Matrox CronosPlus

Installation and Hardware Reference

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Contents

Introduction

This chapter outlines the key features of the Matrox CronosPlus board.

Matrox CronosPlus

Matrox CronosPlus is a standard monochrome and composite color analog frame grabber for extremely cost-sensitive imaging applications. This board is available in a PCI form factor and can acquire different types of standard video formats using its video decoder.
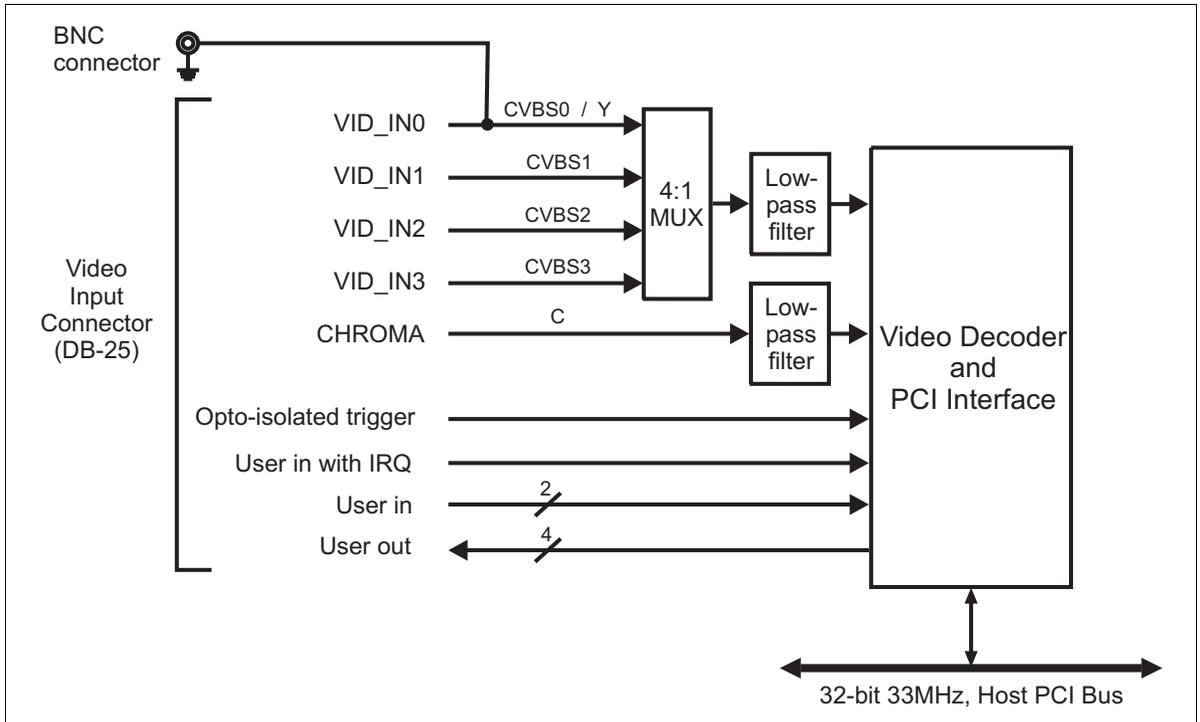
The video decoder can accept composite (CVBS) and component S-video (Y/C) in NTSC/PAL formats, and monochrome video in RS-170/CCIR. Grabbed data can be converted into the following formats with square pixels: BGR32 packed, BGR24 packed, YUV16 packed (stored in YUYV format), and 8-bit monochrome. Formatting features include cropping (ROI capture), arbitrary downscaling, and vertical/horizontal flipping.

You can attach and switch between 4 monochrome/CVBS video sources, or 1 Y/C and 3 monochrome/CVBS video sources.

Matrox CronosPlus accepts an external trigger input, and operates in next valid frame/field mode when grabbing upon a trigger. In addition, to control or synchronize with other devices, the board can accept 3 user input TTL signals and generate 4 user output TTL signals.

Data transfer

The Matrox CronosPlus board allows the transfer of live video to Host memory or off-board display memory. Matrox CronosPlus also features a 32-bit/33 MHz PCI bus master to reduce CPU usage. The board can also generate interrupts for the start and end of a field, frame, and sequence capture.

Software

To operate Matrox CronosPlus, you can purchase one or more Matrox Imaging software products that support the Matrox CronosPlus board. These are the Matrox Imaging Library (MIL) and its derivatives (MIL-Lite, ActiveMIL, ActiveMIL-Lite, and Matrox Inspector). All Matrox software is supported under Windows; consult your software manual for supported Windows environments.

❖ Note that, although other software products might be available to operate Matrox CronosPlus, the discussion throughout this manual is based in terms of Matrox Imaging software products.

MIL   MIL is a development library which provides an extensive list of functions used to capture, process, analyze, transfer, display, and archive images. Processing and analysis operations include: spatial filtering, morphological, measurement, blob analysis, optical character recognition (OCR), pattern recognition (normalized grayscale correlation and Geometric Model Finder), matrix/bar code reading, and calibration operations.

MIL-Lite   MIL-Lite is a subset of MIL. It includes all the MIL functions for image acquisition, transfer, display control, and archiving.

ActiveMIL   ActiveMIL is a set of ActiveX controls that are based on MIL. ActiveMIL was designed for rapid application development (RAD) tools, such as Microsoft's Visual Basic. ActiveMIL is included with MIL (ActiveMIL-Lite is included with MIL-Lite).

Matrox Inspector   Matrox Inspector is an interactive Windows application for image capture, processing, analysis, and archiving.

MIL application developers can use Matrox Inspector as a prototyping tool to quickly build proof-of-concept demonstrations for their machine vision, image analysis, and medical imaging system. End users can use Matrox Inspector to perform and automate image enhancement and measurement tasks.

Matrox Intellicam   Matrox Intellicam is an interactive Windows program that allows fast camera interfacing and provides interactive access to all the acquisition features of your Matrox board. With Matrox Intellicam, you can change the size and position of the active region by creating a custom DCF. Matrox Intellicam is included with all Matrox Imaging software products.

Essentials to get started

To begin using Matrox CronosPlus, you must have a computer with the following:

- An available conventional 3.3 V or 5 V PCI expansion slot (bus-master capable).

- Processor with an Intel 32-bit architecture (IA32) or equivalent.

Other useful considerations
- A computer with a relatively up-to-date PCI chipset, such as the Intel 440BX, 810, 815E, 820, 840, or 850 for full Matrox CronosPlus functionality. These chipsets are recommended because they generally offer better performance in terms of data transfer rates.

- Microsoft Windows if using Matrox Imaging software (consult the documentation accompanying the software for specific supported environments and computer memory/storage requirements).

❖ Matrox CronosPlus is not supported under Windows NT.

- A CD drive, and a hard disk or network drive on which to install the Matrox CronosPlus software.

Inspecting the Matrox CronosPlus package

When you unpack your Matrox CronosPlus package, you should check its contents. Note that optional parts might or might not be included, depending on what you ordered. If something is missing or damaged, contact your Matrox representative.

Standard package

If you ordered Matrox CronosPlus, you should receive the following items:

- The Matrox CronosPlus base board.

- The *Matrox CronosPlus Installation and Hardware Reference* manual (this document).

Optional items

You might have also ordered one or more of the following:

- MIL-32/CD, which includes ActiveMIL; MIL-LITE/CD, which includes ActiveMIL-Lite; or Matrox INSPECTOR-32/CD. Matrox Intellicam is included with each of the aforementioned software packages.

- DB25-TO-5BNC/O cable, an 8-inch input cable with a 25-pin female DB-25 connector on one end and 5 BNCs and open-ended wires on the other end.

Handling components

The electronic circuits in your computer and the circuits on Matrox CronosPlus are sensitive to static electricity and surges. Improper handling can seriously damage the circuits. Be sure to follow these precautions:

- Drain static electricity from your body by touching a metal fixture (or ground) before you touch any electronic component.

- Avoid letting your clothing come in contact with the circuit boards or components.

Caution   Before you add or remove devices from your computer, always **turn off** the power to your computer and all peripherals.

Installation overview

The installation procedure consists of the following steps:

1. Complete the hardware installation as described in Chapter 2. If you have any problems, refer to Appendix A.

2. Complete the software installation procedure as described in the documentation accompanying your software package.

More information For information on using multiple Matrox CronosPlus boards, refer to Chapter 4, and for in-depth hardware information, refer to Chapter 5.

If you want technical information about Matrox CronosPlus, including specifications and connector pinouts and descriptions, refer to Appendix B.

Conventions When the term *Host* is used in this manual, it refers to your computer.

This manual occasionally makes reference to a MIL-Lite function. However, anything that can be accomplished with MIL-Lite can also be accomplished with MIL, ActiveMIL, ActiveMIL-Lite, or Matrox Inspector.[1]

Need help? Appendix A offers solutions to potential problems. If your Matrox CronosPlus installation questions are not answered in this manual, contact your local Matrox representative, Matrox Sales Office, or Matrox Imaging Customer Support Group (see the *Customer Support* section at the back of this manual for telephone numbers).

In the unlikely event of a failure, the warranty and *Product Assistance Request Form* at the back of this manual outlines return conditions and procedures.

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1. Most items can be accomplished with Matrox Inspector.

Chapter

2

Hardware installation

This chapter explains how to install the Matrox CronosPlus hardware.

Installing Matrox CronosPlus

Before you install your board, some precautionary measures must be taken. Turn off the power to the computer and its peripherals, and drain static electricity from your body (by touching a metal part of the computer chassis). Next, follow the steps to install your board.

❖ Your board must be installed before you install the software (either MIL or one of its derivatives).

Use the following steps to install Matrox CronosPlus:

1. Remove the cover from your computer using the instructions from your computer manual.

2. Check that you have an empty PCI slot that can accommodate the board. If you do not have an empty slot, remove a PCI board from your computer to make room for your Matrox CronosPlus board. Five empty (32-bit) PCI slots are illustrated below:
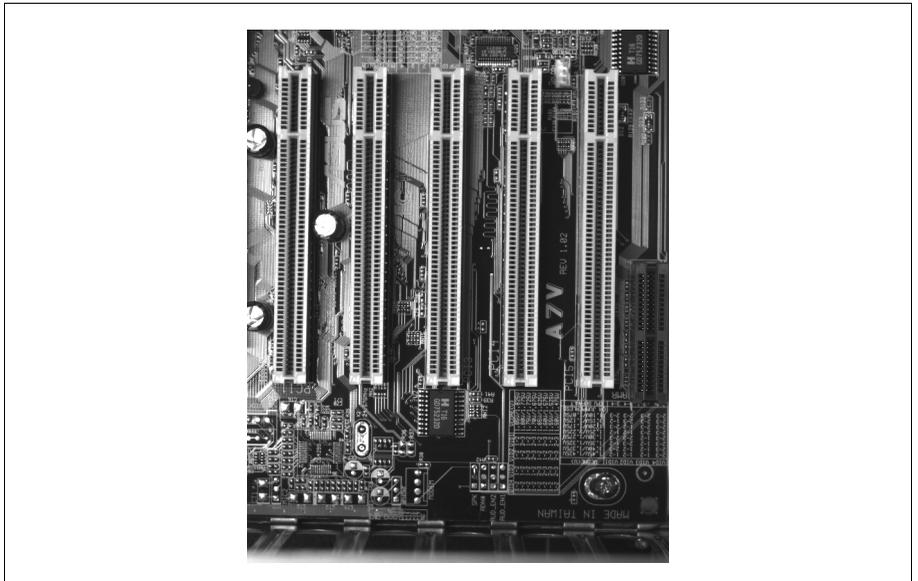
3. If present, remove the blank metal plate located at the back of the selected slot. Keep the removed screw; you will need it to fasten the Matrox CronosPlus board.

4. Carefully position Matrox CronosPlus in the selected PCI slot.
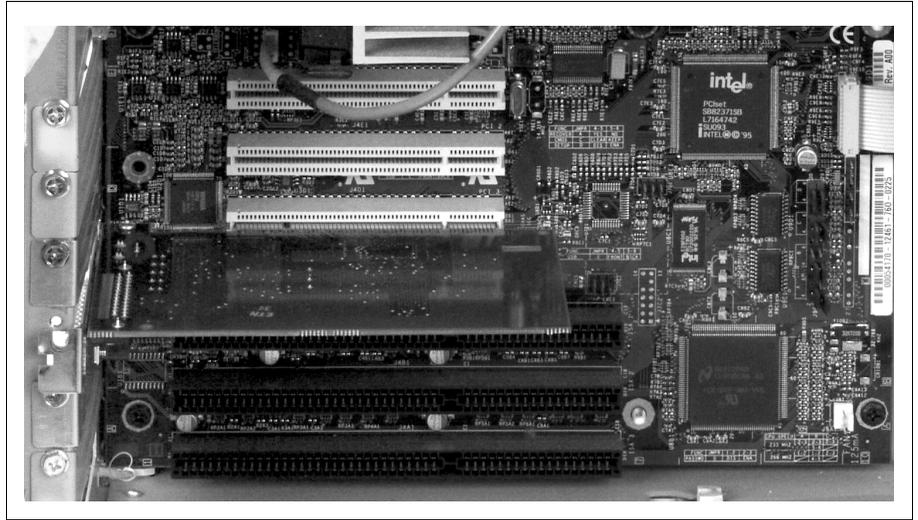
5. Once perfectly aligned with an empty slot, press the board firmly but carefully into the connector.

6. Anchor the board by replacing the screw that you removed.
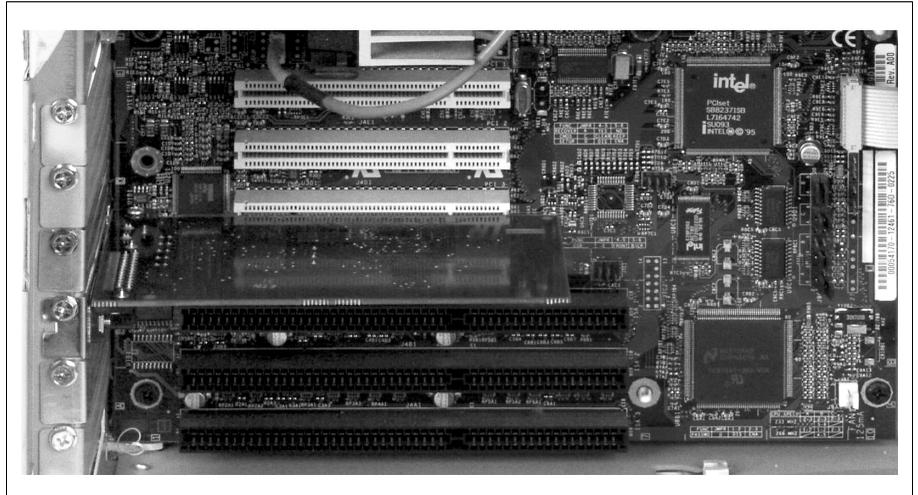
7. Replace the cover of your computer, and connect your video sources. For details, see the *Connecting external devices to Matrox CronosPlus* section.

8. Turn on your computer.

In some cases, when you boot your computer, Windows' Plug-and-Play system will detect a new PCI board and you will be asked to assign a driver to it. At this point, you should click on **Cancel** because the driver will be installed during the installation of MIL or one of its derivatives.

Connecting external devices to Matrox CronosPlus

Matrox CronosPlus has the following connectors on its bracket. The pinouts of these connectors are discussed in detail in Appendix B.

- **BNC connector.** Used to receive CVBS video input 0 or the Y component of Y/C video input.

- **Video input connector** (**DB-25**). Used to receive CVBS video input or the C component of Y/C video input. It is also used to transmit/receive user signals and camera control signals.

You can connect video sources to Matrox CronosPlus's video input connector, using the optional DB25-TO-5BNC/O cable. This cable has a 25-pin female DB-25 connector on one end and 5 BNCs and open-ended wires on the other end.
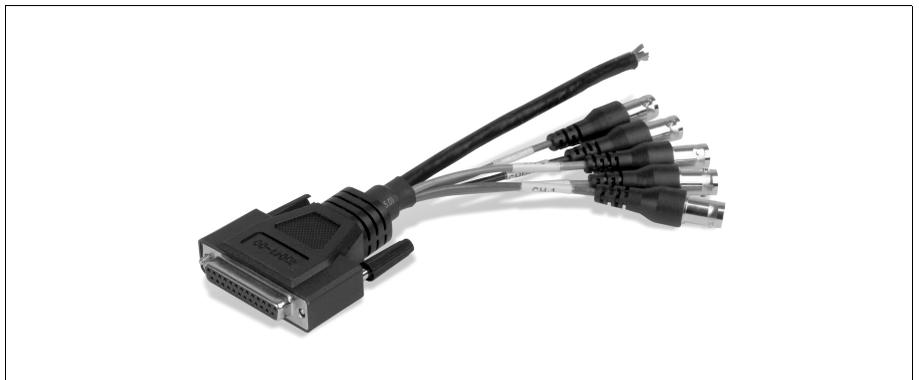
The wires of the cable for video input are listed in the following table:

Wire label	Signal	Expected input
CH-0	VID_IN0	CVBS video input 0 or Y component of Y/C video input.
CH-1	VID_IN1	CVBS video input 1.
CH-2	VID_IN2	CVBS video input 2.
CH-3	VID_IN3	CVBS video input 3.
CHROMA	CHROMA	C component of Y/C video input.

Chapter

3

Using multiple Matrox CronosPlus boards

This chapter explains how to use multiple Matrox CronosPlus boards.

Multiple board installation

This section describes how to use multiple Matrox CronosPlus boards.

Install each additional Matrox CronosPlus board as you installed the first board (refer to Chapter 2). In other words, place each additional board in an empty slot.

Theoretically, you can have as many as 16 Matrox CronosPlus boards installed in your computer at one time; this number is, however, limited by the number of empty slots in your computer and, for simultaneous grabs, by the available bandwidth of your computer (discussed later in this chapter).

Using MIL-Lite, you have to allocate a MIL system for each board and allocate the resources of each MIL system.

Grabbing simultaneously from different boards

You can simultaneously grab images from cameras attached to different Matrox CronosPlus boards; however, the number of cameras from which you can simultaneously grab is determined by the PCI bandwidth available in your computer.

Grabbing from two Matrox CronosPlus boards
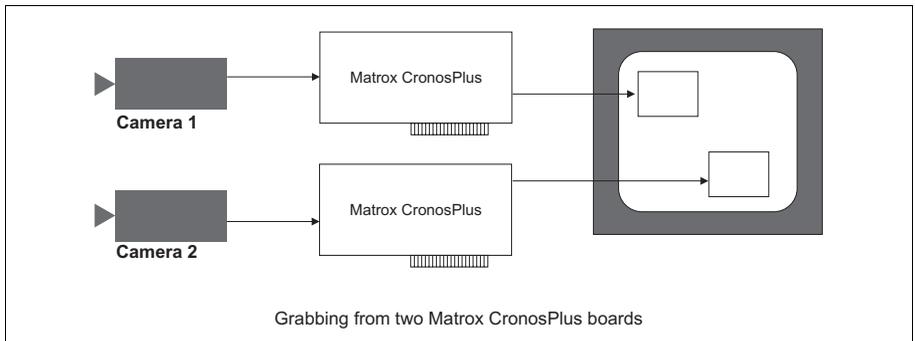
Matrox CronosPlus is susceptible to PCI bus latency. In addition, sustained PCI-transfers to memory require the use of a high performance PCI core-logic chipset, such as the Intel 820, 840, or 850. If a high performance chipset is used with a Matrox CronosPlus board, you should not have any PCI bandwidth

problems when grabbing up to two full-sized color images simultaneously (using two boards). However, grabbing more than two full-sized color images simultaneously might result in PCI bandwidth problems.

As a reference point, grabbing one full-sized NTSC or PAL image in real time will require a PCI bandwidth of 35 Mbytes/sec or 42 Mbytes/sec, respectively, when transferring in RGBX (32-bit) mode.

When grabbing from three or more Matrox CronosPlus boards simultaneously, you will have to reduce the image size to avoid reaching the upper limits of the overall available bandwidth.

Hardware reference

This chapter explains the architecture of the Matrox CronosPlus hardware, as well as the available features and modes.

Matrox CronosPlus hardware reference

This chapter provides information on the architecture, operating modes, and supported features of Matrox CronosPlus.

For a summary of the information given in this chapter and detailed specifications of connectors and pinouts, refer to Appendix B of this manual.
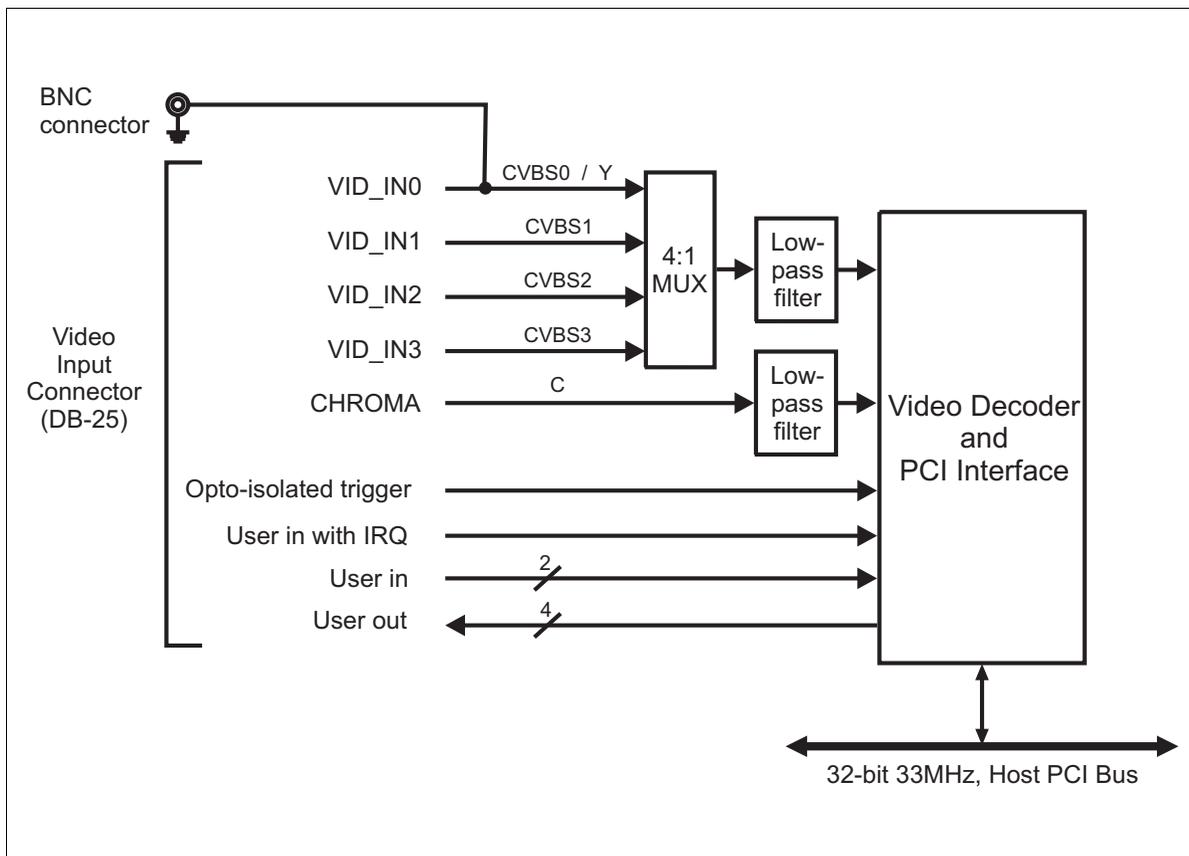
Grab features

The Matrox CronosPlus board is equipped with a video decoder chip that has an integrated PCI interface. The chip can grab RS-170 /CCIR monochrome video and composite (CVBS) and component (Y/C) video in NTSC /PAL format.

Performance

The video timing parameters supported by Matrox CronosPlus are as follows:

	Square pixel video formats	
	NTSC	**PAL**
Field rate (Hz)	60	50
Pixel/line (Pixels)	780	944
Active pixel/line (Pixels)	640	768
Active lines/frame (Lines)	480	576
ADC sampling rate (MHz)	27[1]	27[1]
Line rate (KHz)	15.734	15.625

1. Some scaling is applied for conversion of ITU sampling to square pixels.

Input channels

With Matrox CronosPlus, you can only acquire data from one video source at a time, however you can attach several video sources and switch between them.

The Matrox CronosPlus board can switch between up to four independent composite/monochrome sources. Alternatively, the board can switch between 1 Y/C and 3 composite/monochrome sources.

To switch between video sources of the same type, allocate a single digitizer (using the MIL-Lite function **MdigAlloc**()) and switch between the input channels with (using the MIL-Lite function **MdigChannel**()).

To grab and switch between Y/C and composite/monochrome video sources, allocate two different digitizers: one with a DCF for Y/C video sources and one with a DCF for composite/monochrome video sources. For each allocated digitizer, specify the input channel of the required video source using MIL-Lite function **MdigChannel**(); the channel numbering scheme is based on the number

of available channels for the type of input (DCF type), as opposed to all available channels. Then, specify the appropriate digitizer when performing the grab (**MdigGrab**()).

Low-pass filter

The input low-pass filtering stage is used to limit high frequency noise and aliasing effects at the input of the decoder. The filters used on Matrox CronosPlus are 4th order Butterworth filters with a cut-off frequency of 8 MHz.

Video decoder

A multi-standard video decoder is used to convert NTSC and PAL analog video signals that are composite (CVBS) or component (Y/C) to digitized component video. The decoder supports BGR 8:8:8:8 (32-bit), BGR 8:8:8 (24-bit), and YUV 4:2:2 output pixel formats. Note that YUV 4:2:2 output pixel formats are grabbed as YUYV.

The video decoder also features automatic gain control (AGC). However, you can disable this feature (MIL-Lite **MdigControl**() with M_GRAB_AUTOMATIC_INPUT_GAIN set to M_DISABLE).

The video decoder also features an adaptive multi-line comb filter for better Y/C separation, as well as an on-chip scaler, which can reduce the video image size in both horizontal and vertical directions independently. The full resolution can be scaled down to any value between 1 and 1/64. The video decoder can also crop the image to the required width and height, as well as flip the image vertically and/or horizontally.

Trigger

Matrox CronosPlus accepts an external trigger input which allows image acquisition to be synchronized to external events. The trigger is synchronous to the incoming video stream, and is received through an opto-coupler that isolates the rest of the circuitry from outside surges.

Matrox CronosPlus operates in next valid frame/field mode. When in this mode, the digitizer waits for the next valid frame or field (as specified by the DCF file) before commencing the grab. This trigger mode functions in one of two ways:

- Edge-triggered monoshot acquisition: The PCI bus master interface waits for the rising/falling edge to capture a single frame.

- Level-sensitive "continuous" acquisition: The PCI bus master interface grabs continuously while the level of the trigger is high/low.

❖ The polarity of the active and inactive levels of the trigger signal is software programmable.

The trigger signal's negative component (OPTOTRIG-) is usually connected to the ground of the trigger source.

User bits

Matrox CronosPlus supports 3 user input signals and can generate 4 user output signals, to allow you to control external events such as a strobe light. Both input and output signals are TTL compatible. One user input can generate an interrupt. These user signals (user bits) are programmed using the MIL-Lite function **MdigControl**(). For information on the user bits electrical specifications, see the section *Electrical specifications* in Appendix B.

PCI interface

Matrox CronosPlus has a 32-bit PCI bus interface, which is capable of a peak transfer rate of 132 Mbytes/sec, and operates at 33 MHz.

Matrox CronosPlus uses an internal FIFO to buffer image data while waiting to access the PCI bus. This helps prevent loss of image data during long bus-access latencies found in heavily loaded systems. When the PCI bus is extremely loaded, Matrox CronosPlus might not be able to empty the FIFO when required. This problem causes an acquisition error known as a "Acquisition error: Data transfer error (FIFO overflow)". A way to reduce the occurrence of this error is to grab into a YUV16 packed buffer instead of a BGR24 or BGR32 buffer. In addition, using an AGP graphics board for display instead of a PCI graphics board will also reduce the PCI load. For more information, see the subsection titled, *Grabbing Problems*, in *Appendix A: Troubleshooting*.

Appendix A: Troubleshooting

This appendix gives suggestions to help you resolve potential problems. If your problem is not addressed here, contact your local Matrox representative, Matrox Sales Office, or the Matrox Imaging Customer Support Group.

Troubleshooting

If you have problems using your Matrox CronosPlus board, please try the following:

- Check for disconnected video input cables.

- Read the *Common problems and solutions* section in this chapter.

If your problem is not addressed in this chapter or if the solutions suggested don't work for you, contact your local Matrox representative, Matrox Sales Office, or the Matrox Imaging Customer Support Group.

Common problems and solutions

Installation Problems

↘ **You receive a "Board service fails to start" error upon booting your computer, or you receive a "Driver has not started" error upon allocating a MIL CronosPlus system.**

This could happen due to the following three reasons:

- **The MIL Matrox CronosPlus drivers are not installed correctly.** When the board fails to start under Windows 2000/Me/XP, the driver might have been installed incorrectly and might not have started. Right-click on **My Computer**, and select **Manage** from the presented menu. From the **Computer Management** explorer window, display the **System Tools** folder and then the **Device Manager** folder. If you do not see a Matrox CronosPlus device under Matrox Imaging Adapters, you will have to re-install the driver.

- **Too much or insufficient allocation of DMA memory.** The driver might not start if you have allocated an insufficient amount of DMA memory or if the specified amount of DMA memory would leave the operating system less memory than it requires. To address this problem, re-allocate DMA memory using the *milconfig.exe* utility, included on the MIL-Lite CD.

- **There is a conflict in the BIOS Setup program.** This problem generally occurs when there is a PCI memory mapping error. In the case of Windows Me, this problem could also occur if there is a PCI-IRQ routing error (IRQ conflict).

Under Windows 2000/Me/XP, right-click on **My Computer**, and select **Manage** from the presented menu. From the **Computer Management** explorer window presented, display the **System Tools\ System Information\ Hardware Resources** folder. Then, display the subfolder **\Memory** to check if any of the memory address ranges overlap. After, in the case of Me, display the subfolder **\IRQs** to check for devices that are sharing an IRQ with your Matrox frame grabber. In general, PCI devices can share an interrupt line (IRQ). However, sometimes this might not be possible.

If your frame grabber is sharing an IRQ or if there is a PCI memory mapping error, first try to swap boards from one PCI slot to another. If the problem still persists, try upgrading your BIOS.

Grabbing Problems

↘ **Acquisition error: Data transfer error (FIFO overflow)**

This error message occurs when Matrox CronosPlus cannot maintain the grab and transfer sequence. To avoid this error, Matrox CronosPlus uses a FIFO to buffer image data while waiting to access the PCI bus. However, when the PCI bus is extremely loaded, the PCI bus might not service the request-to-transfer in time and cause the FIFO to overflow and grabbed data to overwrite non-transferred data. When grabbing to the display, data corruption will be visible.

Internal testing has determined that a FIFO overflow error is most likely to occur on computers using a PCI graphics controller and/or specific chipsets. Some chipsets, in particular the Intel 850 chipset revisions 3 and earlier, are unable to guarantee the maximum PCI latency that is supported by Matrox CronosPlus. Consult the *PC Compatibility List*, accessible from the Matrox CronosPlus page of the Matrox Imaging web site, for the most up-to-date information regarding chipsets. Furthermore, for more detailed information about the 850 chipset, consult Intel's web page, http://developer.intel.com/design/chipsets/specupdt/298242.htm, and refer to Errata No. 18 "Intel ICH2 B1' PCI Latency".

↘ **IRQ conflicts**

In general, PCI devices can share an interrupt line (IRQ). However, sometimes this might not be possible. When there is an IRQ conflict under Windows 2000/Me/XP, try the following solutions:

- Re-assign a different IRQ line to the PCI slot in which the Matrox CronosPlus board is installed. Note that PCI devices cannot share interrupt lines with EISA or ISA devices.

- Move the Matrox CronosPlus board to another (free) PCI slot.

- Swap the Matrox CronosPlus board with another board, by switching PCI slots.

Problems during application development

↘ **Computer `hangs' or produces unwanted results while an application is running**

Sometimes, an EISA or ISA device might attempt to use the same interrupt, registers, or memory space as PCI boards, and this causes a conflict. Check for an interrupt, memory, or register conflict.

Under Windows 2000/Me/XP, right-click on **My Computer**, and select **Manage** from the presented menu. From the **Computer Management** explorer window, display the **System Tools\ System Information\ Hardware Resources\ IRQs** folder. Check for devices that are sharing an IRQ with your Matrox frame grabber.

Contacting Matrox

Before contacting your local Matrox representative, Matrox Sales Office, or Matrox Imaging Customer Support Group, ascertain the following information:

- A description of what happened.

- Computer (motherboard) make and model number, environment, and peripherals (especially boards sharing the computer with your Matrox CronosPlus).

- Your board's serial number (printed on the bar code label), and revision number.

Use the *Product Assistance Request Form* at the back of this manual to record the information.

Appendix B: Technical information

This appendix contains information that might be useful when installing your Matrox CronosPlus board.

Technical information

This appendix contains information that might be useful when installing your Matrox CronosPlus board.

General information

- Operating system: See your software manual for supported versions of Microsoft Windows.

- System requirements: A computer with a PCI bus and an Intel Pentium processor (or equivalent) or better.

  Some older systems use a core logic chipset (interfaces PCI with Host memory) that has limited throughput capabilities. Matrox CronosPlus might not be able to attain full functionality on such systems. We recommend systems with newer PCI chipsets, such as the Intel 440BX, 810, 815E, 820, 840, or 850. If you need more specific information regarding potential problems, refer to Appendix A - *Troubleshooting*.

- Technical features:

  - Can acquire data from one of four software selectable channels, which support input in either monochrome RS-170/CCIR or composite NTSC/PAL formats, or from one Y/C video input in NTSC/PAL format.

  - Support for an external trigger input, which can operate in next valid frame/field mode.

  - Three user input signals and four user output signals.

  - Programmable or automatic gain control.

  - 32-bit bus-master interface.

Electrical specifications

Operating voltage and current (typical)		
Voltage	**Current**	**Power**
5 V ± 5%	500 mA	2.5 W
-5 V ± 5%	n/a	
3.3 V± 5%	n/a	
12 V ± 10%	25 mA	0.30 W
-12 V ± 10%	n/a	
Total		2.80 W

Signals	**Specifications**
Video input signals	Termination: 75 Ω with jumper installed, >100 KΩ without jumper.
User input signals	No termination. Input current: ± 1 μA max. Input voltage: • Low: 0 V min; 0.8 V max. • High: 2.0 V min; 5 V max.
User output signals	No termination. Maximum output current: 24 mA. Output voltage: • Low: 0.55 V max. • High: 2.4 V min; 5 V max.
Opto-coupled input signals	511 Ohm series termination Input current: • max of low: 250 μA • min of high: 5 mA (6.3 mA min recommended) • max of high: 15 mA (10 mA max recommended) Input voltage (with 511 Ohm series resistor only): • low: 0.511 V max • high: 2.56 V min

Environmental specifications

- Min./max. ambient operating temperature: 10°C - 60° C.

- Min./max. storage temperature: -45° C - 115° C.

- Max. altitude for operation: 3000 meters.

- Max. altitude for transport: 12000 meters.

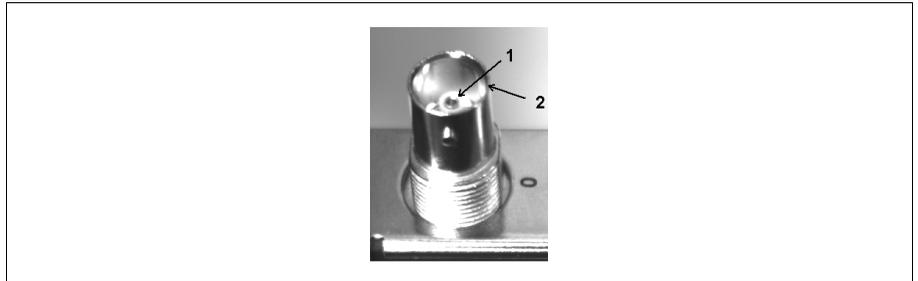- Operating humidity: 20 - 80% relative humidity (non-condensing).

Board connectors

The Matrox CronosPlus board has a BNC video input connector and a 25-pin video input connector on its bracket.

BNC connector

The BNC connector is used to receive CVBS video input 0 or the Y component of Y/C video input. Its pin assignment is as follows:

Pin	Signal	I/O	Description
1	VID_IN0	I	CVBS video input 0 or the Y component of Y/C video input.
2 (SHELL)	GND	-	Ground.

You can use a standard video cable (available from your local electronic store) to interface with this connector.

Video input connector

The video input connector is a standard 25-pin, D-SUB male connector that is located on the module's bracket. The connector is used receive video input, send or receive user signals, and receive a trigger input signal.
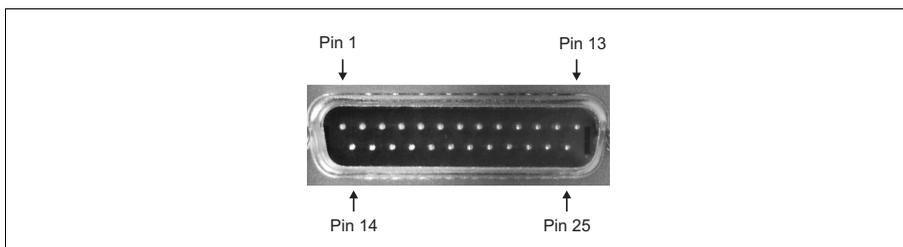
Pin	Signal	I/O	Description
1	USERBIT0	I	TTL user signal 0. This signal can only be an input signal. It can also generate an interrupt.
2	USERBIT1	I	TTL user signal 1. This signal can only be an input signal.
4	USERBIT5	O	TTL user signal 5. This signal can only be an output signal.
5	USERBIT3	O	TTL user signal 3. This signal can only be an output signal.
7	OPTOTRIG+	I	Opto-isolated trigger input (positive).
9	CHROMA	I	Chrominance.
11	VID_IN2	I	CVBS2.
13	VID_IN0	I	CVBS0 or Y.
14	USERBIT2	I	TTL user signal 2. This signal can only be an input signal.
16	USERBIT6	O	TTL user signal 6. This signal can only be an output signal.
17	USERBIT4	O	TTL user signal 4. This signal can only be an output signal.
19	OPTOTRIG-	I	Opto-isolated trigger input (negative).
22	VID_IN3	I	CVBS3.
24	VID_IN1	I	CVBS1.
3, 6, 8, 10, 12, 15, 18, 20, 21, 23, 25	GND	-	Ground.

To build your own cable, parts can be purchased from::

Manufacturer	Amphenol
Connector P/N	ED-B-25-S
Backshell P/N	17-1726-2

Appendix C:
Glossary

This appendix defines some of the specialized terms used in this Matrox CronosPlus document.

- **AGC**

  Automatic Gain control. Used to keep the output signal of a circuit constant as the input signal amplitude varies.

- **Bandwidth**

  A term describing the capacity to transfer data. Greater bandwidth is needed to sustain a higher transfer rate. Greater bandwidth can be achieved, for example, by using a wider bus.

- **Bus**

  A pathway along which signals are sent, generally in two directions, for communication of data.

- **Composite sync**

  A synchronization signal made up of two components: one horizontal and one vertical.

- **DCF**

  Digitizer Configuration Format. A DCF defines the input data format and among other things, how to accept or generate video timing signals such as horizontal sync, vertical sync, and pixel clock.

- **Field**

  One of the two halves that make up an image. One half consists of the image's odd lines (known as the *odd field*); the other half consists of the image's even lines (known as the *even field*).

- **Frame**

  A single image grabbed from a video camera.

- **Grab**

  To acquire an image from a camera.

- **Horizontal sync**

  The part of a video signal that indicates the end of a line and the start of a new one.

  See also *vertical sync*.

- **Host**

  In general, Host refers to the principal CPU in one's computer.

- **Interlaced scanning**

  Describes a transfer of data in which the odd-numbered lines of the source are written to the destination buffer first and then the even-numbered lines (or vice-versa).

  See also *progressive scanning*.

- **Latency**

  The time from when an operation is started to when the final result is produced.

- **Live processing**

  See *real-time processing*.

- **PCI**

  Peripheral Component Interconnect. An expansion bus standard for the '90s.

- **PCI primary/secondary bus**

  A high-performance bus that provides a processor-independent data path between the CPU and high-speed peripherals.

- **PLC**

  Programmable Logic Controller. A device used to automate monitoring and control of industrial plants. It can be used as a stand-alone device or in conjunction with data acquisition.

- **Progressive scanning**

  Describes a transfer of data in which the lines of the source input device are written sequentially into the destination buffer.

  Also known as *non-interlaced.* See also *interlaced scanning*.

- **Real-time processing**

  The processing of an image as quickly as the next image is grabbed.

  Also known as *live processing*.

- **Vertical sync**

  The part of a video signal that indicates the end of a frame and the start of a new one.

  See also *horizontal sync*.

- **Vpp**

  Voltage peak to peak. The signal amplitude measured between the maximum positive and negative voltage peak excursions of a signal.

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V

Regulatory Compliance

FCC Compliance Statement

Remark for the Matrox hardware products supported by this guide

These devices have been tested and found to comply with the limits for a Class B 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. 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 causes 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.

WARNING

Changes or modifications to this unit not expressly approved by the party responsible for the compliance could void the user's authority to operate this equipment. The use of shielded cables for connection of the monitor to the card is required to meet FCC requirements.

Declaration of conformity of a Class B digital device according to the FCC rules

We, the Responsible Party

Matrox, 1075 Broken Sound Parkway, Boca Raton, FL 33487 • Telephone: (561) 989-9626 • Attention: Conformity Group Matrox

Declaration

The Matrox hardware products supported by this guide comply with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) these devices may not cause harmful interference, and (2) these devices must accept any interference received, including interference that may cause undesired operation. Any question regarding this declaration should be forwarded to the above coordinates.

(English) Industry Canada Compliance Statement

Remark for the Matrox hardware products supported by this guide

These digital devices do not exceed the Class B limits for radio noise emission from digital apparatus devices set out in the Radio Interference Regulation of Industry Canada.

(Français) Conformité avec les exigences du ministère de l'Industrie Canada

Remarque sur les produits matériels Matrox couverts par ce guide

Ces appareils numériques n'émettent aucun bruit radioélectrique dépassant les limites applicables aux appareils numériques de Classe B prescrites dans le Règlement sur le brouillage radioélectrique édicté par Industrie Canada.

(English) European user's information – Declaration of Conformity

Remark for the Matrox hardware products supported by this guide

These devices comply with EC Directive 89/336/EEC for a Class B digital device. They have been tested and found to comply with EN55022/CISPR22 and EN55024/CISPR24. In a domestic environment these products may cause radio interference in which case the user may be required to take adequate measures.To meet EC requirements, shielded cables must be used to connect the monitor and other peripherals to the card. These products have been tested in a typical class B compliant host system. It is assumed that these products will also achieve compliance in any class B compliant system.

(Français) Informations aux utilisateurs Européens – Déclaration de conformité

Remarque sur les produits matériels Matrox couverts par ce guide

Ces unités sont conformes à la directive communautaire 89/336/EEC pour les unités numériques de classe B. Les tests effectués ont prouvé qu'elles sont conformes aux normes EN55022/CISPR22 et EN55024/CISPR24. Le fonctionnement de ces produits dans un environnement résidentiel peut causer des interférences radio, dans ce cas l'utilisateur peut être amené à prendre les mesures appropriées. Pour respecter les impératifs communautaires, les câbles de connexion entre le moniteur ou autres périphériques et la carte doivent être blindés. Ces produits ont été testés dans un système hôte typique compatible classe B. On suppose qu'ils présenteront la même compatibilité dans tout système compatible classe B.

(Deutsch) Information für europäische Anwender – Konformitätserklärung

Anmerkung für die Matrox Hardware-Produktunterstützung durch dieses Handbuch

Diese Geräte entsprechen EC Direktive 89/336/EEC für ein digitales Gerät Klasse B. Sie wurden getestet und entsprechen demnach EN55022/CISPR22 und EN55024/CISPR24. In einer Wohnumgebung können diese Produkte Funkinterferenzen erzeugen, und der Benutzer kann genötigt sein, entsprechende Maßnahmen zu ergreifen. Um EG-Anforderungen zu entsprechen, müssen zum Anschließen des Monitors und anderer Peripheriegeräte an die Karte abgeschirmte Kabel verwendet werden. Diese Produkt wurden in einem typischen, der Klasse B entsprechenden, Host-System getestet. Es wird davon ausgegangen, daß diese Produkte auch in jedem Klasse B entsprechenden System entsprechend funktionieren.

(Italiano) Informazioni per gli utenti europei – Dichiarazione di conformità

Nota per i prodotti hardware Matrox supportati da questa guida

Questi dispositivi sono conformi alla direttiva CEE 89/336/EEC relativamente ai dispositivi digitali di Classe B. Sono stati provati e sono risultati conformi alle norme EN55022/CISPR22 e EN55024/CISPR24. In un ambiente domestico, questi prodotti possono causare radiointerferenze, nel qual caso all'utente potrebbe venire richiesto di prendere le misure adeguate. Per soddisfare i requisiti CEE, il monitor e le altre periferiche vanno collegati alla scheda grafica con cavi schermati. Questi prodotti sono stati provati in un tipico sistema host conforme alla classe B. Inoltre, si dà per scontato che questi prodotti acquisiranno la conformità in qualsiasi sistema conforme alla classe B.

(Español) Información para usuarios europeos – Declaración de conformidad

Observación referente a los productos de hardware de Matrox apoyados por este manual

Estos dispositivos cumplen con la directiva de la CE 89/336/EEC para dispositivos digitales de Clase B. Dichos dispositivos han sido sometidos a prueba y se ha comprobado que cumplen con las normas EN55022/CISPR22 y EN55024/CISPR24. En entornos residenciales, estos productos pueden causar interferencias en las comunicaciones por radio; en tal caso el usuario deberá adoptar las medidas adecuadas. Para satisfacer las disposiciones de la CE, deberán utilizarse cables apantallados para conectar el monitor y demás periféricos a la tarjeta. Estos productos han sido sometidos a prueba en un típico sistema anfitrión que responde a los requisitos de la clase B. Se supone que estos productos cumplirán también con las normas en cualquier sistema que responda a los requisitos de la clase B.

Product support

Limited Warranty

*Matrox warrants this product against defects in materials and workmanship for a period of **one year** from the date of delivery. Matrox and its suppliers expressly disclaim any and all other warranties, express or implied.*

Your sole remedy shall be, repair or replacement of the product provided that the defective product be returned to the authorized dealer within a year from the date of delivery.

*If you wish to return your board, contact the Matrox authorized dealer where you purchased the board for service. **Do not return a product to Matrox without authorization.***

In the event you must return the board directly to Matrox, follow these steps:

1. Contact Customer Support (The *Customer support contacts* information sheet included in your package has the phone numbers for Matrox's offices).

   Customer Support will ask you to describe the problem and will issue a Return Merchandise Authorization (RMA).

2. Leave the configuration as it was when you were using the board.

3. Pack the board in its original box and return it with a completed "Product Assistance Request" form (provided in the following page).

Return address

U.S. customers must return their products to our U.S. address:

■ Matrox International Corp.
   625 Route 3 Unit B
   Plattsburgh, N.Y.
   12901-6530

Canadian and other international customers can return their products directly to our Canadian facility:

■ Matrox Electronic Systems Ltd.
   1055 St. Regis Blvd.
   Dorval, Quebec
   H9P 2T4

Product Assistance Request Form

Name:	
Company:	
Address:	
Phone:	Fax:
E-mail:	
Hardware Specific Information	
Computer:	CPU:
System memory:	PCI Chipset:
System BIOS rev:	
Video card used:	Resolution:
Network Card:	Network Software:
Other cards in system:	
Software Specific Information	
Operating system:	Rev:
Matrox SW used:	Rev:
Compiler:	Rev:
Fill out only if you are returning a board	
RMA #:	
Who were you talking to in customer support?	
Date board was received:	Date of failure:
MOD #:	These numbers are on the label at the back of the board.
SER #:	
REV #:	
PMB #:	
PNS #:	
Can you reproduce the problem? Yes ☐ No ☐	
Is an error code displayed? Yes ☐ No ☐	If so, what code?
	... Continued on reverse

Describe the problem: