The PMC-RTV21/G board is a peripheral board for GEME systems which has one Bt878 chip, so it can provide one vision channel. The total physical memory space it needs is also 5MB.

Unpack

Decompress angelo2.gz:

```
tar xvzf angelo2.gz
```

This will extract the Angelo files with the following subdirectories:

```
driver/    device module and installation script
include/   header files for the library
lib/       shared library - libpci_878.so
examples/  example programs for Angelo for X-lib.
examples/example1    example program for one port
     display with ImLib library
examples/example2    example program for one port
     display with X-lib library
examples/example3    example program for four
     port operations
examples/example4    example program for four
     channel multiplexing
examples/example5    example program for image
     geometric operations
examples/example6    example program for EEPROM
     operations
examples/example7    example program for GPIO
     operations
examples/example8    example program for save
     image operations
examples/example9example program for software
     trigger operations
examples/example10example program for Watch Dog
     Timer operations
```

Install The Device

Before installing the Angelo (Bt878) driver module, please do the following:

1. Goto the driver sub-directory.
2. Run `insmod -f mem_mgr.o` to insert the Angelo(Bt878) memory management module into kernal.

Because of the PCI-bus architecture, the Angelo (Bt878) board can be detected automatically. All users have to do is insert the Angelo driver modules and create nodes for the device. This can be done manually, or by running the following script:

```
<InstallDir>/angelo/driver/878.pl <no. of vision
     channels>
```

- For three video channels on one card, run:

  ```
  ./878.pl 3
  ```

- For four video channels on one card, run:

  ```
  ./878.pl 4
  ```

- For eight video channels on two cards, run:

  ```
  ./878.pl 8
  ```

- To use the on-board vision channel of a GEME-V3000 or GEME-V2000 system:

  ```
  ./878.pl 1
  ```

Note: GEME-V3000 and GEME-V2000 systems have one vision channel on-board.

To use the on-board vision channel of a GEME-V3000 or GEME-V2000 system and one vision channel from the PMC-RTV21/G:

```
/878.pl 2
```

To define an installation directory (i.e. `/usr/local/angelo`), add the desired path to the end of the command:

```
./878.pl 2 /usr/local/angelo
```

Install The Library

To install the shared library, type the following command:

```
cp <InstallDir>/angelo/lib/libpci_878.so /usr/lib
```

The 878.pl script can also install the library.

Note: Automatic Driver Module Setup

To automatically setup the Angelo (Bt878) driver modules at boot, refer to the example below:

```
./878.pl 1
cd /etc/rc3.d
vi S99local
```

Append following two commands to the file:

```
insmod <InstallDir>/angelo/driver/mem_mgr.o
insmod <InstallDir>/angelo/driver/p878.o
```

Now the two modules for the Angelo board(s) will be run automatically after reboot.

4 ViewCreator Utility

Once hardware installation is complete, ensure that they are configured correctly before running the ViewCreator utility. This chapter outlines how to establish a vision system and hot to manually controlling Angelo series cards to verify correct operation. ViewCreator provides a simple yet powerful means to setup, configure, test, and debug the vision system.

Note: ViewCreator is only available for Windows 98/NT/2k/XP with a recommended screen resolution higher than 800x600.

4.1 Overview

- ViewCreator offers the following features:
- 32-bit operation under Windows 98/NT/2k/XP
- Angelo series cards access and configuration
- Video picture adjustments
- Image file saving (BMP or JPG)
- Direct access to general purpose I/Os
- FULL, CIF, or QCIF Image size, 2x2 or 4x4 display
- Software triggering

4.2 Component Description

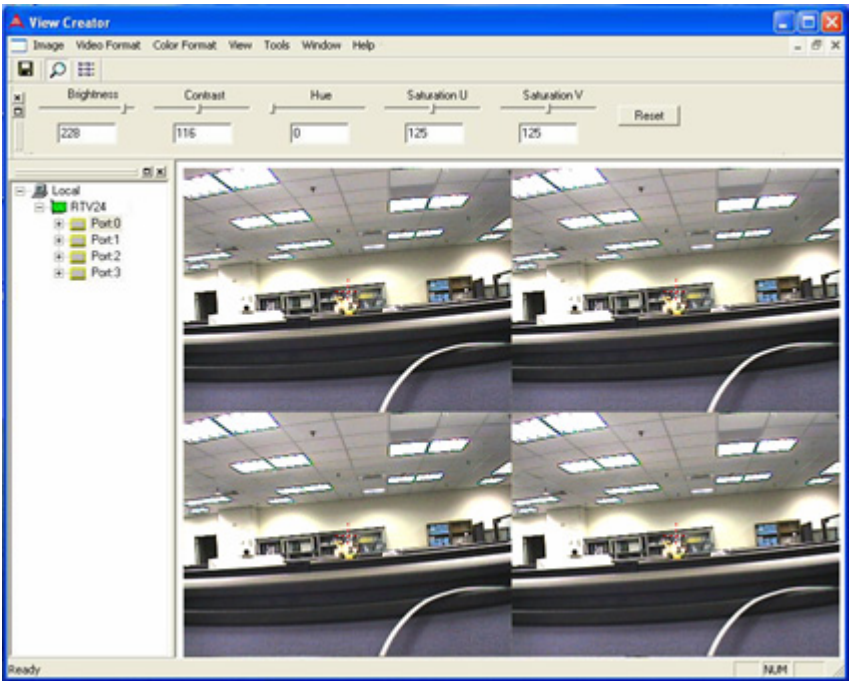


Figure 4-1: ViewCreator Main Screen

Tree Browser

The Tree Browser window lists the Angelo series cards and video ports available at the local computer.

Image View

The Image View window displays Full, CIF, and QCIF size images and image effect.

Control Panel

The control panel allows for making video adjustments including brightness, hue, contrast, etc.

4.3 Operation Theory

ViewCreator provides many functions for the RTV series card as described below.

4.3.1 Continuous Grab

Single Channel Display

Click a video Port icon in the Tree Browser window. A video frame will appear in the Image View window.

2x2 Channels

Click card icon in the Tree Browser window. All video ports in that card will appear in the Image View window.

All Channels

Click the Local icon in the Tree Browser window. All video ports in the system will appear in the Image View window.

4.3.2 Video Image Configuration

Video Format

Click Format in the menu bar to select the format of the video camera. The supported video formats are NTSC, EIA, PAL, and CCIR.

Color Format

The color format setting in ViewCreator is RGB24. The color format of the application can be changed.

Video Size

Click View in the menu bar and select the image size required. The supported video size listed below:

- FULL: 640x480 for NTSC, EIA and 768x576 for PAL, CCIR
- CIF: 320x240 for NTSC, EIA and 384x288 for PAL, CCIR
- QCF: 160x120 for NTSC, EIA and 192x144 for PAL, CCIR

4.3.3 Video Adjustments

Hue

Click and hold the left mouse button on the Hue slider of the Control Panel and drag the cursor to change its value. Values range from 0-255.

Contrast

Click and hold the left mouse button on the Contrast slider of the Control Panel and drag the cursor to change its value. Values range from 0-255

Brightness

Click and hold the left mouse button on the Brightness slider of the Control Panel and drag the cursor to change its value. Values range from 0-255

4.3.4 Save image file

This function can only be used in single channel display mode (select a video Port icon in the Tree Browser window).

JPG

Click Image in the menu bar and select Save As to bring up the Save As dialog box. Select the file location, JPG file format, enter the file name, and click the OK button.

BMP

Click Image in the menu bar and select Save As to bring up the Save As dialog box. Select the file location, BMP file format, enter the file name, and click the OK button.

4.3.5 Tools

GPIO & LED

Click Tool in the menu bar and select GPIO & LED item to bring up the GPIO dialog box. Select the port to access and select the digital output value. Click the write or read button to write/read to/from the digital I/O ports.

LED status is only supported with the cPCI Angelo series card.

EEPROM

Click Tool in the menu bar and select EEPROM to bring up the EEPROM dialog box. Select the card you wish to access, enter the offset and output values, and then click the Write button to write the value into the EEPROM. Enter the offset value and click the Read button to read the value from the EEPROM.

Valid offset values are between 0-127. Valid output values are 0-255. The value in the EEPROM will not be erased when the system is powered off.

Software Trigger

Click Tool in the menu bar and select Software Trigger to bring up the Trigger dialog box. Select the card to access and set the interval of the trigger pulse output. Check the ports you want to trigger simultaneously, and click the Trigger button.

The one shot pulse output voltage goes high (from 0V to 5V).

5 Function Library

This chapter describes the API for Angelo series cards. Users can use these functions to develop application programs under Visual C++, Visual Basic, C++ Builder, and Delphi.

5.1 List of Functions

Category	Section	Function
System	5.3	AngeloRTV_Initial(PortNo)
		AngeloRTV_Close(PortNo)
		AngeloRTV_Software_Reset(PortNo)
		AngeloRTV_Read_Serial(CardNo, HighByte, LowByte)
		AngeloRTV_Get_Version(DriverVersion, DLLVersion, Reserved)
Configuration	5.4	AngeloRTV_Set_Image_Config(PortNo, ConfigIndex,Value)
		AngeloRTV_Get_Image_Config(PortNo, ConfigIndex, Value)
		AngeloRTV_Set_Color_Format(PortNo, ColorFormat)
		AngeloRTV_Get_Color_Format(PortNo, ColorFormat)
		AngeloRTV_Set_Video_Format(PortNo, Value)
		AngeloRTV_Get_Video_Format(PortNo, Value)
		AngeloRTV_Set_Image_Geometric(PortNo, X_Offset, Y_Offset, X_Active, Y_Active, X_Scale, Y_Scale)
		AngeloRTV_Detect_Video_Format(PortNo, FormatValue)
Image Grabbing	5.5	AngeloRTV_Capture_Start(PortNo, CaptureNo)
		AngeloRTV_Select_Channel(PortNo, Multiplex)
		AngeloRTV_Capture_Stop (PortNo)
		AngeloRTV_Capture_Config(PortNo, Start_Field)
		AngeloRTV_Sync_Grab(PortNo, Start_Address, Width, Height, Size_Byte)
GPIO & EPROM	5.6	AngeloRTV_Set_GPIO_Sts(PortNo, Status)
		AngeloRTV_Get_GPIO_Sts(PortNo, Status)
		AngeloRTV_Set_GPIO_Int_Logic (PortNo, Logic)
		AngeloRTV_Write_EEPROM(PortNo, Offset, Value)
		AngeloRTV_Read_EEPROM(PortNo, Offset, Value)
		AngeloRTV_Set_LED_Sts (PortNo, LEDStatus)
Callback & Thread	5.7	AngeloRTV_Set_Int_Event(PortNo,hEvent)
		AngeloRTV_Set_Callback(PortNo, CallBackProc)
		AngeloRTV_Get_Int_Status(PortNo,IntStatus)
Software Trigger	5.8	AngeloRTV_Trigger_Config(PortNo, Interval)
		AngeloRTV_Trigger_Start(CardNo, Multiplex)
Frame Buffer	5.9	AngeloRTV_Get_frame(PortNo, Start_Address, Width, Height, Size_Byte)
		AngeloRTV_Save_File(PortNo, FileName, FileFormat, nQuality)
		AngeloRTV_Copy_frame(PortNo, Dest_Address, Size_Byte)

Table 5-1: List of Functions

5.2 C/C++ Programming Library

Function prototypes and common data types are defined in Angelo.h. The Angelo series library uses these data types. We suggest that these data types be used in your application programs. The following table shows the data types and their range:

Type Name	Description	Range
U8	8-bit ASCII character	0 to 255
I16	16-bit integer	-32768 to 32767
U16	16-bit unsigned integer	0 to 65535
I32	32-bit long integer	-2147483648 to 2147483647
U32	32-bit unsigned long integer	0 to 4294967295
F32	32-bit float	-3.402823E38 to 3.402823E38
F64	64-bit double float	-1.797683134862315E308 to 1.797683134862315E309
Boolean	Boolean logic	TRUE, FALSE

Table 5-2: C/C++ Data Types

5.3 System Functions

@ Name

AngeloRTV_Initial(PortNo)

Initialize the port in Angelo series card.

AngeloRTV_Close(PortNo)

Close the port in Angelo series card.

AngeloRTV_Software_Reset(PortNo)

Reset the port in Angelo series card.

AngeloRTV_Read_Serial(CardNo, HighByte, LowByte)

Read the unique 48-Bit Serial Number of Angelo Series Card (Only for RTV-24 Rev.B1 above, PCI-2100 Rev.A2 above)

AngeloRTV_Get_Version(DriverVersion, DLLVersion, Reserved)

Get the version of driver of AngeloRTV card and AngeloRTV.dll.

@ Description

AngeloRTV_Initial:

This function initializes the ports of the Angelo Series card. Each application program must call this function before any other functions can be used. If the initialization is executed successfully, it returns a value of 0.

Note: There are four ports on the RTV-24, cRTV-24, and cRTV-44 series cards, and one port on the PMC- RTV21.

AngeloRTV_Close:

Releases all resources from the ports.

AngeloRTV_Software_Reset:

Resets the port to its initial state.

AngeloRTV_Read_Serial:

This function can read a 48-bit unique ID and store in 2 Long interger.

AngeloRTV_Get_Version:

Used to get the current version of AngeloRTV card driver and AngeloRTV.dll file.

@ Syntax

C/C++ (Windows 98/NT/2000/XP/CE.NET)

```
I16 AngeloRTV_Initial(U16 PortNo)
```

```
I16 AngeloRTV_Close(U16 PortNo)
I16 AngeloRTV_Software_Reset(U16 PortNo)
U16 AngeloRTV_Read_Serial(U16 CardNo, U32*
     HighByte, U32* LowByte);
I16 AngeloRTV_Get_Version(U32 *DriverVersion, U32
     *DLLVersion, U32 *Reserved)
```

Visual Basic (Windows 98/NT/2000/XP/CE.NET)

```
AngeloRTV_Initial (ByVal PortNo As Integer) As
     Integer
AngeloRTV_Close(ByVal PortNo As Integer) As
     Integer
AngeloRTV_Software_Reset (ByVal PortNo As
     Integer) As Integer
AngeloRTV_Read_Serial(Byval CardNo as Integer,
     ByRef HighByte As Long, ByRef LowByte As
     Long) As Integer
AngeloRTV_Get_Version (ByRef DriverVersion As
     Long, ByRef DLLVersion As Long, ByRef
     Reserved As Long) As Integer
```

Delphi (Windows 98/NT/2000/XP)

```
AngeloRTV_Initial(PortNo:Smallint):Smallint
AngeloRTV_ Close (PortNo:Smallint):Smallint
AngeloRTV_Software_Reset
     (PortNo:Smallint):Smallint
AngeloRTV_Read_Serial(CardNo:Smallnt; Var
     HighByte: Longint; Var
     LowBytet:Longint):Smallint;
AngeloRTV_Get_Version (var DriverVersion:Longint;
     var DLLVersion:Longint; var
     Reserved:Longint):Smallint
```

@ Arguments

PortNo:

Port number is the zero index of the Angelo series card. For example, if there are two RTV-24 Angelo cards (card 0, card 1) in the system, and each RTV-24 has four ports, the first port of card 0 is “0”, and the first port of card 1 is “4.”

HighByte:

HighByte stores the upper 16Bit of Serial No..

LowByte:

LowByte stores the lower 32Bit of Serial No.

DriverVersion:

Indicate the current version of AngeloRTV driver. This parameter is a pointer to an integer array with length 4.

DLLVersion:

Indicate the current version of AngeloRTV.dll file. This parameter is a pointer to an integer array with length 4.

@ Return Code

- 0: ERROR_NoError
- -2: ERROR_Card_Not_Exist – make sure the Angelo series card is plugged into the system, check the device manager to make sure the device is loaded, and the “PortNo” parameter is valid.
- -3: ERROR_Card_Not_Accessible – make sure the Angelo series card is plugged into the system, check the device manager to make sure the device is loaded, and the “PortNo” parameter is valid.
- -12: ERROR_CPLD_Check_Failed – Power off the computer and power on again.

@ Example

<VC/BCB >

AngeloRTV_Initial –

```
I16 Result;
for(int PortNo= 0 ; PortNo <4;PortNo++)
Result = AngeloRTV_Initial (PortNo);
```

AngeloRTV_Cose –

```
I16 Result;
for(int PortNo= 0 ; PortNo <4;PortNo++)
Result = AngeloRTV_Cose (PortNo);
```

AngeloRTV_Software_Reset–

```
I16 Result;
for(int PortNo= 0 ; PortNo <4;PortNo++)
Result = AngeloRTV_Software_Reset (PortNo);
```

AngeloRTV_Read_Serial–

```
int Result;
int CardNo = 0;
unsigned long HighByte = 0, LowByte = 0;
Result = AngeloRTV_Read_Serial(CardNo, &HighByte,
     &LowByte);
```

AngeloRTV_Get_Version –

```
I16 Result;
U32 DriverVersion[4] = {0}, DLLVersion[4] = {0},
     Reserved[4] = {0};
char strDriverVersion[20], strDLLVersion[20];
Result = AngeloRTV_Get_Version (DriverVersion,
     DLLVersion, Reserved);
sprintf(strDriverVersion, "%d.%d.%d.%d",
     DriverVersion[0], DriverVersion[1],
     DriverVersion[2], DriverVersion[3]);
sprintf(strDLLVersion, "%d.%d.%d.%d",
     DLLVersion[0], DLLVersion[1],
     DLLVersion[2], DLLVersion[3]);
```

< Visual Basic >

AngeloRTV_Initial –

```
Dim Result As Integer
Dim PortNo As Integer
For PortNo= 0 To 3
Result = AngeloRTV_Initial (ByVal PortNo)
```

AngeloRTV_Cose –

```
Dim Result As Integer
Dim PortNo As Integer
For PortNo= 0 To 3
Result = AngeloRTV_Close (ByVal PortNo)
```

AngeloRTV_Read_Serial–

```
Dim Result As Integer
Dim CardNo As Integer
Dim HighByte As Long, LowByte As Long
CardNo=0
HighByte=0
LowByte=0
Result = AngeloRTV_Read_Serial(CardNo, HighByte,
     LowByte)
```

AngeloRTV_Software_Reset–

```
Dim Result As Integer
Dim PortNo As Integer
For PortNo= 0 To 3
Result = AngeloRTV_Software_Reset (ByVal PortNo)
```

AngeloRTV_Get_Version –

```
Dim Result As Integer
Dim DriverVersion(3) As Long, DLLVersion(3) As
     Long, Reserved(3) As Long
Dim strDriverVersion, strDLLVersion As String
```

```
Result = AngeloRTV_Get_Version (DriverVersion(0),
     DLLVersion(0), Reserved(0))
strDriverVersion = CStr(DriverVersion(0)) + "." +
     CStr(DriverVersion(1)) + "." +
     CStr(DriverVersion(2)) + "." +
     CStr(DriverVersion(3))
strDLLVersion = CStr(DLLVersion(0)) + "." +
     CStr(DLLVersion(1)) + "." +
     CStr(DLLVersion(2)) + "." +
     CStr(DLLVersion(3))
```

<Delphi >

AngeloRTV_Initial –

```
var PortNo,Result:SmallInt;
for i:= 0 to 3 do
begin
Result := AngeloRTV_Initial (PortNo);
End;
```

AngeloRTV_Cose –

```
var PortNo,Result:SmallInt;
for i:= 0 to 3 do
begin
Result := AngeloRTV_Close (PortNo);
End;
```

AngeloRTV_Software_Reset–

```
var PortNo,Result:SmallInt;
for i:= 0 to 3 do
begin
Result := AngeloRTV_Software_Reset (PortNo);
End;
```

AngeloRTV_Read_Serial–

```
var
CardNo,Result:SmallInt;
HighByte, LowByte:SmallInt;
Result := AngeloRTV_Read_Serial(CardNo, HighByte,
LowByte)
```

AngeloRTV_Get_Version –

```
var
Result: Smallint;
DriverVersion: array[1..4] of Longint;
DLLVersion: array[1..4] of Longint;
Reserved: array[1..4] of Longint;
strDriverVersion, strDLLVersion: String;
```

```
Result := AngeloRTV_Get_Version
      (DriverVersion[1], DLLVersion[1],
      Reserved[1]);
strDriverVersion := IntToStr(DriverVersion[1]);
strDriverVersion := strDriverVersion + '.' +
      IntToStr(DriverVersion[2]);
strDriverVersion := strDriverVersion + '.' +
      IntToStr(DriverVersion[3]);
strDriverVersion := strDriverVersion + '.' +
      IntToStr(DriverVersion[4]);
strDLLVersion := IntToStr(DLLVersion[1]);
strDLLVersion := strDLLVersion + '.' +
      IntToStr(DLLVersion[2]);
strDLLVersion := strDLLVersion + '.' +
      IntToStr(DLLVersion[3]);
strDLLVersion := strDLLVersion + '.' +
      IntToStr(DLLVersion[4]);
```

5.4 Configuration Functions

@ Name

AngeloRTV_Set_Image_Config(PortNo, ConfigIndex ,Value)

Set the video adjustments.

AngeloRTV_Get_Image_Config(PortNo, ConfigIndex, Value)

Get the video adjustments.

AngeloRTV_Set_Color_Format(PortNo, ColorFormat)

Set the color format.

AngeloRTV_Get_Color_Format(PortNo, ColorFormat)

Get the color format.

AngeloRTV_Set_Video_Format(PortNo, Value)

Set the video format.

AngeloRTV_Get_Video_Format(PortNo, Value)

Set the video format.

AngeloRTV_Set_Image_Geometric(PortNo, X_Offset, Y_Offset, X_Active, Y_Active, X_Scale, Y_Scale)

Advanced image processing.

AngeloRTV_Detect_Video_Format(PortNo, FormatValue)

Detect the video format and if there is signal input.

@ Description

AngeloRTV_Set_Image_Config:

Adjusts the hue, contrast, Saturation and brightness of the port for the Angelo series card.

AngeloRTV_Get_Image_Config:

Retrieves the current hue, contrast, Saturation and brightness setting of the port for the Angelo series card.

AngeloRTV_Set_ Color _Format:

Sets the color format of the port for the Angelo series card. Valid color formats are: gray scale, RGB.

AngeloRTV_Get_ Color _Format:

Retrieves the color format of the port for the Angelo series card.

AngeloRTV_Set_ Video_Format:

Sets the Video format of the port for the Angelo series card. Valid color formats are: NTSC, EIA, PAL, CCIR.

AngeloRTV_Get_ Video _Format:

Retrieves the video format of the port for the Angelo series card.

AngeloRTV_Set_Image_Geometric:

This function is used for image cropping and scaling.

AngeloRTV_Detect_Video_Format:

Use the function to retrieve the video format. And if the return value of the 2nd parameter is 0 that means there is no signal input.

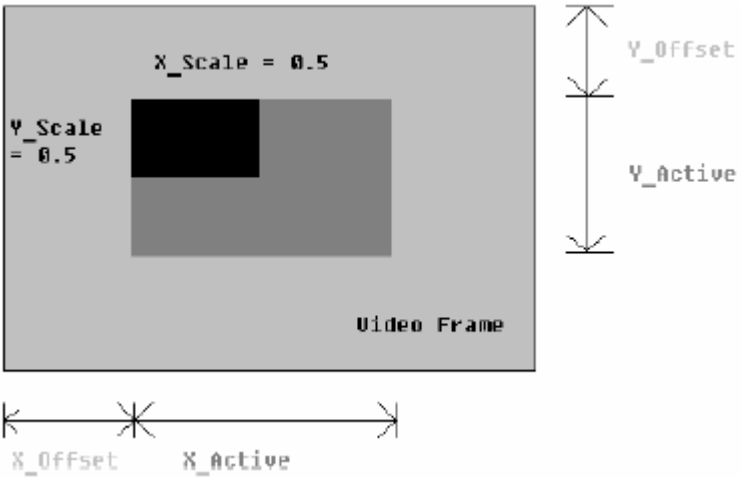


Figure 5-1: Video Frame

@ Syntax

C/C++ (Windows 98/NT/2000/XP/CE.NET)

```
I16 AngeloRTV_Set_Image_Config(U16 PortNo,U8
     ConfigIndex , U8 Value);
I16 AngeloRTV_Get_Image_Config(U16 PortNo,U8
     ConfigIndex , U8* Value);
I16 AngeloRTV_Set_ Color _Format (U16 PortNo, U8
     ColorFormat);
I16 AngeloRTV_Get_ Color _Format (U16 PortNo, U8*
     ColorFormat);
```

```
I16 AngeloRTV_Set_Video _Format (U16 PortNo, U8
    VideoFormat);
I16 AngeloRTV_Set_Video _Format (U16 PortNo, U8*
    VideoFormat);
I16 AngeloRTV_Set_Image_Geometric(U16 PortNo, U32
    X_Offset, U32 Y_Offset, U32 X_Active, U32
    Y_Active,double X_Scale,double Y_Scale);
I16 AngeloRTV_Detect_Video_Format (U16 PortNo, U8
    *FormatValue);
```

Visual Basic (Windows 98/NT/2000/XP/CE.NET)

```
AngeloRTV_Set_Image_Config(ByVal PortNo As
    Integer, ByVal ConfigIndex As Byte,ByVal
    Value As Byte) As Integer
AngeloRTV_Get_Image_Config(ByVal PortNo As
    Integer, ByVal ConfigIndex As Byte, ByRef
    Value As Byte) As Integer
AngeloRTV_Set_ Color _Format (ByVal PortNo As
    Integer, ByVal ColorFormat As Byte) As
    Integer
AngeloRTV_Get_ Color _Format (ByVal PortNo As
    Integer, ByRef ColorFormat As Byte) As
    Integer
AngeloRTV_Set_Video _Format (ByVal PortNo As
    Integer, ByVal VideoFormat As Byte) As
    Integer
AngeloRTV_Set_Video _Format (ByVal PortNo As
    Integer, ByRef VideoFormat As Byte) As
    Integer
AngeloRTV_Set_Image_Geometric(ByVal PortNo As
    Integer, ByVal X_Offset As Long, ByVal
    Y_Offset As Long, ByVal X_Active As Long,
    ByVal Y_Active As Long, ByVal X_Scale As
    Double, ByVal Y_Scale As Double)  As Integer
AngeloRTV_Detect_Video_Format (ByVal PortNo,
    ByRef FormatValue As Byte) As Integer
```

Delphi (Windows 98/NT/2000/XP)

```
AngeloRTV_Set_Image_Config(PortNo:Smallint;Confi
    gIndex:Byte;Value:Byte): Smallint;
    AngeloRTV_Get_Image_Config(PortNo:Smallint;
    ConfigIndex:Byte;var Value:Byte):Smallint;
AngeloRTV_Set_Color_Format(PortNo:Smallint;Color
    Format:Byte):Smallint;
```

```
AngeloRTV_Get_Color_Format(PortNo:Smallint;var
     ColorFormat:Byte):Smallint;
AngeloRTV_Set_Video_Format(PortNo:Smallint;Video
     Format:Byte):Smallin;
AngeloRTV_Get_Video_Format(PortNo:Smallint;var
     VideoFormat:Byte):Smallint;
AngeloRTV_Set_Image_Geometric (PortNo:Smallint;
     X_Offset:LongInt; Y_Offset:LongInt;
     X_Active:LongInt; Y_Active:LongInt;
     X_Scale:Double; Y_Scale:Double):Smallint;
AngeloRTV_Detect_Video_Format(PortNo:Smallint;
     var FormatValue:Byte):Smallint;
```

@ Arguments

PortNo:

Port number is the zero index of the Angelo series card. For example, if there are two PCI-RTV-24 Angelo cards (card 0, card 1) in the system, and each PCI-RTV-24 has four ports, the first port of card 0 is “0”, and the first port of card 1 is “4.”

ConfigIndex:

- 0 for BRIGHTNESS
- 1 for HUE
- 2 for SATURATION (U)
- 3 for SATURATION (V)
- 4 for CONTRAST (LUMA)
- 5 for luma notch filter (for monochrome video, the notch filter should not be used)

Value: (0-255)

- Range Default value
- BRIGHTNESS 0 ---- 255 128
- HUE 0 ---- 255 0
- CHROMA (U) 0 ---- 255 127
- CHROMA (V) 0 ---- 255 127
- LUMA 0 ---- 255 108
- LUMA notch filter 0(Enable) or 1(Disable)

Color Format:

- RGB16 = 0,
- GRAY = 1,
- RGB15 = 2,
- RGB24 = 3,
- RGB32 = 4,
- RGB8 = 5,
- RAW8X = 6,
- YUY24:2:2= 7,

Video Format:

- Full NTSC (640*480) = 0,
- Full PAL (768*576) = 1,
- CIF NTSC (320*240) = 2,
- CIF PAL (384*288) = 3,
- QCIF NTSC (160*120) = 4,
- QCIF PAL (192*144) = 5,

Note: Please do not use Full NTSC and Full PAL format to acquire dynamic object image, because the interlaced scanning may not be able to present clear image for it.

X_Scale:

This parameter is the scaling factor applied to the Angelo sampled line to obtain pixels according to the resolution.

X_Active

This parameter value is the length of the active video line

X_Offset

This parameter value is the number of scaled pixels to skip before the start of the active video line.

Y_Scale:

This parameter is the scaling factor applied to the Angelo sampled data lines in the vertical direction. It must be the following values:

- Y_Scale = 1.0
- Y_Scale = 0.5
- Y_Scale = 0.25

Y_Active

This parameter value is the height (in lines) of the active video image.

Y_Offset

This parameter value is the number of lines to skip before the first line of the active video image.

FormatValue:

If the return value of this parameter is 0 that means there is no video signal input. And if the value is 1 or 2, the video format of the port is NTSC. Otherwise, if the value is 3, 4 or 5, the video format of the port is PAL.

@ Example

<VC/BCB >

AngeloRTV_Set_Image_Config –
AngeloRTV_Get_Image_Config –

```
I16 Result;
I16 PortNo = 0;
U8 ConfigIndex = 0;
U8 Value = 128;
Result = AngeloRTV_Set_Image_Config (PortNo,
ConfigIndex, Value);
Result = AngeloRTV_Get_Image_Config (PortNo,
ConfigIndex, &Value);
```

AngeloRTV_Set_Color_Format –
AngeloRTV_Get_Color_Format –
AngeloRTV_Set_Video_Format –
AngeloRTV_Get_Video_Format –

```
I16 Result;
I16 PortNo = 0;
U8 VideoFormat = 0;
U8 ColorFormat = 3;
Result = AngeloRTV_Set_Color_Format(PortNo,
     ColorFormat);
Result = AngeloRTV_Get_Color_Format(PortNo,
     &ColorFormat);
Result = AngeloRTV_Set_Video_Format(PortNo,
     VideoFormat);
Result = AngeloRTV_Get_Video_Format(PortNo,
     &VideoFormat);
```

AngeloRTV_Set_Image_Geometric –

```
I16 Result;
I16 PortNo = 0;
U32 X_Active = 600;
U32 Y_Active = 400;
U32 X_Offset = 40;
U32 Y_Offset = 80;
Double X_Scale = 1.0;
Double Y_Scale = 1.0;
Result = AngeloRTV_Set_Image_Geometric (PortNo,
     X_Offset, Y_Offset, X_Active, Y_Active,
     X_Scale, Y_Scale);
```

AngeloRTV_Detect_Video_Format –

```
I16 Result;
U16 PortNo;
U8   FormatValue;
PortNo = 0;
Result = AngeloRTV_Detect_Video_Format (PortNo,
     &FormatValue);
```

< Visual Basic >

AngeloRTV_Set_Image_Config –
AngeloRTV_Get_Image_Config –

```
Dim Result As Integer
Dim PortNo As Integer
Dim ConfigIndex As Byte
Dim Value As Byte
PortNo = 0
ConfigIndex =0
Value = 128
Result = AngeloRTV_Set_Image_Config (ByVal
     PortNo, ByVal ConfigIndex, ByVal Value)
Result = AngeloRTV_Get_Image_Config (ByVal
     PortNo, ByVal ConfigIndex, ByRef Value)
```

AngeloRTV_Set_Color_Format –
AngeloRTV_Get_Color_Format –
AngeloRTV_Set_Video_Format –
AngeloRTV_Get_Video_Format –

```
Dim Result As Integer
Dim PortNo As Integer
Dim ColorFormat As Byte
Dim VideoFormat As Byte
PortNo = 0
ColorFormat =3
VideoFormat = 0
```

```
Result = AngeloRTV_Set_Color_Format(ByVal PortNo,
     ByVal ColorFormat)
Result = AngeloRTV_Get_Color_Format(ByVal PortNo,
     ByRef ColorFormat)
Result = AngeloRTV_Set_Video_Format(ByVal PortNo,
     ByVal VideoFormat)
Result = AngeloRTV_Get_Video_Format(ByVal PortNo,
     ByRef VideoFormat)
```

AngeloRTV_Set_Image_Geometric –

```
Dim Result As Integer
Dim PortNo As Integer
Dim X_Active As Long
Dim Y_Active As Long
Dim X_Offset As Long
Dim Y_Offset As Long
Dim X_Scale As Double
Dim Y_Scale As Double
PortNo = 0
X_Active = 600
Y_Active = 400
X_Offset = 40
Y_Offset = 80
X_Scale = 1.0
Y_Scale = 1.0
Result = AngeloRTV_Set_Image_Geometric (PortNo,
     X_Offset, Y_Offset, X_Active, Y_Active,
     X_Scale, Y_Scale)
```

AngeloRTV_Detect_Video_Format –

```
Dim Result As Integer
Dim PortNo As Integer
Dim FormatValue As Byte
PortNo = 0
Result = AngeloRTV_Detect_Video_Format (ByVal
     PortNo, ByRef FormatValue)
```

<Delphi >

AngeloRTV_Set_Image_Config –

AngeloRTV_Get_Image_Config –

```
Var
Result : SmallInt;
PortNo : SmallInt;
ConfigIndex: Byte;
Value: Byte;
PortNo:=0;
```

```
ConfigIndex:=0;
Value:=0;
Result := AngeloRTV_Set_Image_Config
     (PortNo,ConfigIndex, Value);
Result := AngeloRTV_Get_Image_Config (PortNo,
     ConfigIndex, Value);
```

AngeloRTV_Set_Color_Format –
AngeloRTV_Get_Color_Format –
AngeloRTV_Set_Video_Format –
AngeloRTV_Get_Video_Format –

```
Var
Result : SmallInt;
PortNo : SmallInt;
VideoFormat: Byte;
ColorFormat: Byte;
PortNo:=0;
VideoFormat:=0;
ColorFormat:=3;
Result :=
     AngeloRTV_Set_Color_Format(PortNo,ColorForm
     at);
Result :=
     AngeloRTV_Get_Color_Format(PortNo,ColorForm
     at);
Result :=
     AngeloRTV_Set_Video_Format(PortNo,VideoForm
     at);
Result := AngeloRTV_Get_Video_Format(PortNo,
     VideoFormat);
```

AngeloRTV_Set_Image_Geometric –

```
Var
Result : SmallInt;
PortNo : SmallInt;
X_Active : LongInt;
Y_Active : LongInt;
X_Offset : LongInt;
Y_Offset : LongInt;
X_Scale : Double;
Y_Scale : Double;
PortNo := 0;
X_Active := 600;
Y_Active := 400;
X_Offset := 40;
```

```
Y_Offset := 80;
X_Scale := 1.0;
Y_Scale := 1.0;
Result := AngeloRTV_Set_Image_Geometric(PortNo,
     X_Offset, Y_Offset, X_Active, Y_Active,
     X_Scale, Y_Scale);
```

AngeloRTV_Detect_Video_Format –

```
var
Result : SmallInt;
PortNo : SmallInt;
FormatValue : Byte;
PortNo := 0;
Result := AngeloRTV_Detect_Video_Format (PortNo,
     FormatValue);
```

5.5 Image Grabbing

@ Name

AngeloRTV_Capture_Start(PortNo, CaptureNo)

Start to grab the video image

AngeloRTV_Select_Channel(PortNo, Multiplex)

Channel extension of video signal, for advanced only

AngeloRTV_Capture_Stop(PortNo)

Stop to grab the video image

AngeloRTV_Capture_Config(PortNo, Start_Field)

Set the starting field of image

AngeloRTV_Sync_Grab(PortNo, Start_Address, Width, Height, Size_Byte)

Get an image frame with start address of memory

@ Description

AngeloRTV_Capture_Start:

Continuously captures video frames and stops when the total frame number equals the "CaptureNo" parameter. The frame update rate is 30 frames/sec. If the "CaptureNo" is 0xFFFFFFFF, the frame grabbing will not stop until the "AngeloRTV_Capture_Stop" function is called.

AngeloRTV_Capture_Stop:

Stop grabbing video frames.

AngeloRTV_Select_Channel:

Angelo series cards are capable of channel extension. This function is used to multiplex video signals for the ports. In most cases using this function should not be required because the default setting is one port is dedicated to one channel.

Note: Do not call this function if there is no channel extension board in the system.

AngeloRTV_Capture_Config:

Chooses the starting field of image.

AngeloRTV_Sync_Grab:

This is a synchronous image grabbing function to get an image frame. Retrieve the memory start address from the frame data, width, height, and size in bytes of the image.

@ Syntax

C/C++ (Windows 98/NT/2000/XP/CE.NET)

```
I16 AngeloRTV_Capture_Start (U16 PortNo, U32
     CaptureNo)
I16 AngeloRTV_Select_Channel (U16 PortNo, U16
     Multiplex)
I16 AngeloRTV_Capture_Stop (U16 PortNo)
I16 AngeloRTV_Capture_Config (U16 PortNo, U32
     Start_Field)
I16 AngeloRTV_Sync_Grab(U16 PortNo, U32*
     Start_Address, U32* Width, U32* Height, U32*
     Size_Byte)
```

Visual Basic (Windows 98/NT/2000/XP/CE.NET)

```
AngeloRTV_Capture_Start (ByVal PortNo As Integer,
     ByVal CaptureNo As Long) As Integer
AngeloRTV_Select_Channel (ByVal PortNo As
     Integer, ByVal Multiplex As Integer) As
     Integer
AngeloRTV_Capture_Stop (ByVak PortNo As Integer)
     As Integer
AngeloRTV_Capture_Config (ByVal PortNo As
     Integer, ByVal Start_Field As Long) As
     Integer
AngeloRTV_Sync_Grab(ByVal PortNo As Integer,
     ByRef Start_Address As Long, ByRef Width as
     Long, ByRef Height As Long, ByRef Size_byte
     As Long) As Integer
```

Delphi (Windows 98/NT/2000/XP)

```
AngeloRTV_Capture_Start (PortNo:Smallint;
     CaptureNo:LongInt):Smallint
AngeloRTV_Select_Channel (PortNo:Smallint;
     Multiplex:SmallInt):Smallint
AngeloRTV_Capture_Stop
     (PortNo:Smallint):Smallint
AngeloRTV_Capture_Config (PortNo:Smallint;
     Start_Field:LongInt):Smallint
AngeloRTV_Sync_Grab(PortNo:Smallint; var
     Start_Address:Pointer; var Width:Longint;
     var Height:Longint; var
     Size_byte:Longint):Smallint
```

@ Argument

PortNo:

Port number is the zero index of the Angelo series card. For example, if there are two PCI-RTV-24 Angelo cards (card 0, card 1) in the system, and each PCI-RTV-24 has four ports, the first port of card 0 is “0”, and the first port of card 1 is “4.”

CaptureNo:

Total number of frames to capture. If the “CaptureNo” is 0xFFFFFFFF, the frame grabbing will not stop until the “AngeloRTV_Capture_Stop” function is called.

Multiplex:

Indicates the multiplex channels.

- Bit 0 : Channel 0, 0 for disable ; 1 for enable.
- Bit 1 : Channel 1, 0 for disable ; 1 for enable.
- Bit 2 : Channel 2, 0 for disable ; 1 for enable.
- Bit 3 : Channel 3, 0 for disable ; 1 for enable.

For example:

- Multiplex = 1, only channel 0 is enable
- Multiplex = 2, only channel 1 is enable
- Multiplex = 15, four channels are enable

Start_Filed:

Indicates the first field of image.

- 0: first field is Odd, so the image will be Odd field + Even field.
- 1: first field is Even, so the image will be Even field + Odd field.
- 2: first field depends on the current field, so the image will be Even field + Odd field, or Odd field + Even field.

Start_Address:

Memory start address of the video frame.

Width:

Image width.

Height:

Image height.

Size_Byte:

Memory size in bytes.

@ Return Code

- 0: ERROR_NoError
- -7: ERROR_Not_Initialized – Make sure the port has been initialized by “AngeloRTV_Initial”.
- -9: ERROR_Invalid_PortNo – Please input the correct “PortNo” parameter.

@ Example

<VC/BCB >

AngeloRTV_Capture_Config –
AngeloRTV_Capture_Start –
AngeloRTV_Sync_Grab –
AngeloRTV_Capture_Stop –

```
I16 Result;
U16 PortNo = 0;
U32 CaptureNo = 0xFFFFFFFF;
U32 Start_Field = 0;
U32 StrAddr;
U32 Width, Height, Size_Byte;
Result = AngeloRTV_Capture_Config (PortNo,
     Start_Field);
Result = AngeloRTV_Capture_Start (PortNo,
     CaptureNo);
Result = AngeloRTV_Sync_Grab (PortNo, &StrAddr,
     &Width, &Height, &Size_Byte);
Result = AngeloRTV_Capture_Stop (PortNo);
```

< Visual Basic >

AngeloRTV_Capture_Config –
AngeloRTV_Capture_Start –
AngeloRTV_Sync_Grab –

```
AngeloRTV_Capture_Stop –
Dim Result As Integer
Dim PortNo As Integer
Dim CaptureNo As Long
Dim Start_Field As Long
Dim StrAddr As Long
Dim Width as Long, Height As Long, Size_Byte As
     Long
PortNo = 0
CaptureNo = &HFFFFFFFF
Start_Field = 0
```

```
Result = AngeloRTV_Capture_Config (ByVal PortNo,
     ByVal Start_Field)
Result = AngeloRTV_Capture_Start (ByVal PortNo,
     ByVal CaptureNo)
Result = AngeloRTV_Sync_Grab (ByVal PortNo,
     StrAddr, Width, Height, Size_Byte)
Result = AngeloRTV_Capture_Stop (ByVal PortNo)
```

<Delphi >

AngeloRTV_Capture_Config –
AngeloRTV_Capture_Start –
AngeloRTV_Sync_Grab –
AngeloRTV_Capture_Stop –

```
Var
Result : SmallInt;
PortNo: SmallInt;
CaptureNo: LontInt;
Start_Field: LontInt;
StrAddr: Pointer;
Width, Height, Size_Byte: LongInt;
begin
PortNo:=0;
Start_Field :=0;
CaptureNo:= INFINITE;
Result := AngeloRTV_Capture_Config (PortNo,
     Start_Field);
Result := AngeloRTV_Capture_Start (PortNo,
     CaptureNo);
Result := AngeloRTV_Sync_Grab (PortNo, StrAddr,
     Width, Height, Size_Byte);
Result: = AngeloRTV_Capture_Stop (PortNo);
end;
```

5.6 GPIO & EEPROM Functions

@ Name

AngeloRTV_Set_GPIO_Sts (PortNo, Status)

Set Digital Output status.

AngeloRTV_Get_GPIO_Sts (PortNo, Status)

Get Digital Input status.

AngeloRTV_Set_GPIO_Int_Logic (PortNo, Logic)

Configure the Digital Input Interrupt condition

AngeloRTV_Write_EEPROM (PortNo, Offset, Value)

Write data into EEPROM

AngeloRTV_Read_EEPROM (PortNo, Offset, Value)

Read data from EEPROM

AngeloRTV_Set_LED_Sts (PortNo, LEDStatus)

Set LED status for cPci RTV24 card.

@ Description

AngeloRTV_Set_GPIO_Sts:

There is one digital output channel in each port of the Angelo series card, use this function to set the digital output status.

AngeloRTV_Get_GPIO_Sts:

There is one digital input channel in each port of Angelo series card, use this function to get the digital input status.

AngeloRTV_Set_GPIO_Int_Logic:

This function used to configure the Digital Input Interrupt condition.

AngeloRTV_Write_EEPROM:

Writes data into the EEPROM. Data in EEPROM will not be lost even when powered off.

AngeloRTV_Read_EEPROM:

Reads data from the EEPROM. Data in EEPROM will not be lost even when powered off.

AngeloRTV_Set_LED_Sts:

Use the function to set LED status. The function is for cPci RTV24 card only.

@ Syntax

C/C++ (Windows 98/NT/2000/XP/CE.NET)

```
I16 AngeloRTV_Set_GPIO_Sts(U16 PortNo,U8 Status);
I16 AngeloRTV_Get_GPIO_Sts(U16 PortNo,U8*
    Status);
I16 AngeloRTV_Set_GPIO_Int_Logic(U16 PortNo, U16
    Logic);
I16 AngeloRTV_Write_EEPROM(U16 CardNo, U8 Offset,
    U8 Value);
I16 AngeloRTV_Read_EEPROM(U16 CardNo, U8 Offset,
    U8* Value);
I16 AngeloRTV_Set_LED_Sts (U16 PortNo, U8
    LEDStatus);
```

Visual Basic (Windows 98/NT/2000/XP/CE.NET)

```
AngeloRTV_Set_GPIO_Sts (ByVal PortNo As Integer,
    ByVal Status As Byte) As Integer
AngeloRTV_Get_GPIO_Sts (ByVal PortNo As Integer,
    ByRef Status As Byte) As Integer
AngeloRTV_Set_GPIO_Int_Logic(ByVal PortNo As
    Integer, ByVal Logic As Integer) As Integer
AngeloRTV_Write_EEPROM (ByVal PortNo As Integer,
    ByVal Offset As Byte, ByVal Value As Byte)
    As Integer
AngeloRTV_Read_EEPROM (ByVal PortNo As Integer,
    ByVal Offset As Byte, ByRef Value As Byte)
    As Integer
AngeloRTV_Set_LED_Sts (ByVal PortNo As Integer,
    ByVal LEDStatus As Byte) As Integer
```

Delphi (Windows 98/NT/2000/XP)

```
AngeloRTV_Set_GPIO_Sts
    (PortNo:Smallint;status:Byte):Smallint;
AngeloRTV_Get_GPIO_Sts (PortNo:Smallint;var
    status:Byte):Smallint;
AngeloRTV_Set_GPIO_Int_Logic(PortNo:Smallint;
    Logic:Smallint):Smallint;
AngeloRTV_Write_EEPROM (
    PortNo:Smallint;Offset:Byte;Value:Byte):Sma
    llint;
AngeloRTV_Read_EEPROM ( PortNo:Smallint;
    Offset:Byte;var Value:Byte):Smallint;
AngeloRTV_Set_LED_Sts (PortNo:Smallint;
    LEDStatus:Byte):Smallint;
```

@ Argument

PortNo:

Port number is the zero index of the Angelo series card. For example, if there are two PCI-RTV-24 Angelo cards (card 0, card 1) in the system, and each PCI-RTV-24 has four ports, the first port of card 0 is “0”, and the first port of card 1 is “4.”

Status:

The digital input or digital output status

- 0 Low
- 1 High

Logic:

The digital input interrupt condition

- 0: Active Low
- 1: Active High

Offset:

The offset address of the EEPROM. This parameter is valid between 0 and 127

Value: The value in Byte data type, this parameter is valid between 0 and 255.

LEDStatus:

Use the parameter to set the LED status.

- LEDStatus = 1: High
- LEDStatus = 0: Low

@ Return Code

- 0: ERROR_NoError
- -7: ERROR_Not_Initialized – Make sure the port has been initialized by “AngeloRTV_Initial”.
- -9: ERROR_Invalid_PortNo – Please input the correct “PortNo” parameter.
- -15: ERROR_Invalid_Address – a valid offset address is between 0 and 127

@ Example

<VC/BCB >

AngeloRTV_Set_GPIO_Sts –

AngeloRTV_Get_GPIO_Sts –

```
I16 Result;
I16 PortNo = 0;
U8   Status = 1;
Result = AngeloRTV_Set_GPIO_Sts (PortNo, Status);
Result = AngeloRTV_Get_GPIO_Sts (PortNo, &
     Status);
```

AngeloRTV_Set_GPIO_Int_Logic –

```
I16 Result;
U16 PortNo = 0;
U16 Logic = 0;
Result = AngeloRTV_Set_GPIO_Int_Logic (PortNo,
     Logic);
```

AngeloRTV_Write_EEPROM
AngeloRTV_Read_EEPROM

```
I16 Result;
I16 PortNo = 0;
U8   Offset = 0;
U8   Value = 128;
Result = AngeloRTV_Write_EEPROM (PortNo, Offset,
     Value);
Result = AngeloRTV_Read_EEPROM (PortNo, Offset,
     &Value);
```

AngeloRTV_Set_LED_Sts –

```
I16 Result;
U16 PortNo;
U8  LEDStatus;
PortNo = 0;
LEDStatus = 1;
Result = AngeloRTV_Set_LED_Sts (PortNo,
     LEDStatus);
```

< Visual Basic >

AngeloRTV_Set_GPIO_Sts –
AngeloRTV_Get_GPIO_Sts –

```
Dim Result As Integer
Dim PortNo As Integer
Dim Status As Byte
PortNo = 0
Status = 1
Result = AngeloRTV_Set_GPIO_Sts (ByVal PortNo,
     ByVal Status)
Result = AngeloRTV_Get_GPIO_Sts (ByVal PortNo,
     ByRef Status)
```

AngeloRTV_Set_GPIO_Int_Logic –

```
Dim Result As Integer
Dim PortNo As Integer
Dim  Logic As Integer
PortNo = 0
Logic = 0
Result = AngeloRTV_Set_GPIO_Int_Logic (ByVal
     PortNo, ByVal Logic)
```

AngeloRTV_Write_EEPROM

AngeloRTV_Read_EEPROM

```
Dim Result As Integer
Dim PortNo As Integer
Dim Offset As Byte
Dim Value As Byte
PortNo = 0
Offset =0
Value = 128
Result = AngeloRTV_Write_EEPROM(ByVal PortNo,
     ByVal Offset, ByVal Value)
Result = AngeloRTV_Read_EEPROM(ByVal PortNo,
     ByVal Offset, ByRef Value)
```

AngeloRTV_Set_LED_Sts –

```
Dim Result As Integer
Dim PortNo As Integer
Dim LEDStatus As Byte
PortNo = 0
LEDStatus = 1
Result = AngeloRTV_Set_LED_Sts (ByVal PortNo,
     ByVal LEDStatus)
```

<Delphi >

AngeloRTV_Set_GPIO_Sts –

AngeloRTV_Get_GPIO_Sts –

```
Var
Result : SmallInt;
PortNo : SmallInt;
Status: Byte;
PortNo:=0;
Status:=1;
Result := AngeloRTV_Set_GPIO_Sts (PortNo,
     Status);
Result := AngeloRTV_Get_GPIO_Sts (PortNo,
     Status);
```

AngeloRTV_Set_GPIO_Int_Logic –

```
var
Result: SmallInt;
PortNo: SmallInt;
Logic: SmallInt;
PortNo := 0;
Logic := 0;
Result := AngeloRTV_Set_GPIO_Int_Logic (PortNo,
     Logic);
```

AngeloRTV_Write_EEPROM
AngeloRTV_Read_EEPROM

```
Var
Result : SmallInt;
PortNo : SmallInt;
Offset: Byte;
Value: Byte;
PortNo:=0;
Offset:=0;
Value:=128;
Result := AngeloRTV_Write_EEPROM (PortNo, Offset,
     Value);
Result := AngeloRTV_Read_EEPROM (PortNo, Offset,
     Value);
```

AngeloRTV_Set_LED_Sts –

```
var
Result: Smallint;
PortNo: Smallint;
LEDStatus: Byte;
PortNo := 0;
LEDStatus := 1;
Result := AngeloRTV_Set_LED_Sts (PortNo,
     LEDStatus);
```

5.7 Callback & Thread Functions

@ Name

AngeloRTV_Get_Int_Status (PortNo, IntStatus)

Gets the current interrupt status

AngeloRTV_Set_Int_Event (PortNo,hEvent)

Assigns the windows interrupt event

AngeloRTV_Set_Callback(PortNo, CallBackProc)

Sets the callback function when an interrupt is generated

@ Description

AngeloRTV_Get_Int_Status:

Allows users to identify what caused an interrupt signal.

- Bit 0: GPIO interrupt, when Digital input channel is changed.
- Bit 1: Channel 0 Image ready
- Bit 2: Channel 1 Image ready
- Bit 3: Channel 2 Image ready
- Bit 4: Channel 3 Image ready

Note: There are four channels in each port, the default channel is channel 0.

AngeloRTV_Set_Int_Event:

Links interrupt events. Users only have to declare the “hEvent” variable and call this function to DLL, the DLL will link the event and interrupt automatically.

AngeloRTV_Set_Callback:

Links the callback function when an interrupt is generated to host pc.

Note: There are two ways to use the synchronization mechanism, one is the callback function, and the other is the thread function.

@ Syntax

C/C++ (Windows 98/NT/2000/XP/CE.NET)

```
I16 AngeloRTV_Get_Int_Status(U16 PortNo,U32
     *IntStatus);
I16 AngeloRTV_Set_Int_Event(U16 PortNo,HANDLE*
     hEvent);
```

```
I16 AngeloRTV_Set_Callback (U16 PortNo, void (
      __stdcall *CallBackProc)(U32
      VideoBufferaddress ,U16 PortNo));
```

Visual Basic (Windows 98/NT/2000/XP/CE.NET)

```
AngeloRTV_Set_Int_Event (ByVal PortNo As Integer,
      ByRef hEvent As Long) As Integer
AngeloRTV_Get_Int_Status(ByVal PortNo As Integer,
      ByRef IntStatus As Long) As Integer
AngeloRTV_Set_Callback(ByVal PortNo As Integer,
      ByVal CallBack As Long) As Integer
```

Delphi (Windows 98/NT/2000/XP)

```
AngeloRTV_Set_Int_Event(PortNo:Smallint;var
      hEvent:Integer):Smallint;
AngeloRTV_Get_Int_Status(PortNo:Smallint;var
      IntStatus:Longint):Smallint;
AngeloRTV_Set_Callback(PortNo:Smallint;lpCallBac
      kProc:CallbackFunc):Smallint;
```

@ Argument

PortNo:

Port number is the zero index of the Angelo series card. For example, if there are two PCI-RTV-24 Angelo cards (card 0, card 1) in the system, and each PCI-RTV-24 has four ports, the first port of card 0 is “0”, and the first port of card 1 is “4.”

IntStatus:

Interrupt status

- Bit 0:GPIO interrupt, when Digital input channel is changed.
- Bit 1:Channel 0 Image ready
- Bit 2:Channel 1 Image ready
- Bit 3:Channel 2 Image ready
- Bit 4:Channel 3 Image ready

hEvent:

Interrupt event handle.

@ Return Code

- 0: ERROR_NoError
- -7: ERROR_Not_Initialized – Make sure the port has been initialized by “AngeloRTV_Initial”.
- -9: ERROR_Invalid_PortNo – Please input the correct “PortNo” parameter.

@ Example

< VC/BCB >

Use Thread:

```
HANDLE hEvent=NULL;
void *pThread=NULL;
U32 threadID;
U16 PortNo = 0;

DWORD nObj;
U32 Size_Byte;
U32  Status =0;
I16 ISR_ON=0;
DWORD WINAPI IntThreadProc( LPVOID lpParam )
{
      while( ISR_ON )
      {
      nObj = WaitForSingleObject(hEvent,
      INFINITE);
      AngeloRTV_Get_Int_Status(PortNo,&Status);
      if((Status&0x01)==1)//GPIO
      {
      }
      if((Status>>1&0x01)==1)//Channel 0 of the
      nPort
      {
      }
      else if((Status>>2&0x01)==1)//Channel 1 of
      the nPort
      {
      }
      else if((Status>>3&0x01)==1)//Channel 2 of
      the nPort
      {
      }
      else if((Status>>4&0x01)==1)//Channel 3 of
      the nPort
```

```
        {
        }
        ResetEvent(hEvent);
        }
        Return TRUE;
    }
    AngeloRTV_Set_Int_Event(PortNo,&hEvent);
    pThread =CreateThread(NULL, 0, IntThreadProc, 0,
        0, &threadID);
```

Use Callback Function:

```
    U16 PortNo = 0;
    void __stdcall MediaStreamProc( U32
        VideoBufferaddress ,U16 PortNo)
    {
        U32 Status;
        AngeloRTV_Get_Int_Status(PortNo,&Status);
        if((Status&0x01)==1)//GPIO
        {
        }
        if((Status>>1&0x01)==1)//Channel 0 of the
        nPort
        {
        }
        else if((Status>>2&0x01)==1)//Channel 1 of
        the nPort
        {
        }
        else if((Status>>3&0x01)==1)//Channel 2 of
        the nPort
        {
        }
        else if((Status>>4&0x01)==1)//Channel 3 of
        the nPort
        {
        }
     }
    AngeloRTV_Set_Callback(PortNo,MediaStreamProc);
```

< Visual Basic >

Use Callback Function

```
    Dim Result As Integer
    Dim PortNo As Integer
    Public Sub lpcallback(ByVal VideoBufferaddress As
        Long, ByVal PortNo As Integer)
```

```
Dim Status As Long
Result  = AngeloRTV_Get_Int_Status(PortNo,
     Status)
End Sub
PortNo = 0
Result = AngeloRTV_Set_Callback(PortNo, AddressOf
     lpcallback)
```

<Delphi >

Use Thread

```
Var
ISR_ON : SmallInt;
Event_Angelo:Integer;
ThreadId : LongInt;
PortNo: SmallInt;
PortNo:=0;
     function ThreadFunc(Parameter: Pointer):
     Integer ;
          var
        Str_Add :Pointer;
        Size_Byte :Longint;
        intstatus : LongInt;
begin
        while(ISR_ON=1) do
        begin

     WaitForSingleObject(Event_Angelo,INFINITE);
               ResetEvent(Event_Angelo);

     AngeloRTV_Get_Int_Status(PortNo,intstatus);
               if intstatus = 2 then //image
     ready for channel 0 of port
               begin

               end;
        end;
end;

     AngeloRTV_Set_Int_Event(PortNo,Event_Angelo
     );
     ISR_ON :=1;
       Mythread :=
     BeginThread(nil,0,ThreadFunc,nil,0,ThreadId
     );
```

Use Callback function

```
var
PortNo: SmallInt;
PortNo:=0;
procedure MyCallback(VideoBufferAddress :
      LongInt;PortNo : SmallInt);stdcall
var
      Str_Add :Pointer;
      Result :Smallint;
      Size_Byte :LongInt;
      intstatus :LongInt;
begin
      AngeloRTV_Get_Int_Status(PortNo,intstatus);
         if intstatus = 2 then
         begin
         end;
      end;
AngeloRTV_Set_Callback(Cur_Port,MyCallback);
```

5.8 Watchdog Timer

Note: This function is only available for RTV-24.

@ Name

AngeloRTV_Set_WDT(CardNo, Enable, Interval)

Sets the watch dog status(Only for PCI-RTV24)

@ Description

AngeloRTV_Set_WDT:

Enables or disables the watch dog timer in the Angelo series cards, and set the interval of timer. When users have enabled the watch dog timer and selected a 16 seconds interval, a system reset signal will be triggered if this function is not called after 16 seconds.

@ Syntax

C/C++ (Windows 98/NT/2000/XP/CE.NET)

```
I16 AngeloRTV_Set_WDT (U16 CardNo,U16 Enable,U16
      Interval)
```

Visual Basic (Windows 98/NT/2000/XP/CE.NET)

```
AngeloRTV_Set_WDT (ByVal PortNo As Integer, ByVal
      Enable As Integer, ByVal Interval As
      Integer) As Integer
```

Delphi (Windows 98/NT/2000/XP)

```
AngeloRTV_Set_WDT(CardNo:Smallint;enable:Smallin
      t;interval:Smallint):Smallint;
```

@ Argument

CardNo:

Card number is the zero index in Angelo series card. For example, if there are two Pci-RTV-24 Angelo cards (card 0, card 1) in the system, “CardNo” of card 0 is 0, and 1 for card 1.

Enable:

Enables or disables the watch dog timer. 0 for disable, 1 for enable.

Interval:

Indicates the watch dog timer interval.

- 1: 8 seconds
- 2: 16 seconds
- 3: 32 seconds

@ Return Code

- 0 : ERROR_NoError
- -7: ERROR_Not_Initialized – Make sure the port has been initialized by “AngeloRTV_Initial”.
- -9 : ERROR_Invalid_PortNo – Please input the correct “PortNo” parameter.

@ Example

<VC/BCB >

AngeloRTV_Set_WDT

```
I16 Result;
U16 CardNo = 0;
U16 Enable = 1;
U16 Interval = 1;
Result =
      AngeloRTV_Set_WDT(CardNo,Enable,Interval);
```

< Visual Basic >

AngeloRTV_Set_WDT

```
Dim Result As Integer
Dim CardNo As Integer
Dim Enable As Integer
Dim Interval As Integer
CardNo = 0
Enable = 1
Interval = 1
Result =
      AngeloRTV_Set_WDT(CardNo,Enable,Interval)
```

<Delphi >

AngeloRTV_Set_WDT

```
Var
Result : SmallInt;
CardNo: SmallInt;
Enable: SmallInt;
Interval: SmallInt;
CardNo :=0;
Enable:=1;
Interval:=1;
```

```
Result :=
     AngeloRTV_Set_WDT(CardNo,Enable,Interval);
```

5.9 Software Trigger

@ Name

AngeloRTV_Trigger_Config (PortNo,Interval)

Sets software trigger configuration(Only for PCI-RTV24, cPCI-RTV-24, cPCI-RTV44)

AngeloRTV_Trigger_Start (CardNo, Multiplex)

Generates single or multiple trigger output simultaneously(Only for PCI-RTV24, cPCI-RTV-24, cPCI-RTV44)

@ Description

AngeloRTV_Trigger_Config:

Configures the pulse output interval.

AngeloRTV_Trigger_Start:

Generates a one shot pulse output for single or multiple ports.

@ Syntax

C/C++ (Windows 98/NT/2000/XP/CE.NET)

```
I16 AngeloRTV_Trigger_Config(U16 PortNo,U16
      Interval);
I16 AngeloRTV_Trigger_Start(U16 CardNo,U16
      Multiplex);
```

Visual Basic (Windows 98/NT/2000/XP/CE.NET)

```
AngeloRTV_Trigger_Config (ByVal PortNo As
      Integer, ByVal Interval As Integer) As
      Integer
AngeloRTV_Trigger_Start (ByVal CardNo As Integer,
      ByVal Multiplex As Integer) As Integer
```

Delphi (Windows 98/NT/2000/XP)

```
AngeloRTV_Trigger_Config (PortNo:Smallint;
      Interval:Smallint):Smallint;
AngeloRTV_Trigger_Start (CardNo:Smallint;
      Multiplex:Smallint):Smallint;
```

@ Argument

CardNo:

Card number is the zero index in Angelo series card. For example, if there are two Pci-RTV-24 Angelo cards (card 0, card 1) in the system, “CardNo” of card 0 is 0, and 1 for card 1.

PortNo:

Port number is the zero index of the Angelo series card. For example, if there are two PCI-RTV-24 Angelo cards (card 0, card 1) in the system, and each PCI-RTV-24 has four ports, the first port of card 0 is “0”, and the first port of card 1 is “4.”

Interval:

Indicates the trigger output interval, the valid range is from 0 to 253, the definition is as following

- 0: 16ms
- 32: 12ms
- 128: 8ms
- 253: 60μs

Multiplex:

Indicates the trigger output ports in Angelo series cards.

- Bit 0: Port 0 on each card. 0 for disable, 1 for enable.
- Bit 1: Port 1 on each card. 0 for disable, 1 for enable.
- Bit 2: Port 2 on each card. 0 for disable, 1 for enable.
- Bit 3: Port 3 on each card. 0 for disable, 1 for enable.

For example:

- Multiplex = 1, only port 0 in each Angelo series card generates a trigger output.
- Multiplex = 2, only port 1 in each Angelo series card generates a trigger output.
- Multiplex = 15, four ports in each Angelo series card generates a trigger output.

@ Return Code

- 0: ERROR_NoError
- -7: ERROR_Not_Initialized – Make sure the port has been initialized by “AngeloRTV_Initial”.
- -9: ERROR_Invalid_PortNo – Please input the correct “PortNo” parameter.

@ Example

<VC/BCB >

AngeloRTV_Trigger_Config
AngeloRTV_Trigger_Start

```
I16 Result;
U16 CardNo = 0;
U16 PortNo = 0;
U16 Multiplex = 1;
U16 Interval = 32;
Result =
     AngeloRTV_Trigger_Config(PortNo,Interval);
Result = AngeloRTV_Trigger_Start(CardNo,
     Multiplex);
```

< Visual Basic >

AngeloRTV_Trigger_Config

AngeloRTV_Trigger_Start

```
Dim Result As Integer
Dim CardNo As Integer
Dim PortNo As Integer
Dim Multiplex As Integer
Dim Interval As Integer
CardNo = 0
PortNo = 0
Multiplex = 1
Interval = 32
Result = AngeloRTV_Trigger_Config
     (PortNo,Interval)
Result = AngeloRTV_Trigger_Start (CardNo,
     Multiplex)
```

<Delphi >

AngeloRTV_Trigger_Config

AngeloRTV_Trigger_Start

```
Var
Result : SmallInt;
CardNo: SmallInt;
PortNo: SmallInt;
Multiplex: SmallInt;
Interval: SmallInt;
CardNo :=0;
PortNo:=0;
Multiplex:=1;
Interval:=32;
Result := AngeloRTV_Trigger_Config
     (PortNo,Interval);
Result := AngeloRTV_Trigger_Start (CardNo,
     Multiplex);
```

5.10 Frame Buffer

@ Name

AngeloRTV_Copy_frame (PortNo, Dest_Address, Size_Byte)

Copies the frame date to the user allocated destination memory (bytes).

AngeloRTV_Get_frame(PortNo, Start_Address,Width, Height, Size_Byte)

Gets the frame memory start address and size of frame (bytes).

AngeloRTV_Save_File(PortNo, FileName, FileFormat, nQuality)

Save the video frame into an image file.

@ Description

AngeloRTV_Copy_frame:

Copies frame data to memory or an array that the user has allocated. Before using this function, remember to allocate enough memory address space or array elements.

AngeloRTV_Save_File:

Saves the current video frame into an image file (TIF, BMP, or JPEG). nQuality is only used JPEGs.

AngeloRTV_Get_frame:

Retrieves the memory start address from the frame data, width, height, and size in bytes of the image. For example a FULL NTSC RGB24 video frame will occupy 900K Byte (640*480*3) memory address space.

Format	DWORD(32Bit)	Pixel Data			
		Byte 3 Bit [31:24]	Byte 2 Bit[23:16]	Byte 1 Bit[15:8]	Byte 0 Bit[7:0]
RGB32	Dw0	Appha	R	G	B
RGB24	Dw0	B1	R0	G0	B0
	Dw1	G2	B2	R1	G1
	Dw2	R3	G3	B3	R2
RGB16	Dw0	{R0[31:27], G0[26:21], B0[20:16]}	{R0[15:11], G0[10:5], B0[4:0]}		

Table 5-3: Pixel Data

Format	DWORD(32Bit)	Pixel Data			
RGB15	Dw0	{0,R0[30:26], G0[25:21], B0[20:16]}	{0,R0[14:10], G0[9:5], B0[4:0]}		
Gray Scale(Y8)	Dw0	Y3	Y2	Y1	Y0

Table 5-3: Pixel Data

@ Syntax

C/C++ (Windows 98/NT/2000/XP/CE.NET)

```
I16 AngeloRTV_Copy_Frame(U16 PortNo,U8
    *Dest_Address,U32 Size_Byte);
I16 AngeloRTV_Get_Frame(U16 PortNo,U32*
    Start_Address, U32* Width, U32* Height, U32*
    Size_Byte);
16 AngeloRTV_Save_File(U16 PortNo, char*
    FileName,U8 FileFormat,U32 nQuality);
```

Visual Basic (Windows 98/NT/2000/XP/CE.NET)

```
AngeloRTV_Copy_Frame (ByVal PortNo As Integer,
    Dest_Address As Byte, ByVal Size_byte As
    Long) As Integer
AngeloRTV_Get_Frame (ByVal PortNo As Integer,
    ByRef Start_Address As Long, ByRef Width as
    Long, ByRef Height As Long, ByRef Size_byte
    As Long) As Integer
AngeloRTV_Save_File (ByVal PortNo As Integer,
    ByVal FileName As String, ByVal FileFormat
    As Byte, ByVal nQuality As Long) As Integer
```

Delphi (Windows 98/NT/2000/XP)

```
AngeloRTV_Copy_Frame(PortNo:Smallint;var
    Dest_Address:Byte;Size_byte:Longint):Smalli
    nt;
AngeloRTV_Get_Frame(PortNo:Smallint;var
    Start_Address:Pointer; var Width:Longint ,
    var Height:Longint ,var
    Size_byte:Longint):Smallint;
AngeloRTV_Save_File(PortNo:Smallint;FileName:Str
    ing;FileFormat:Byte;nQuality
    :LongIng):Smallint;
```

@ Argument

PortNo:

Port number is the zero index of the Angelo series card. For example, if there are two PCI-RTV-24 Angelo cards (card 0, card 1) in the system, and each PCI-RTV-24 has four ports, the first port of card 0 is “0”, and the first port of card 1 is “4.”

Dest_Address:
User allocated destination memory address or array.

Start_Address:
Memory start address of the video frame.

Width:
Image width.

Height:
Image height.

Size_Byte:
Memory size in bytes.

FileName:
File name to save to. Remember to add the file extension name.

FileFormat:
File format to save to.

- 0: TIF
- 1: BMP
- 2: JPEG

nQuality:
This parameter in used only for the JPEG file format.

@ Return Code

- 0: ERROR_NoError
- -7: ERROR_Not_Initialized – Make sure the port has been initialized by “AngeloRTV_Initial”.
- -9: ERROR_Invalid_PortNo – Please input a correct “PortNo” parameter.

@ Example

<VC/BCB >

AngeloRTV_Copy_Frame

```
I16 Result;
U16 PortNo = 0;
```

```
U32 Size_Byte = 640*480*3;
U8* Dest_Address =NULL;
Dest_Address = (U8*)malloc(Size_Byte );
Result = AngeloRTV_Copy_Frame (PortNo,
     Dest_Address, Size_Byte);
```

AngeloRTV_Get_Frame

```
I16 Result;
U16 PortNo = 0;
U32 Size_Byte,Width,Height ;
U32 StrAddr ;
Result = AngeloRTV_Get_Frame(PortNo,&StrAddr,
     &Width, &Height,&Size_Byte);
```

AngeloRTV_Save_File

```
I16 Result;
U16 PortNo = 0;
U8 File_Format = 2;
U32 nQuality = 25;
Result = AngeloRTV_Save_File(PortNo,"Image.jpg",
     File_Format, nQuality);
```

< Visual Basic >

AngeloRTV_Copy_Frame

```
Dim Result As Integer
Dim PortNo As Integer
Dim Size_Byte As Long
Dest_Address( ) As Byte
PortNo = 0
Size_Byte =640*480*3
ReDim Dest_Address(0 To Size_Byte - 1) As Byte
Result = AngeloRTV_Copy_Frame (PortNo,
     Dest_Address(0), Size_Byte);
```

AngeloRTV_Get_Frame

```
Dim Result As Integer
Dim PortNo As Integer
Dim Size_Byte As Long
Dim StrAddr As Long
Dim Width as Long,Height As Long
PortNo = 0
Result = AngeloRTV_Get_Frame( ByVal PortNo,
     Str_Add, Width, Height, Size_Byte)
```

AngeloRTV_Save_File

```
Dim Result As Integer
Dim File_Format as Byte
Dim nQuality as Long
```

```
PortNo = 0
File_Format = 2
NQuality = 25
Result = AngeloRTV_Save_File (PortNo,
     "Image.jpg", File_Format, NQuality)
```

<Delphi >

AngeloRTV_Copy_Frame

```
Var
Result : SmallInt;
PortNo: SmallInt;
Size_Byte :Longint;
Dest_Add : array of Byte;
PortNo := 0;
Size_Byte := 640*480*3;
SetLength(Dest_Add, Size_Byte);
Result := AngeloRTV_Copy_Frame (PortNo,
     Dest_Add[0], Size_Byte);
```

AngeloRTV_Get_Frame

```
Var
Result : SmallInt;
PortNo: SmallInt;
Size_Byte : LongIng;
Width :LongIng;
Height :LongIng;
Str_Add :Pointer;
PortNo:=0;
Result :=AngeloRTV_Get_Frame(PortNo,
     Str_Add,Width, Height, Size_Byte);
```

AngeloRTV_Save_File

```
Var
Result : SmallInt;
PortNo: SmallInt;
File_Format : Byte;
NQuality :LongInt;
PortNo:=0;
File_Format:=2;
Nquality := 25;
Result := AngeloRTV_Save_File (PortNo,
     'Image.jpg', File_Format, Nquality)
```

6 Appendix

6.1 Glossary

Brightness:

Attribute of a visual sensation according to which an area appears to exhibit more or less light

CCIR:

An acronym to designate a scanning system used in Europe. The CCIR system is made of two interlaced fields of 312.5 lines, for a total of 625 lines. In each field, only 287.5 lines are visible, for a total of 575 visible lines. A line lasts 64 ms, of which approximately 52 ms are conveying visible pixels.

Composite Video:

Composite video (CVS/CVBS) signal carries video picture information for color, brightness and synchronizing signals for both horizontal and vertical scans.

CIF:

CIF has 352(H) x 288(V) luminance pixels, and 176(H) x 144(V) chrominance pixels. QCIF is a similar picture format with one-quarter the size of CIF.

EIA:

An acronym to designate a scanning system used in America and Japan. The EIA system is made of two interlaced fields of 262.5 lines, for a total of 525 lines. In each field, only 242.5 lines are visible, for a total of 485 visible lines (typical value). A line lasts 63.56 ms, of which approximately 52 ms are conveying visible pixels.

Field:

For interlaced video the total picture is divided into two fields, one even and one odd, each containing one half of the total vertical information. Each field takes one sixtieth of a second (one fiftieth for PAL) to complete. Two fields make a complete frame of video.

Frame:

One frame (two fields) of video contains the full vertical interlaced information content of the picture. For NTSC this consists of 525 lines and PAL a frame is consisted of 625 lines.

Gamma:

Cathode ray tubes (CRTs) do not have a linear relationship between brightness and the input voltage applied. To compensate for this non-linearity, a pre distortion or gamma correction is applied, generally at the camera source. A value of gamma equal to 2.2 is typical, but can very for different CRT phosphors.

Hue:

Attribution of visual sensation according to which area appears to be similar to one, or proportions of two, of the perceived colors red, yellow, green, and blue.

NTSC:

Acronym to designate a color television broadcast standard used in America and Japan. The (M) NTSC system uses 525 lines per frame (2 interlaced fields), a 29.97 frame per second update rate, and a YIQ or RGB color space. In each field, only 242.5 lines are visible, for a total of 485 visible lines (typical value). A line lasts 63.56 ms, of which approximately 52 ms are conveying visible pixels.

PAL:

Acronym to designate a color television broadcast standard used in Europe. The (B, G, H, I) PAL (or Phase Alternation Line) uses 625 lines per frame (2 interlaced fields), a 25 frame per second update rate, and the RGB color space. In each field, only 287.5 lines are visible, for a total of 575 visible lines. A line lasts 64 ms, of which approximately 52 ms are conveying visible pixels.

Saturation:

A characteristic describing color amplitude or intensity. A color of a given hue may consist of low or high saturation value, which relates to the vividness of color.

6.2 Standards Compliance

Notice for USA
Compliance Information Statement
(Declaration of Conformity Procedure)
DoC FCC Part 15

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules.

These limits are designed to provide reasonable protection against harmful interference in a residential installation or when the equipment is operated in a commercial environment.

This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Notice for Europe
This product is in conformity with the
Council Directive 89/336/EEC
amended by 92/31/EEC and 93/68/EEC

This equipment has been tested and found to comply with EN55022/CISPR22 and EN55024/CISPR24. To meet EC requirements, shielded cables must be used to connect a peripheral to the card. This product has been tested in a typical class B compliant host system. It is assumed that this product will also achieve compliance in any class A compliant unit.

Warranty Policy

Thank you for choosing ADLINK. To understand your rights and enjoy all the after-sales services we offer, please read the following carefully.

1. Before using ADLINK's products please read the user manual and follow the instructions exactly. When sending in damaged products for repair, please attach an RMA application form which can be downloaded from: http://rma.adlinktech.com/policy/.
2. All ADLINK products come with a limited two-year warranty, one year for products bought in China:
   - The warranty period starts on the day the product is shipped from ADLINK's factory.
   - Peripherals and third-party products not manufactured by ADLINK will be covered by the original manufacturers' warranty.
   - For products containing storage devices (hard drives, flash cards, etc.), please back up your data before sending them for repair. ADLINK is not responsible for any loss of data.
   - Please ensure the use of properly licensed software with our systems. ADLINK does not condone the use of pirated software and will not service systems using such software. ADLINK will not be held legally responsible for products shipped with unlicensed software installed by the user.
   - For general repairs, please do not include peripheral accessories. If peripherals need to be included, be certain to specify which items you sent on the RMA Request & Confirmation Form. ADLINK is not responsible for items not listed on the RMA Request & Confirmation Form.

3. Our repair service is not covered by ADLINK's guarantee in the following situations:
   - Damage caused by not following instructions in the User's Manual.
   - Damage caused by carelessness on the user's part during product transportation.
   - Damage caused by fire, earthquakes, floods, lightening, pollution, other acts of God, and/or incorrect usage of voltage transformers.
   - Damage caused by unsuitable storage environments (i.e. high temperatures, high humidity, or volatile chemicals).
   - Damage caused by leakage of battery fluid during or after change of batteries by customer/user.
   - Damage from improper repair by unauthorized ADLINK technicians.
   - Products with altered and/or damaged serial numbers are not entitled to our service.
   - This warranty is not transferable or extendible.
   - Other categories not protected under our warranty.
4. Customers are responsible for shipping costs to transport damaged products to our company or sales office.
5. To ensure the speed and quality of product repair, please download an RMA application form from our company website: http://rma.adlinktech.com/policy. Damaged products with attached RMA forms receive priority.

If you have any further questions, please email our FAE staff: service@adlinktech.com.