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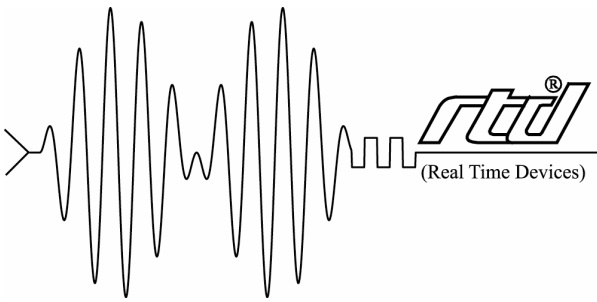
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Find the *RTD Embedded Technologies CM7326* at our website: *Click HERE*

CM7326/CM7327

FrameGrabberModule

User's manual



RTD Embedded Technologies, Inc.
"Accessing the Analog World"®

BDM-610020014
Rev. B

CM7326 and CM7327
FrameGrabberModule
User's manual



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Revision history

2002.07.16	New CM7327 FrameGrabberModule support
	Updated Windows 2000 and Windows XP installation procedure
2002.02.27	New Windows 2000 and Windows XP installation procedure
2002.01.29	Updated JP2 (CCIR656) digital input pin descriptions
	Corrected JP3 output voltage
	Output example schematics (TTL and relay)
2002.01.11	Updated Windows 95/98 installation procedure
2001.05.02	Initial release
Rev. A	New Manual Naming Method
Rev. B	Updated Windows 2000 and XP installation procedure for installing with VFW support

Published by:

RTD Embedded Technologies, Inc.
103 Innovation Blvd.
State College, PA 16803-0906

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Chapter 1. Introduction

This manual gives information on the CM7326 and CM7327 Frame grabber utility module. This module supports frame grabbing functions using 6 selectable composite video inputs, 3 svideo inputs and 1 CCIR656 digital input.

1.1. CM7326 and CM7327 frame grabber utility module

The CM7326 and CM7327 Frame grabber utility module was designed to provide frame grabber functions to support Real Time Devices' PC/104*Plus* CPU modules and other standard PC/104*Plus* processor modules.

Both CM7326 and CM7327 use the same driver. These cards are fully software compatible.

1.2. Features

The following are major features of the CM7326 and CM7327 Frame grabber utility module.

- 6 composite or 3 svideo inputs
- 1 CCIR 656 digital video input
- 4 opto-coupled digital input
- 4 opto-coupled digital output
- scaleable resolution up to 768x576 (PAL), 640x480(NTSC)
- up to 25 frame/sec (PAL) and 30 frame/sec (NTSC)
- PAL, SECAM or NTSC input signals
- Windows NT/2000/XP, Windows 95/98/ME, Linux and DOS-DPMI32 drivers
- plug and play hardware configuration (PCI 2.1 compatible)
- WatchDog and HardwareKey functions

The following are major features of the CM7327 Frame grabber utility module only.

- CCIR resolution support (720x576 PAL, 720x480 NTSC)[1]
- Fast analog input switching time (about 40 ms PAL)

1.3. Connectors

Connector provided are:

- J1 and J2, ISA bus (XT, AT) [2]
- J3, PCI bus
- VID1 to VID6, video inputs (software selectable)
- JP1, Watchdog timer RESET in/out
- JP2, CCIR656 digital video input
- JP3, opto-coupled general purpose digital I/O

[1] CM7327 supports both CCIR and square pixel modes.
[2] Not used for the operation of the frame grabber module. Used only to pass through ISA signals for other board on the stack.

1.4. General specifications

- Dimensions: 95x103x24 mm including connectors
- 4 layer PCB, combined through hole and surface mount

Operating conditions

- Temperature: 0-70 degrees C
- Relative humidity: 0-95% non condensing
- Storage temperature: -55 to +85 degrees C

Chapter 2. Configuring the utility module

The following sections contain information on configuring the utility module. Please read the entire section before attempting to use the utility module!

2.1. PCI board selector

Since the utility module uses stackthrough buses, the only hardwire installation you will do is to place the module onto the PC/104*Plus* stack. To do this, you will connect the ISA and PCI bus connectors with the matching connector of another module.

Before you can use this module you have to set the PCI board selector rotary switch located on the board (SW1). If this module is the first from the CPU module select '1', if the second select '2', etc.

2.2. Recommended procedure

We recommend you follow the procedure below to ensure the stacking of the modules does not damage connectors or electronics.

- Turn off power to the PC/104*Plus* system or stack.
- Select and install standoffs to properly position the utility module on the PC/104*Plus* stack.
- Touch a grounded metal part of the stack to discharge any buildup of static electricity.
- Remove the utility module from its anti-static bag.
- Check to see if the keying pins in the ISA bus connector are properly positioned.
- Check the stacking order and set the PCI selector rotary switch.
- Hold the utility module by its edges and orient it so that the bus connector pins line up with the matching connector pins on the stack.
- Gently and evenly press the utility module onto the PC/104*Plus* stack.

Caution: Do not force the module onto the stack! Wiggling the module or applying too much force may damage it. If the module does not readily press into place, remove it, check for bent pins or out-of-place keying pins, and try again.

Chapter 3. Connecting the utility module

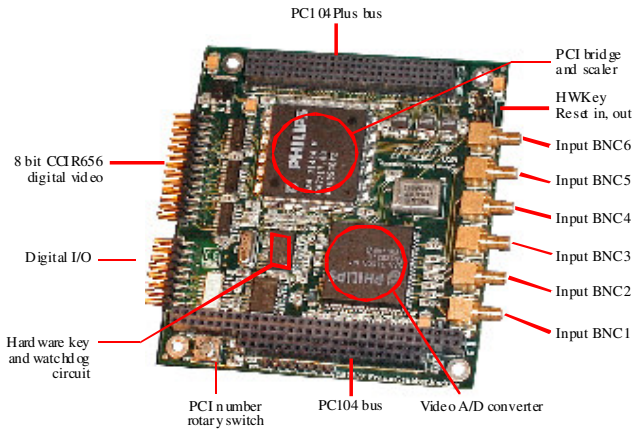
The following sections describe connectors of the utility module.

3.1. Finding Pin 1 on the Connectors

Pin 1 on the connectors is indicated by a square solder pad visible on the bottom of the PC board.

3.2. Component locations

The figure below shows locations of major components, including connectors.



Connector	Function	Dimension
J1,J2	PC/104 AT,XT bus[3]	64+32 pin
J3	PC/104*Plus* PCI bus	120 pin
VID1-VID6	Video inputs	mini BNC
JP1	Watchdog RESET in/out	2x2 pin
JP2	CCIR 656 digital video input	26 pin
JP3	Digital I/O	16 pin

[3] Not used for the operation of the frame grabber module. Used only to pass through ISA signals for other board on the stack.

3.3. Connector pinouts

JP1	
Pin	Description
1	System Reset I/O
2	GND
3	no-pin
4	no-pin
5	System Reset I/O
6	GND

V_{INLmax} = 0,8V

V_{INHmin} = 2V

$V_{OUTLmax}$ = 0,6V

$V_{OUTHmin}$ = 4,3V

JP2			
Pin	Description	Pin	Description
1	Clock A+	14	Data 3B-
2	Clock B-	15	Data 2A+
3	GND	16	Data 2B-
4	GND	17	Data 1A+
5	Data 7A+ (MSB)	18	Data 1B-
6	Data 7B-	19	Data 0A+
7	Data 6A+	20	Data 0B-
8	Data 6B-	21	NC.
9	Data 5A+	22	NC.
10	Data 5B-	23	GND
11	Data 4A+	24	NC.
12	Data 4B-	25	GND
13	Data 3A+	26	NC.

Driver:

Output impedance: 110Ω;

Min. diff. output signal: $2V_{P-P}$ (load: 110Ω);

Receiver:

Input impedance: 110Ω;

Min. diff. input signal: $200mV_{P-P}$

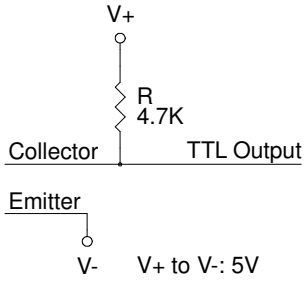
JP3			
Pin	Description	Pin	Description
1	Output 1 (Collector)	9	Input 1 (LED anode)
2	Output 1 (Emitter)	10	Input 1 (LED cathode)
3	Output 2 (Collector)	11	Input 2 (LED anode)
4	Output 2 (Emitter)	12	Input 2 (LED cathode)
5	Output 3 (Collector)	13	Input 3 (LED anode)
6	Output 3 (Emitter)	14	Input 3 (LED cathode)
7	Output 4 (Collector)	15	Input 4 (LED anode)
8	Output 4 (Emitter)	16	Input 4 (LED cathode)

Input: 5V/5mA

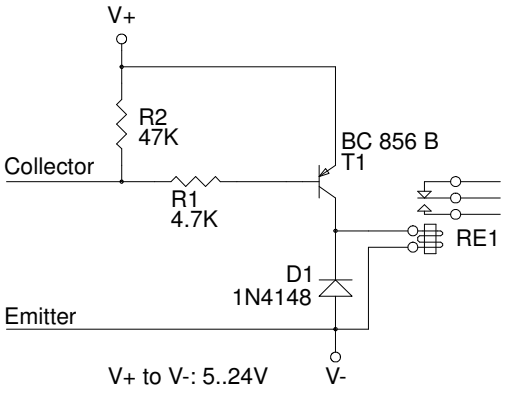
Output: 50V/5mA

All channels are optically separated. The output transistors of optocoupler are NPN-type.

Output examples:



Example1



Example2

Video-in	
Connector	Description
VID1	CVBS or SVHS-C1
VID2	CVBS or SVHS-Y3
VID3	CVBS or SVHS-C3
VID4	CVBS or SVHS-Y2
VID5	CVBS or SVHS-C2
VID6	CVBS or SVHS-Y1

Input voltage range: 0,5-1,3V_{p-p}

Input impedance: 75Ω

SW1	
Switch Position	Module Slot
0 or 4	1
1 or 5	2
2 or 6	3
3 or 7	4

Chapter 4. Using the utility module

Using the module to capture frames.

4.1. Principles of operation

The card digitize the pictures from the video stream in 768x576(PAL) and 640x480(NTSC) resolution, square pixels or 720x576(PAL) and 720x480(NTSC) on CM7327 only. In the analog stage you can set the luminance, chrominance, and many various A/D converting parameter.

You can use AGC (Automatic Gain Control) on inputs. You can set the gain control option in the control panel applet. If you set the AGC on the decoder uses automatic gain control. If you set it OFF you can set gain values on all inputs individually.

The input configuration is software selectable.

After the analog stage, the PCI bridge and scaler circuit can scale and/or convert the picture into other formats. The scaler circuit can digitally shrink the picture in real-time.

Image formats: (Y,U,V,R,G,B are 8 bit values)

- Grayscale, in memory Y_1, Y_2, Y_3, Y_4, ...
- YUV 4:2:2 (UYVY), in memory U_1,Y_1,V_1,Y_2, U_2,Y_3,V_2,Y_4, ..., Y is the luminance value and U,V are the color difference values. Two pixel has two luminance values and one-one color difference values.
- YUV 4:2:2 (YUYV or YUY2), in memory Y_1,U_1,Y_2,V_1, Y_3,U_2,Y_4,V_2, ..., Y is the luminance value and U,V are the color difference values. Two pixel has two luminance values and one-one color difference values.
- RGB 24, in memory B_1,G_1,R_1, B_2,G_2,R_2, ... The color difference digital video is converted to RGB with the followings: R=Y+1.375V, G=Y-0.703125V-0.34375U, B=Y+1.734375U.
- RGB 32, in memory B_1,G_1,R_1,0, B_2,G_2,R_2,0, ...
- RGB16(565), RGB15(1555),RGB15(5515) 16 bit WORD packed RGB formats with 5 or 6 bit channels

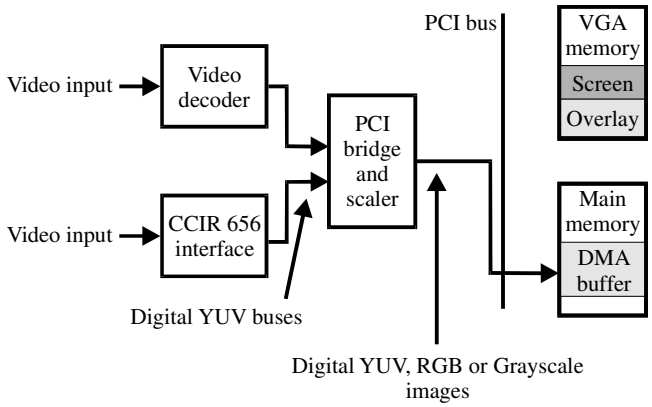
4.2. Image capture mode

In image capture mode the card capture single frames from the video stream. In this mode the card's capture capability is a maximum of 12 full frames/sec (PAL) and 15 full frames/sec (NTSC) because the capture function is stopped after every frame. If you capture only a half frame (one field) you can reach the full standard speed. (25 frame/sec PAL, 30 frame/sec NTSC)

If you capture full size images, 768x576(PAL) or 640x480(NTSC), the even and odd fields are interleaved in the memory.

If you capture only half height images 288(PAL) or 240(NTSC), only the even field is put into the memory buffer.

The figure below shows the image path to memory.



Available modes: Grayscale, YUV, RGB24

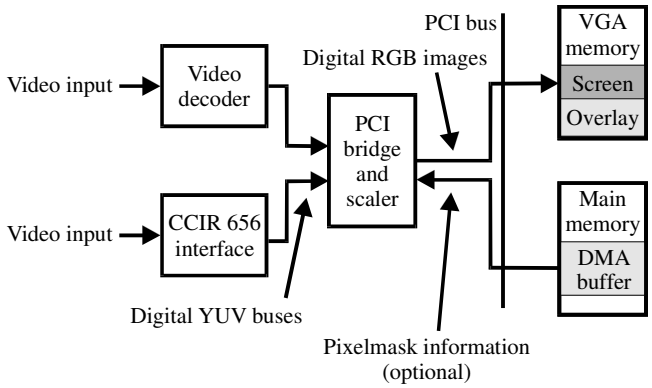
Sample application: digcarddemo.zip

API functions: DCardDigit, DCardDigitEx

4.3. Video overlay mode

In video overlay mode, the images transfer directly to the VGA card's screen memory. In this mode the image data overwrites the screen, windows and other graphics. To prevent overwriting application windows you can use a pixel-by-pixel enable mask.

The figure below shows the image path to VGA memory.



Available modes: RGB24, RGB32, RGB15, RGB16

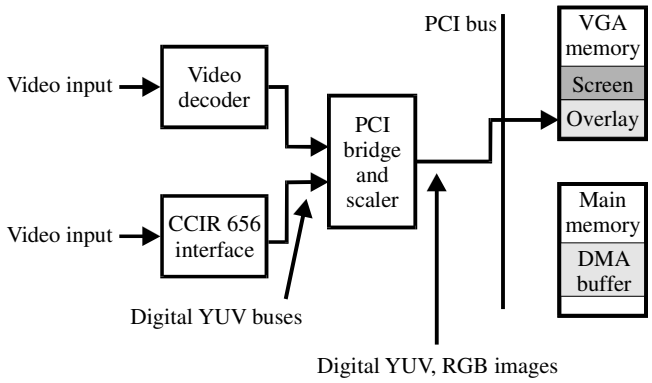
Sample application: digcarddemo.zip

API functions: DCardOverlay, DCardMask, DCardWindowsMask, DCardWindowsMaskEx

4.4. Direct overlay mode

In direct overly mode, the images transfer to the DirectX video overlay memory in the VGA card. The picture visibility can control via DirectX overlay surface properties like color-key. A helper DLL is available to use the grabber card with directoverlay surfaces. (It supports Windows 95/98/ME, Windows NT4.0sp3 or newer, Windows 2000/XP)

The figure below shows the image path to direct overlay surface in VGA memory.



Available modes: YUV, RGB24, RGB32, RGB15, RGB16

Sample application: overlaydemo.zip

API functions: DCardOverlayEx, HexOVR.DLL

Chapter 5. Chapter 6 Software installation

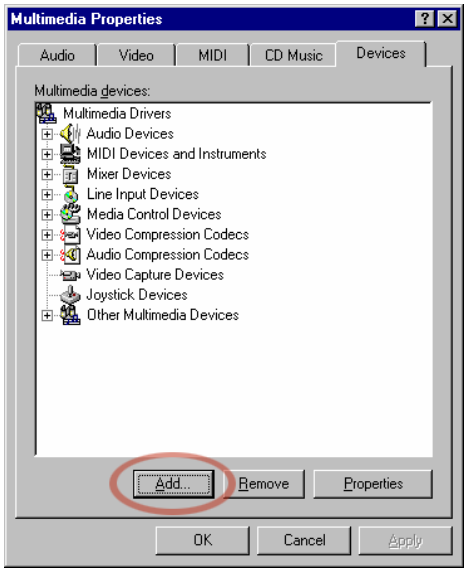
This chapter contains information on:

- Software installation
- Control panel application

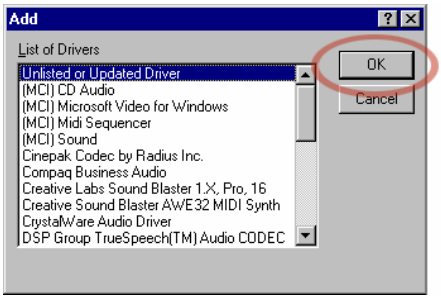
5.1. Software installation

5.1.1. Windows NT 4.0

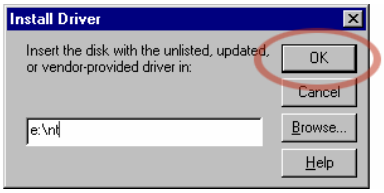
1. Insert the frame grabber driver CD into the CD-ROM
2. Start Control Panel from the Start menu/Settings
3. Choose Multimedia
4. Select the Devices tab on the top
5. Click Add... button



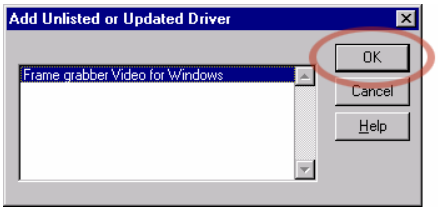
6. Select unlisted or updated driver in the list and click OK



7. Type d:\nt if your CD-ROM drive letter is 'D' and click OK



8. When a dialog box appears with ”Frame grabber Video for Windows” text click OK

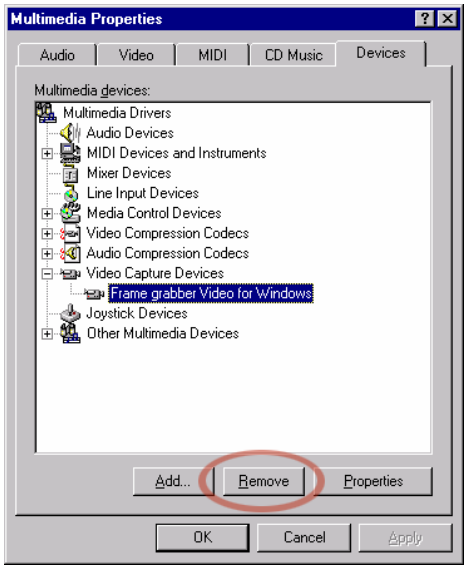


9. Restart the computer

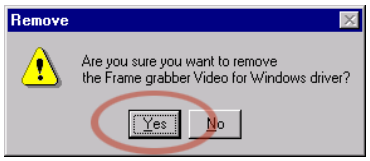
You can install the Twain32 driver with install.bat in the twain32 folder.

5.1.2. Remove the driver in Windows NT

1. Start Control Panel from the Start menu/Settings
2. Choose Multimedia
3. Select the Devices tab on the top
4. Select ”Frame grabber Video for Windows” and click Remove.



5. Click Yes.



6. Restart the computer

5.2. Windows 95/98/ME

1. When windows say that ”New hardware found” click Next



2. Click Next



3. When windows found CM7326 as PCI Multimedia Device, click Next



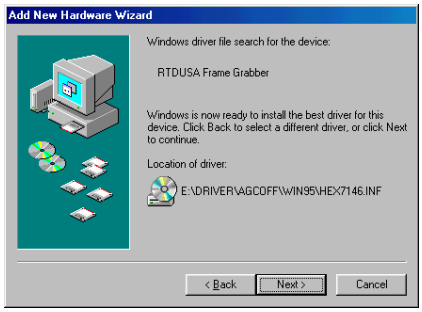
4. To specify driver's folder, click Next



5. Specify the driver's folder and click Next



6. When windows found RTDUSA Frame Grabber driver, click Next

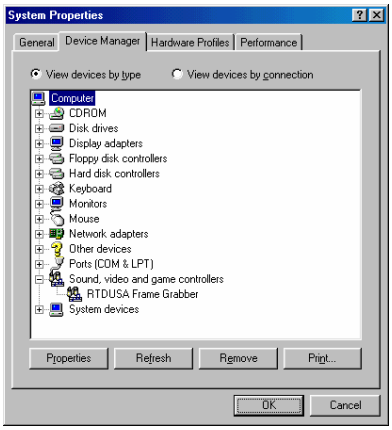


7. After copying files, click Finish



5.2.1. Remove the driver in Windows 95/98/ME

1. Open System in Control Panel
2. Select “RTD USA Frame grabber"



3. Click Remove, and follow the on-screen instructions.

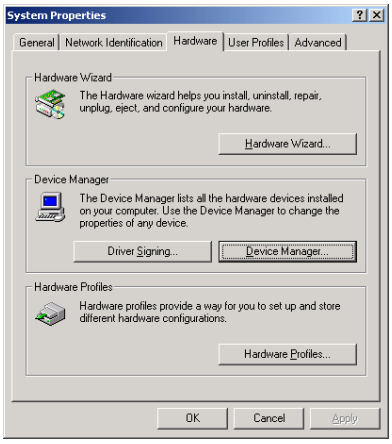
5.3. Windows 2000 (with VideoForWindows support)

Before continuing with the following installation procedure you will need to open the "Drivers" folder included on your CM7326 companion CD. In this folder there is a directory called "nt", copy the "nt" directory to your hard drive. The "nt directory contains the "oemsetup.inf" file that gives you VFW support. Go to the location on your hard drive where the "nt" folder is located and open it. Remove the file "hex7146.inf", either delete it or put it in some other directory. The "nt" directory you now have on your hard drive is where you need to point to in step 10 of this installation procedure. You can now follow the installation procedure.

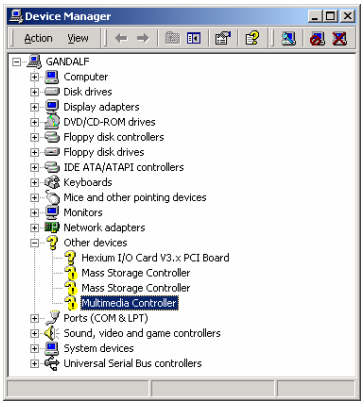
1. Open Control Panel.



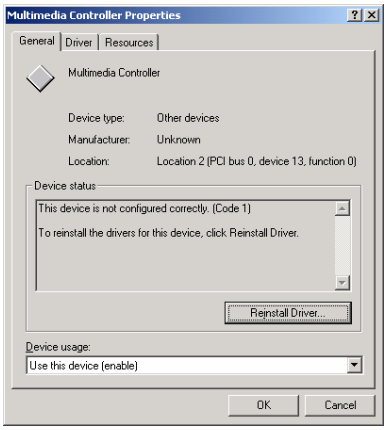
2. Select System



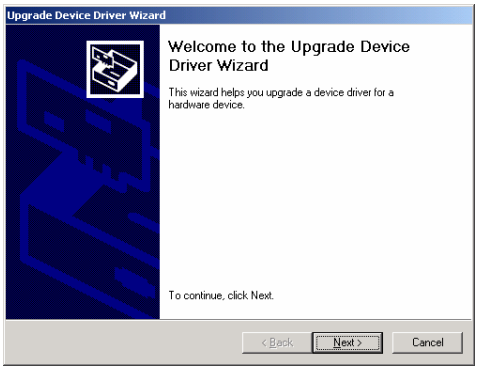
3. Click Device Manager in Hardware tab



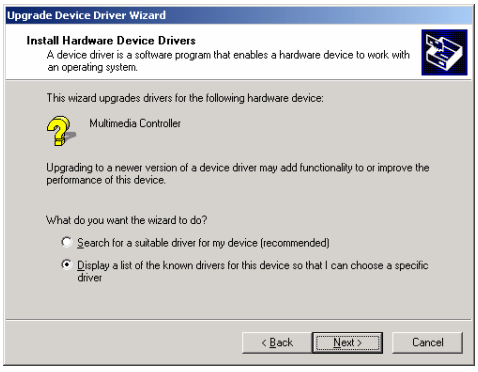
4. Select Multimedia Device, and double click on it



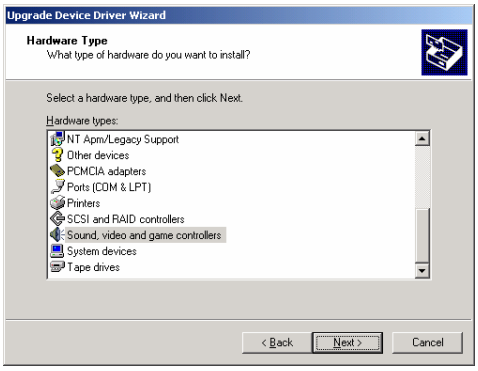
5. Select Reinstall Driver button



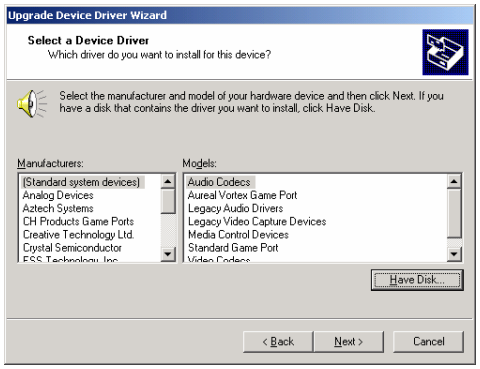
6. Click Next



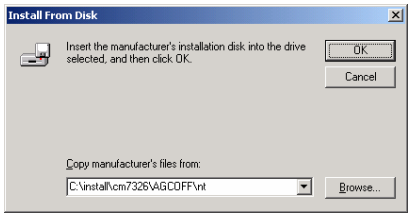
7. Select 'Display a list...' and click Next



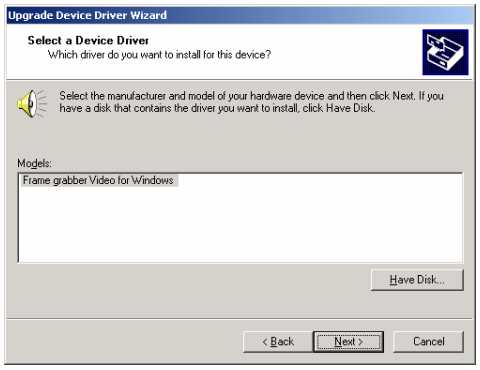
8. Select 'Sound, video ...' and click Next



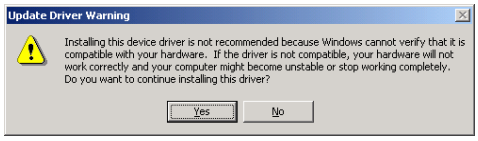
9. Click Have Disk



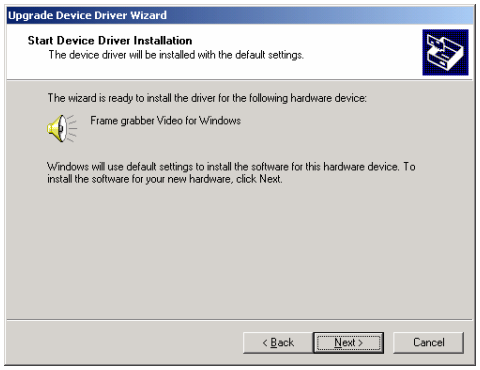
10. Specify the driver location and click OK



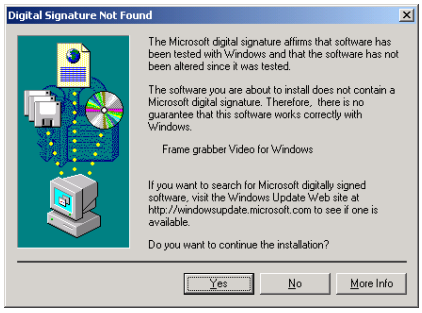
11. Click Next



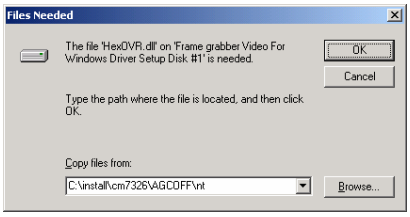
12. Click Yes



13. Click Next



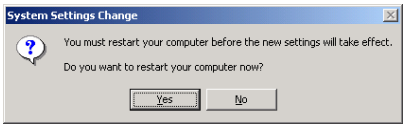
14. Select Yes



15. Specify the driver location and click OK



16. Click Finish

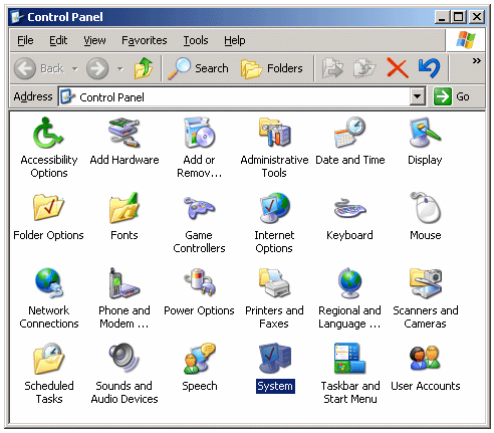


17. Click Yes to restart the machine

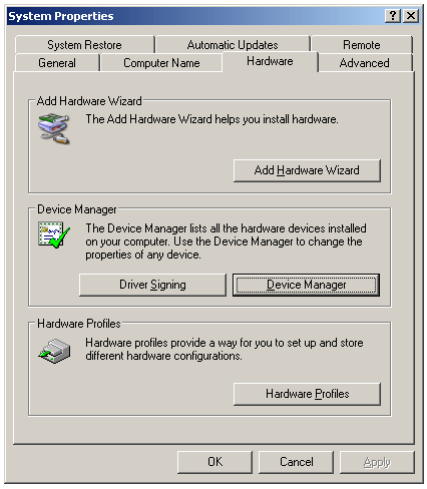
5.4. Windows XP (with VideoForWindows support)

Before continuing with the following installation procedure you will need to open the “Drivers” folder included on your CM7326 companion CD. In this folder there is a directory called “nt”, copy the “nt” directory to your hard drive. The “nt directory contains the “oemsetup.inf” file that gives you VFW support. Go to the location on your hard drive where the “nt” folder is located and open it. Remove the file “hex7146.inf”, either delete it or put it in some other directory. The “nt” directory you now have on your hard drive is where you need to point to in step 10 of this installation procedure. You can now follow the installation procedure.

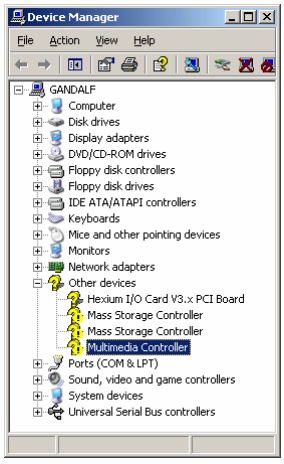
1. Open Control Panel



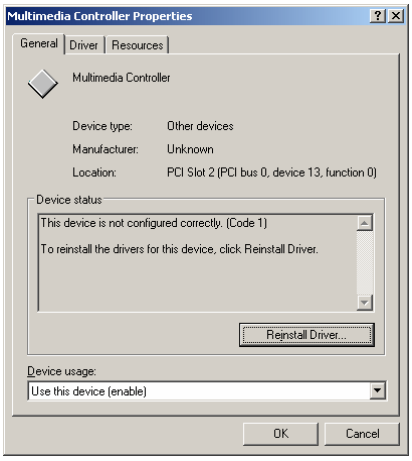
2. Select System



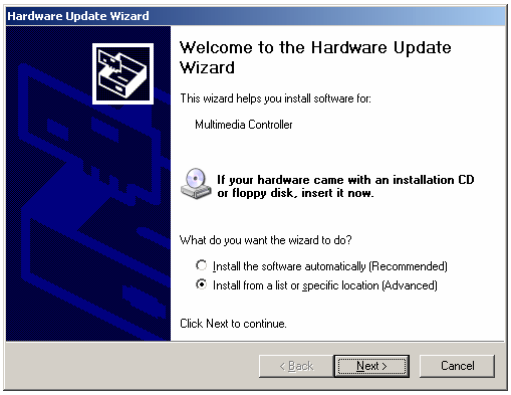
3. Click Device Manager in Hardware tab



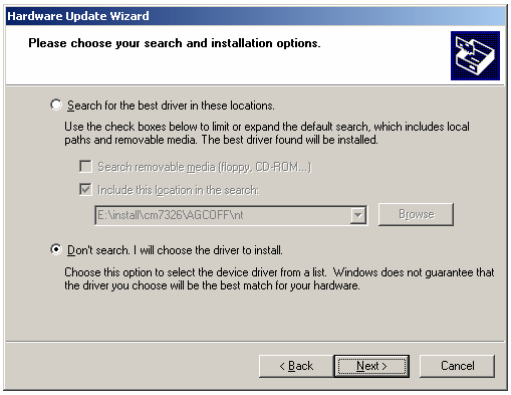
4. Select Multimedia Device in double click on it



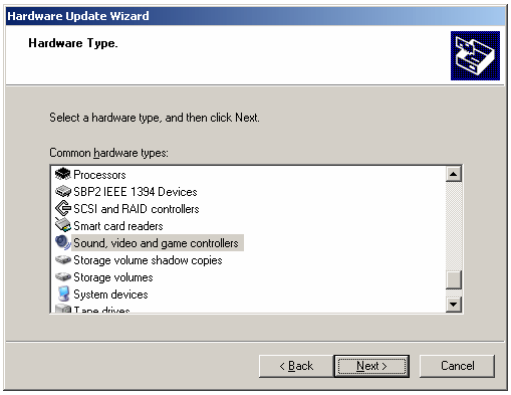
5. Click Reinstall Driver



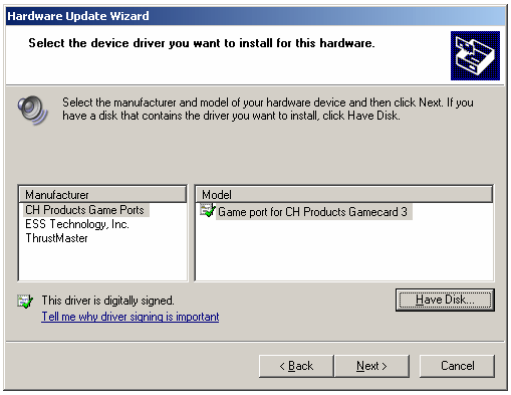
6. Select 'Install from ...' and click Next



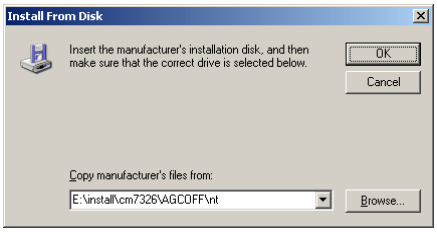
7. Select 'Don't search...' and click Next



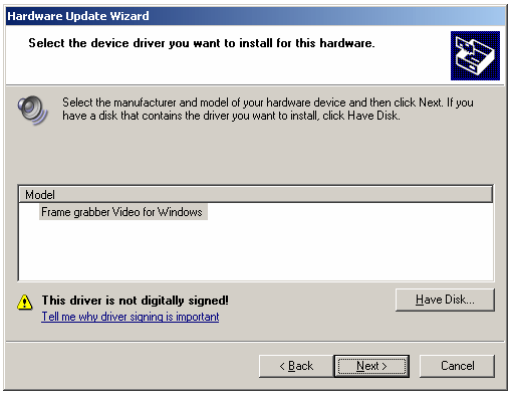
8. Select 'Sound, video ...' and click Next



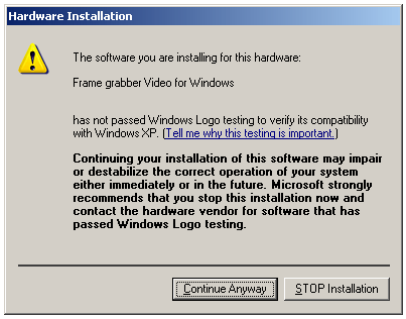
9. Click Have Disk



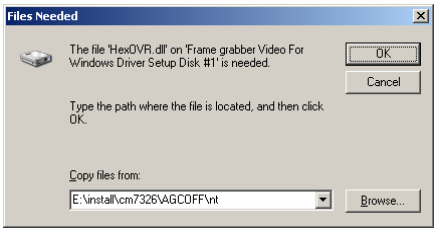
10. Specify the driver location and click OK



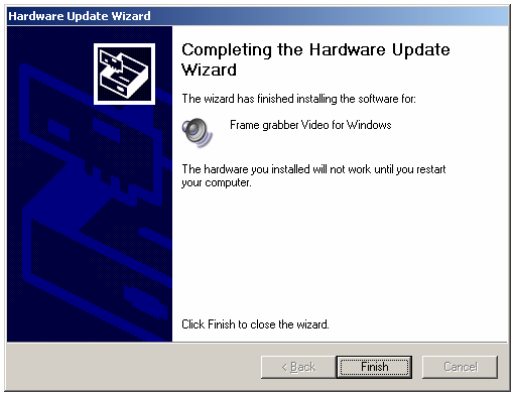
11. Click Next



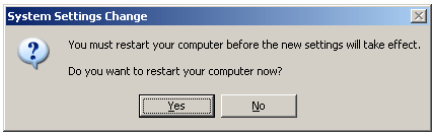
12. Click Continue Anyway



13. Specify the driver location and click OK



14. Click Finish



15. Select Yes to restart the machine

5.5. Windows 2000/XP (without VideoForWindows support)

Install the driver with the new hardware wizard and select the automatic driver search option in the first step. In the second step specify the \nt subfolder and install the driver.

If you would like to update a previously installed driver you have to search and delete the oemx.inf and oemx.pnf file in the winnt\inf folder. (When Windows searches a new or updated driver it will find the oemx.inf and display the name. After you delete these files you can update the newer driver normally.)

5.6. Troubleshooting

Q: The computer does not start after installing the card (no VGA signal and beeps)

A: Check that the card is correctly plugged into the slot and check the PCI device selector rotary switch.

Q: The driver said: ”Card not found”

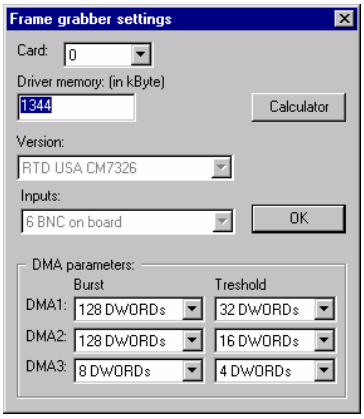
A: Check that the card is correctly plugged into the slot, and check the PCI device selector rotary switch. (In Windows95/98 read software installation procedure)

Q: The driver said: ”Resource conflict”

A: The BIOS failed to map the card or other NT drivers allocated the card addresses. Try changing PC/104*Plus* card’s position (order).

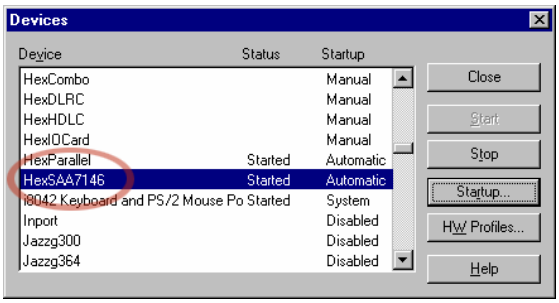
Q: The driver said: ”Linear driver memory allocation error”

A: Not enough memory. Use more memory or decrease the driver memory allocation in the ControlPanel/”RTDUSA Frame Grabber” applet.



Q: Digcard.exe said: „DCardInit error”

A: Driver is not installed properly. (Check the ControlPanel/ Devices/ HexSAA7146 status)



Chapter 6. Reference information

Chapter 7. Return Policy and Warranty

7.1. Return Policy

If you wish to return a product to the factory for service, please follow this procedure:

Read the Limited Warranty to familiarize yourself with our warranty policy.

Contact the factory for a Return Merchandise Authorization (RMA) number.

Please have the following available:

- Complete board name
- Board serial number
- A detailed description of the board's behavior

List the name of a contact person, familiar with technical details of the problem or situation, **along with their phone and fax numbers, address, and e-mail address** (if available).

List your shipping address!!

Indicate the shipping method you would like used to return the product to you.
We will not ship by next-day service without your pre-approval.

Carefully package the product, using proper anti-static packaging.

Write the RMA number in large (1") letters on the outside of the package.

Return the package to:

RTD Embedded Technologies, Inc.
103 Innovation Blvd.
State College PA 16803-0906
USA

7.2. Limited Warranty

RTD Embedded Technologies, Inc. warrants the hardware and software products it manufactures and produces to be free from defects in materials and workmanship for one year following the date of shipment from RTD Embedded Technologies, INC. This warranty is limited to the original purchaser of product and is not transferable.

During the one year warranty period, RTD Embedded Technologies will repair or replace, at its option, any defective products or parts at no additional charge, provided that the product is returned, shipping prepaid, to RTD Embedded Technologies. All replaced parts and products become the property of RTD Embedded Technologies. Before returning any product for repair, customers are required to contact the factory for an RMA number.

THIS LIMITED WARRANTY DOES NOT EXTEND TO ANY PRODUCTS WHICH HAVE BEEN DAMAGED AS A RESULT OF ACCIDENT, MISUSE, ABUSE (such as: use of incorrect input voltages, improper or insufficient ventilation, failure to follow the operating instructions that are provided by RTD Embedded Technologies, "acts of God" or other contingencies beyond the control of RTD Embedded Technologies), OR AS A RESULT OF SERVICE OR MODIFICATION BY ANYONE OTHER THAN RTD Embedded Technologies. EXCEPT AS EXPRESSLY SET FORTH ABOVE, NO OTHER WARRANTIES ARE EXPRESSED OR IMPLIED, INCLUDING, BUT NOT LIMITED TO, ANY IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, AND RTD Embedded Technologies EXPRESSLY DISCLAIMS ALL WARRANTIES NOT STATED HEREIN. ALL IMPLIED WARRANTIES, INCLUDING IMPLIED WARRANTIES FOR MECHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE LIMITED TO THE DURATION OF THIS WARRANTY. IN THE EVENT THE PRODUCT IS NOT FREE FROM DEFECTS AS WARRANTED ABOVE, THE PURCHASER'S SOLE REMEDY SHALL BE REPAIR OR REPLACEMENT AS PROVIDED ABOVE. UNDER NO CIRCUMSTANCES WILL RTD Embedded Technologies BE LIABLE TO THE PURCHASER OR ANY USER FOR ANY DAMAGES, INCLUDING ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES, EXPENSES, LOST PROFITS, LOST SAVINGS, OR OTHER DAMAGES ARISING OUT OF THE USE OR INABILITY TO USE THE PRODUCT.

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