Matrox Meteor-II /Multi-Channel

Installation and Hardware Reference

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Chapter

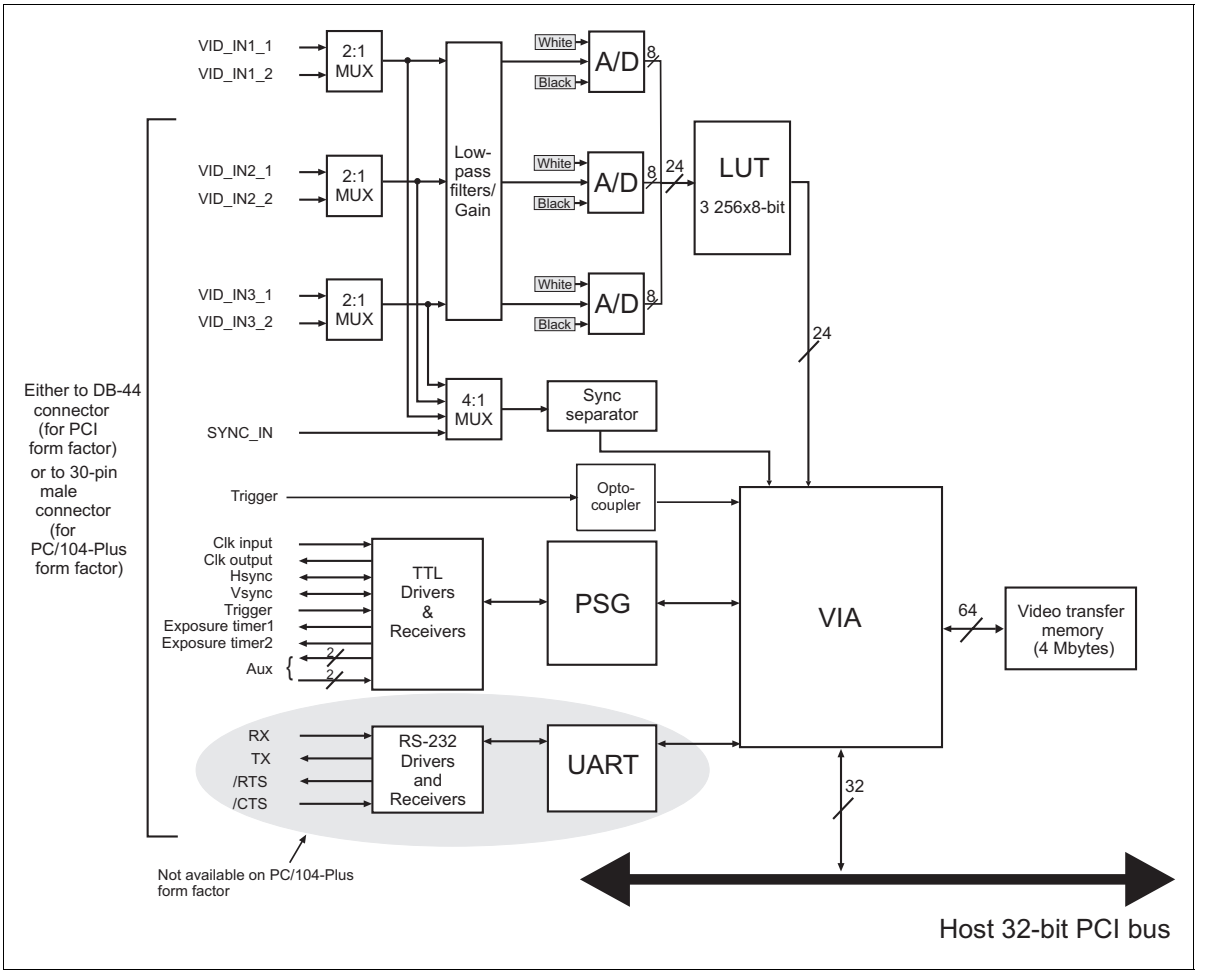
1

Introduction

This chapter outlines the key features of the Matrox Meteor-II /Multi-Channel board.

Matrox Meteor-II /Multi-Channel

Matrox Meteor-II /Multi-Channel is a monochrome and component RGB analog frame grabber for standard and non-standard video acquisition. Matrox Meteor-II /Multi-Channel is available in a PCI or PC/104-*Plus* form factor.



Acquisition features

Matrox Meteor-II /Multi-Channel can acquire different types of standard and non-standard monochrome and component RGB video. The board features six software-selectable input channels on which two component RGB or six monochrome cameras can be attached. Matrox Meteor-II /Multi-Channel

supports acquisition from one camera at a time or simultaneous acquisition from up to three gen-locked RS-170/CCIR cameras. Matrox Meteor-II /Multi-Channel supports both single and dual-tap configurations. It also accepts an external trigger, and can operate in either asynchronous reset mode or next valid frame/field mode.

The PCI form factor also includes an auxiliary power supply input, which can be used to draw auxiliary power from your computer to provide power to your camera.

Data transfer

The Matrox Meteor-II /Multi-Channel board allows the transfer of live video to Host memory or off-board display memory. To prevent loss of data during long bus-access latencies found in heavily loaded computer systems, the Matrox Meteor-II /Multi-Channel board features 4 Mbytes of video transfer memory for temporary frame storage. The board is also equipped with the Matrox Video Interface ASIC (VIA), which acts as a video-to-PCI bridge.

Software

To operate Matrox Meteor-II /Multi-Channel, you can purchase one or more Matrox Imaging software products that support the Matrox Meteor-II /Multi-Channel 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 Meteor-II /Multi-Channel, 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 commands used to capture, process, analyze, transfer, display, and archive images. Processing and analysis operations include: geometric transformations, spatial filtering operations, morphological operations, measurements, blob analysis, optical character recognition (OCR), pattern recognition (Normalized Grayscale Correlation pattern matching and Geometric Model Finder), edge extraction (Edge Finder), matrix/bar code reading, and calibration.

MIL-Lite

MIL-Lite is a subset of MIL. It includes all the MIL commands 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. For boards that accept non-standard video sources, Matrox Intellicam also has the ability to create custom digitizer configuration format (DCF) files, which MIL and its derivatives use to interface to specific non-standard video sources. Matrox Intellicam is included with MIL /ActiveMIL and MIL-Lite /ActiveMIL-Lite.

For more information about Matrox Intellicam, refer to the *Matrox Intellicam User Guide*.

What you need to get started

To begin using Matrox Meteor-II /Multi-Channel, you need the following:

- A computer with a PCI bus and an Intel Pentium processor (or equivalent) or better.
- Microsoft Windows if using Matrox Imaging software (consult the Matrox Imaging software package for specific supported environments and computer memory/storage requirements).

Other useful considerations

- A computer with a newer PCI chipset, such as the Intel 440BX, 810, 815E, 820, 840, 845PE, 850, 860, E7500, or E7505 for full Matrox Meteor-II functionality. These chipsets are recommended because they generally offer better performance in terms of data transfer rates.

- A computer with an empty 32-bit PCI expansion slot (bus-master capable).
- A CD drive, and a hard disk or network drive on which to install the Matrox Meteor-II software.

Inspecting the Matrox Meteor-II /Multi-Channel package

When you unpack your Matrox Meteor-II /Multi-Channel 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 Meteor-II /Multi-Channel, you should receive the following items:

- The Matrox Meteor-II /Multi-Channel board.
- The *Matrox Meteor-II /Multi Channel Installation and Hardware Reference* manual (this document).
- A 4-pin power cable, included with Matrox Meteor-II /Multi-Channel for PCI form factor.
- A 30-pin connector to interface with the video input connector, included with Matrox Meteor-II /Multi-Channel for PC/104-*Plus* (stand-alone version).

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. Both the MIL and MIL-Lite CDs include Matrox Intellicam.
- DBHD44-TO-8BNC input cable with a high density 44-pin connector and eight BNC connectors for Matrox Meteor-II /Multi-Channel for PCI. Three BNC-TO-SVHS (Y/C) adapter cables are shipped with the DBHD44-TO-8BNC cable.

- DH44-TO-8BNC/O input cable with a high density 44-pin connector. This cable is required if you want to connect to special input and output signals, such as synchronization signals, control signals, and DC power output.

Handling components

The electronic circuits in your computer and the circuits on Matrox Meteor-II /Multi-Channel 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 as described in the documentation accompanying your software package.

More information

For information on using multiple Matrox Meteor-II boards, refer to Chapter 3, and for in-depth hardware information, refer to Chapter 4.

If you want technical information about Matrox Meteor-II /Multi-Channel, including specifications and connector descriptions, and pinouts, refer to Appendix B.

A revision history for the development of Matrox Meteor-II /Multi-Channel is available in Appendix C.

Conventions

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

This manual occasionally makes reference to a MIL-Lite command. 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 Meteor-II /Multi-Channel 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.

1. Most items can be accomplished with Matrox Inspector.

Chapter

2

Hardware installation

This chapter explains how to install the Matrox Meteor-II /Multi-Channel hardware.

Installing Matrox Meteor-II /Multi-Channel

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 according to its form factor: PCI or PC/104-*Plus*.

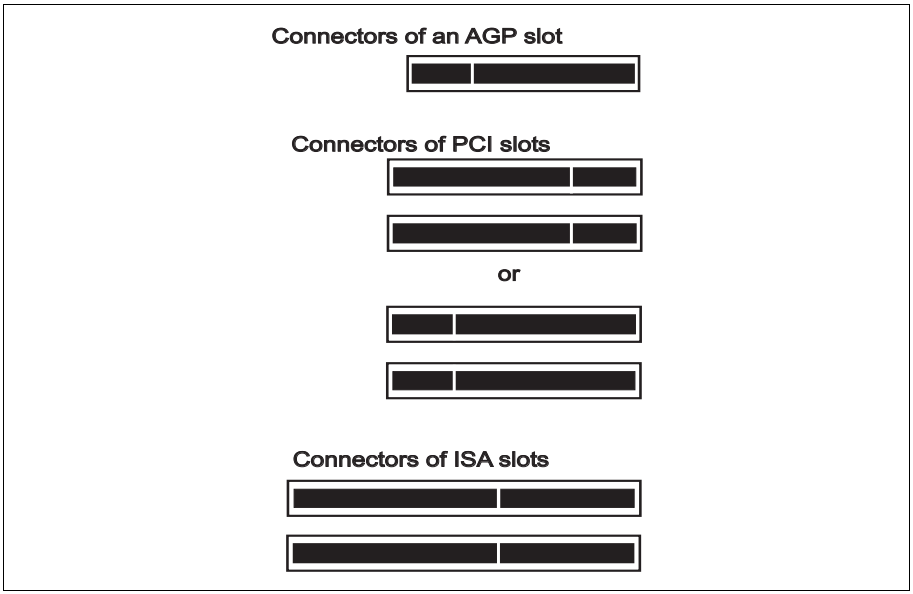
❖ If you are not using Windows NT as your operating system, your board must be installed before you install the software (either MIL or one of its derivatives). If you are adding another Matrox Meteor-II to your computer, you will have to re-install your software after installing your board.

Installing Matrox Meteor-II /Multi-Channel for PCI

Use the following steps to install your Matrox Meteor-II board for PCI:

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

2. Check that you have an empty PCI (32-bit) 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 Meteor-II board and take note of the slot number you choose.

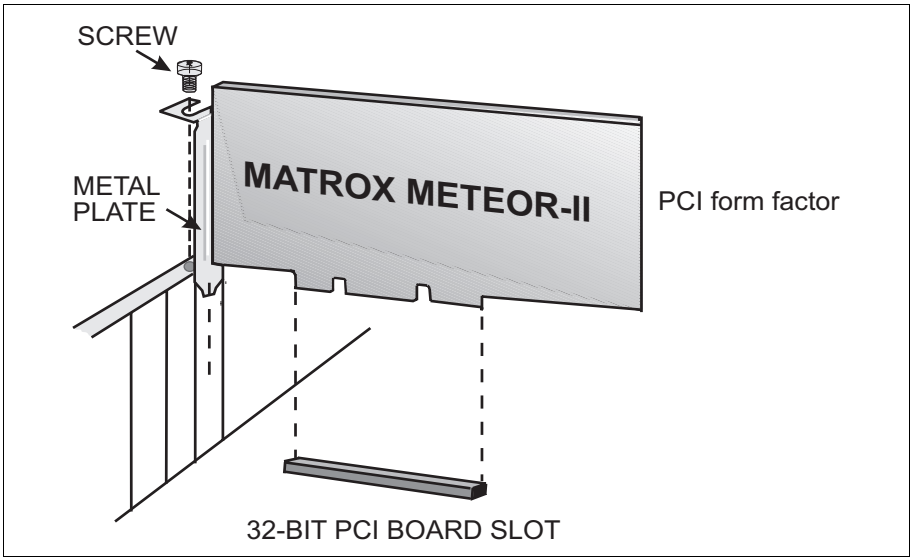


Caution

Some computers have a large, black-ridged heat sink that prevents boards from occupying most PCI slots. Your Matrox Meteor-II ***must not*** touch this heat sink. Therefore, choose a slot where the board completely avoids it.

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 Meteor-II board.

4. Carefully position Matrox Meteor-II in the selected PCI slot as illustrated below. If you are using a tower computer, orient the board to suit the board slots in your computer.



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. Connect your video sources. For details, see the *Connecting external devices* section.

8. Turn on your computer.

In some cases, when you boot your computer, Windows' Plug-and-Play system will detect a new PCI card 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.

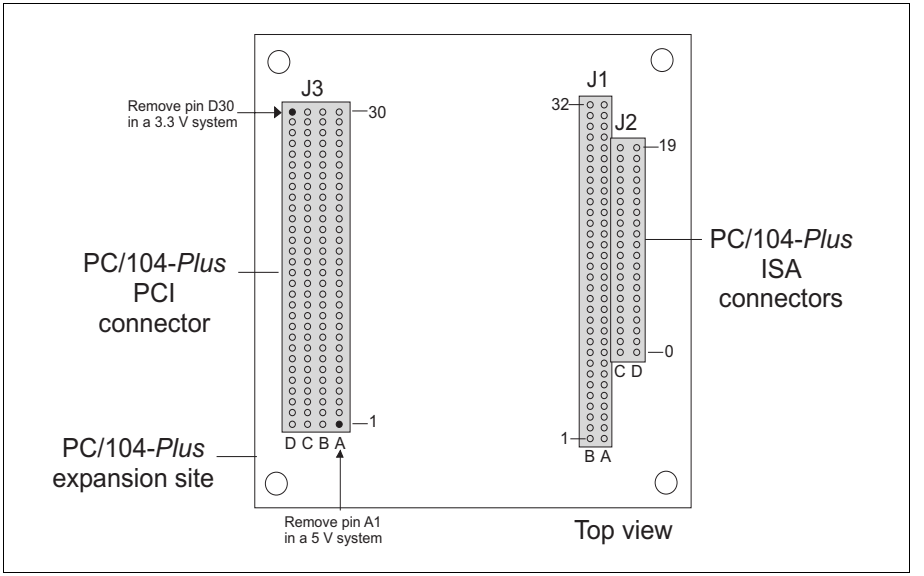
Installing Matrox Meteor-II /Multi-Channel for PC/104-*Plus*

This section refers to the stand-alone version of Matrox Meteor-II /Multi-Channel for PC/104-*Plus*. The version pre-configured for Matrox 4Sight-II is not discussed in this manual. For more information, see *Note about Matrox Meteor-II /Multi-Channel for PC/104-Plus* later in this chapter.

Use the following steps to install your Matrox Meteor-II board for PC/104-*Plus*:

1. Matrox Meteor-II for PC/104-*Plus* can operate in either a 5V or 3.3V system. In some cases, a hole in the PC/104-*Plus* (PCI) connector is filled, which prevents another PC/104-*Plus* board from being stacked on top. To install Matrox Meteor-II for PC/104-*Plus* in a system with a specific signalling environment, a pin must be removed. The table and diagram below indicate which pins to cut, and their locations on the connector.

Signalling environment	Pin to remove on J3 connector
5V	A1
3.3V	D30



2. Check that you have an available PC/104-*Plus* connector on the motherboard, or verify that your existing stack can support another board.

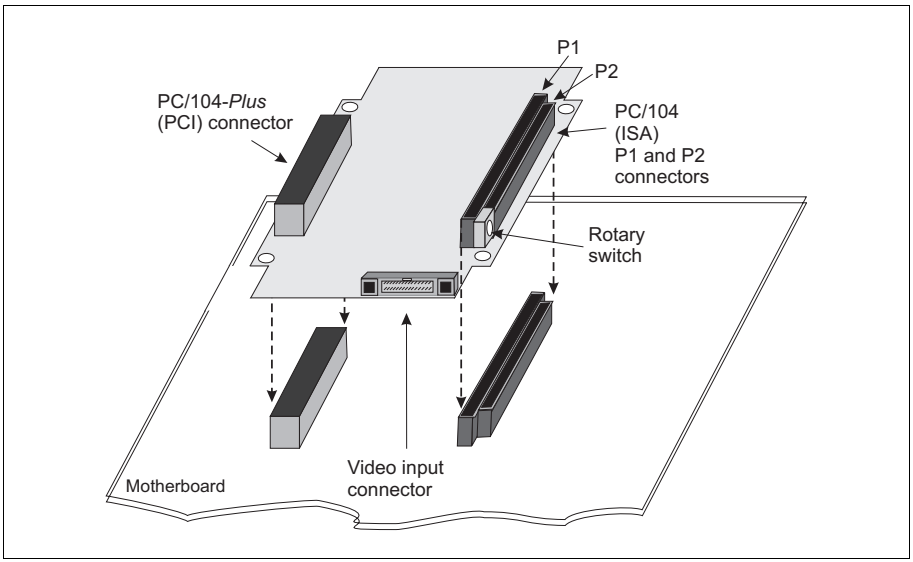
3. Remove the anchoring screws from the stack; do not discard them since you will need them to fasten the Matrox Meteor-II board.

4. If you have existing PC/104 boards in your computer, remove them and stack them on the PC/104-*Plus* board. PC/104 boards must be stacked last.

5. Carefully position Matrox Meteor-II over the connectors and press the board firmly into place.

6. Replace the anchoring screws.

7. Set the rotary switch (next to the PC/104 (ISA) P2 connector) to 0 if installing the first stackable board, or another appropriate setting if not the first. See the section, *Multiple board installation*, in Chapter 3.



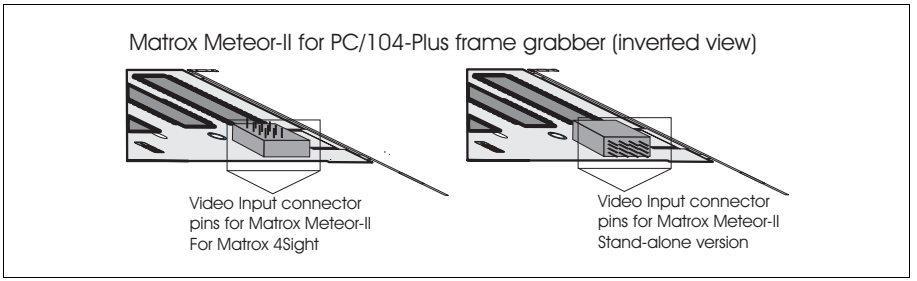
8. Connect your video sources. For details, see the *Connecting external devices* section.

9. Turn on your computer.

In some cases, when you boot your computer, Windows' Plug-and-Play system will detect a new PCI card 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.

Note about Matrox Meteor-II /Multi-Channel for PC/104-*Plus*

A version of the Matrox Meteor-II /Multi-Channel for PC/104-*Plus* accompanies the Matrox 4Sight-II integrated unit. It differs slightly in its structure from its stand-alone counterpart. The stand-alone version of the Matrox Meteor-II for PC/104-*Plus* has a video input connector that lies in the same plane as the board (in other words, the pins are parallel to the board). The version that accompanies the Matrox 4Sight-II integrated unit lies in a plane perpendicular to the board. The latter allows the Matrox Meteor-II board to be hardwired to the input connector of the Matrox 4Sight-II unit; as such, it can only be used as the first board in the PC/104-*Plus* stack on the Matrox 4Sight-II unit.



When ordered as part of the Matrox 4Sight-II unit, Matrox Meteor-II for PC/104-*Plus* comes pre-installed. See the *Matrox 4Sight-II installation and hardware reference* manual for more information.

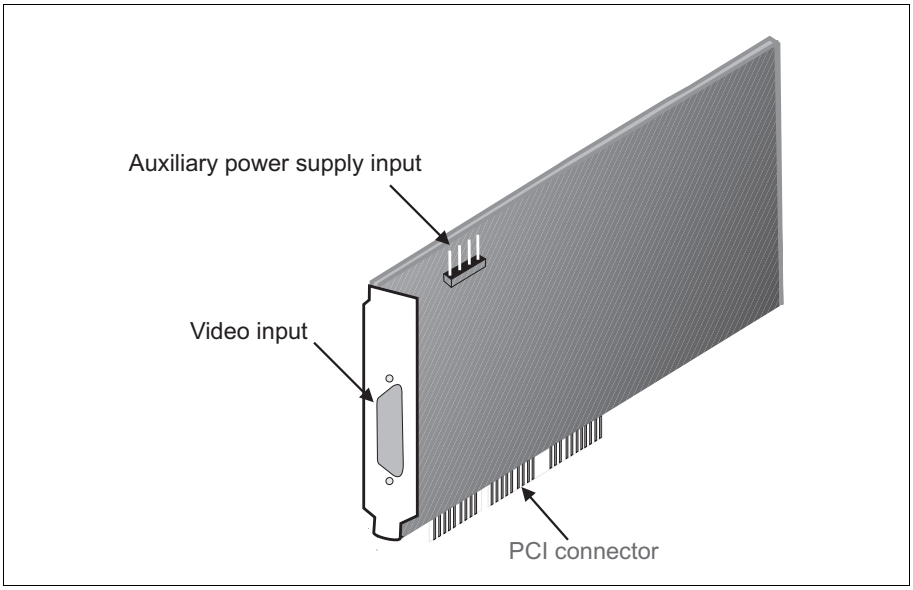
Connecting external devices

This section will discuss the connectors for the Matrox Meteor-II /Multi-Channel PCI and PC/104-*Plus* form factors.

Matrox Meteor-II /Multi-Channel for PCI

Matrox Meteor-II /Multi-Channel has three connectors, which are indicated in the diagram below. One of these connectors is located on its bracket. The connectors listed are discussed in detail in Appendix B.

- **Video input connector.** Used to receive analog video, as well as send and receive synchronization signals and power.
- **Auxiliary power supply input.** Used to route power from your computer through the Matrox Meteor-II board to your camera.



Connecting a video input to Meteor-II /Multi-Channel for PCI

Connect video sources to Matrox Meteor-II /Multi-Channel's video input connector, using the optional DBHD44-TO-8BNC cable. This cable has eight BNC connectors and a 44-pin high-density D-Subminiature plug. The wires of the cable are color-coded as follows:

Wires	Signals	Description
RED (1)	VID1_IN1	Analog Video Input1, R
GREEN (2)	VID1_IN2	Analog Video Input2, G
BLUE (3)	VID1_IN3	Analog Video Input3, B
BLACK (4)	SYNC_IN	SYNC input
GREY (5)	OPTOTRIG+*	External trigger input
WHITE (6)	VID2_IN1	Analog Video Input4, R
YELLOW (7)	VID2_IN2	Analog Video Input5, G
PURPLE (8)	VID2_IN3	Analog Video input6, B
*OPTOTRIG- is usually connected to the ground of the trigger source. It is the shield of the gray BNC.		

Connecting Matrox Meteor-II /Multi-Channel for PCI to the auxiliary power supply input

To use Matrox Meteor-II /Multi-Channel to power your camera:

1. Use the 4-pin power cable to connect the auxiliary power supply connector to the power supply in the computer.

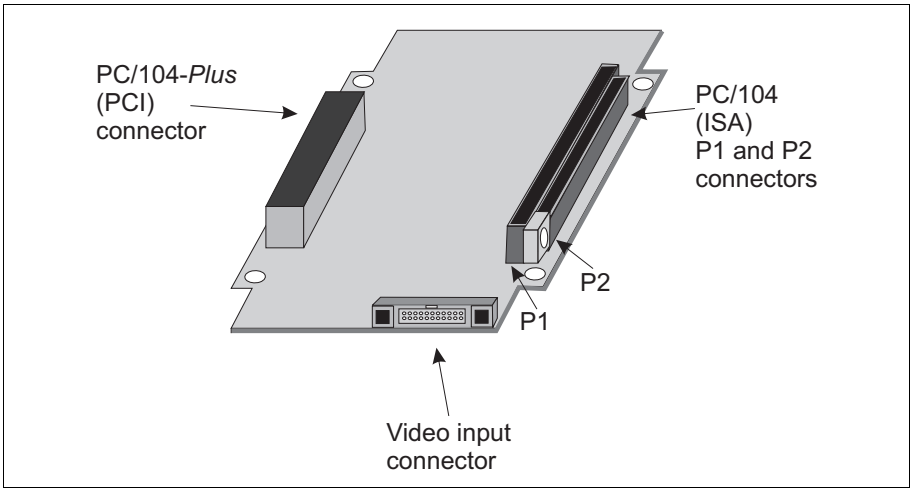
2. Ensure that the jumper is across the appropriate Matrox Meteor-II auxiliary power supply selection pins, for the required voltage (5 V or 12 V). See Appendix B for a diagram.

3. Use the DBHD44-TO-8BNC/O cable to connect your camera's video output and power supply input to the video input connector. Note that the total current drawn by all the cameras is limited to 1.5 A, and the circuit uses an auto-resettable fuse.

Matrox Meteor-II /Multi-Channel for PC/104-*Plus*

Matrox Meteor-II /Multi-Channel for PC/104-*Plus* has four connectors, which are indicated in the diagram below. The video input connector is discussed in detail in Appendix B.

- **Video input connector.** A connector used to receive analog video, as well as send and receive synchronization signals and power.
- **PC/104-*Plus* (PCI) connector.** An interface connector to send data across the PCI bus.
- **PC/104 (ISA) connectors.** Two interface connectors to send data across the ISA bus.



Connecting a video input to Matrox Meteor-II /Multi-Channel for PC/104-*Plus*

Connect video sources to Matrox Meteor-II /Multi-Channel through its video input connector, a 30-pin right-angle male connector. A standard cable for PC/104-*Plus* form factor boards is not available from Matrox. You can use the included mating connector, crimp the ribbon cable to it and attach your required connector to the other end of the ribbon cable. Then, connect this custom cable to the video input connector. See Appendix B for the pinouts, signals, and ribbon cable information for the /Multi-Channel board.

The Matrox Meteor-II /Multi-Channel for PC/104-*Plus,* designed for Matrox 4Sight-II, has a custom video input connector that attaches directly to the motherboard, which in turn, is hard-wired to the video-input connector on the back side of the unit. Therefore, you can interface a camera with the PC/104-*Plus* board by connecting the camera to your unit's video input connector. Detailed information on connecting a video input to this board can be found in the *Matrox 4Sight-II installation and hardware reference* manual.

Chapter 3

Using multiple Matrox Meteor-II boards

This chapter explains how to use multiple Matrox Meteor-II boards.

Multiple board installation

This section describes how to use multiple Matrox Meteor-II boards.

Installing multiple PCI boards

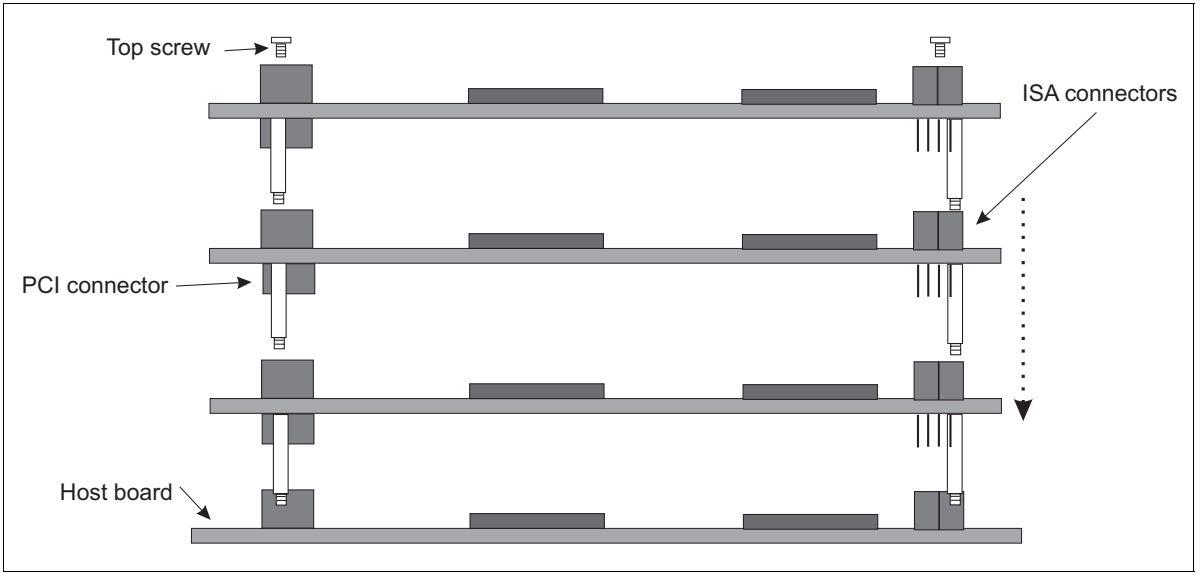
Install each additional Matrox Meteor-II board for PCI as you installed the first board (refer to Chapter 2). In other words, place each additional board in an empty slot. For the PCI form factor, ensure that the installed boards avoid the CPU heat sink.

Theoretically, you can have as many as 16 Matrox Meteor-II PCI 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.

Installing multiple PC/104-Plus boards

The number of PC/104-*Plus* boards that you can stack depends on the computer you are using. If using a Matrox 4Sight-II integrated unit, you can stack a maximum of three PC/104-*Plus* boards, as shown in the following diagram. Note that if you have PC/104 boards in your computer, they must be placed at the top of the stack.



In addition, you should set the rotary switch of each PC/104-*Plus* board to a unique setting in the stack. Setting the rotary switch dedicates a group of PCI signals to the board in the stack: clock, request grant, ID select, and interrupt signals. It is recommended that the first board installed (the board closest to the Host CPU board) be configured to 0, the second 1, and so on. The table below shows the recommended switch setting for each board, as well as the corresponding setting for the dedicated signals.

Switch position	Board position	Interrupt	Request grant	ID select
0 or 4	1	Interrupt A	0	0
1 or 5	2	Interrupt B	1	1
2 or 6	3	Interrupt C	2	2
3 or 7	4	Interrupt D	2	3

If you are installing an additional Matrox Meteor-II board on a Matrox 4Sight-II unit, the board already installed has the setting fixed at 0; therefore, the setting for the additional board must be something other than 0 or 4.

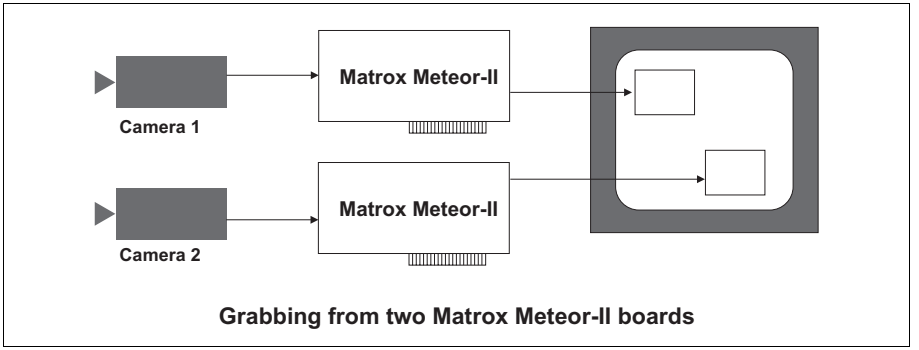
Grabbing simultaneously from different boards

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

PCI bandwidth requirements

Matrox Meteor-II /Multi-Channel has a low susceptibility to PCI bus latency due to its 4 Mbytes of video transfer memory. In addition, sustained PCI-transfers to memory require the use of a high performance PCI core-logic chipset, such as the Intel 820, 840, 850, 860, or E7505. If a high performance chipset is used with a Matrox Meteor-II /Multi-Channel 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.



Grabbing from two Matrox Meteor-II boards

As a reference point, grabbing one 640 x 480 image in real time will require a PCI bandwidth of 35 Mbytes/sec when transferring in RGBX (32-bit) mode.

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

Chapter

4

Hardware reference

This chapter explains the architecture of the Matrox Meteor-II /Multi-Channel hardware, as well as the available features and modes.

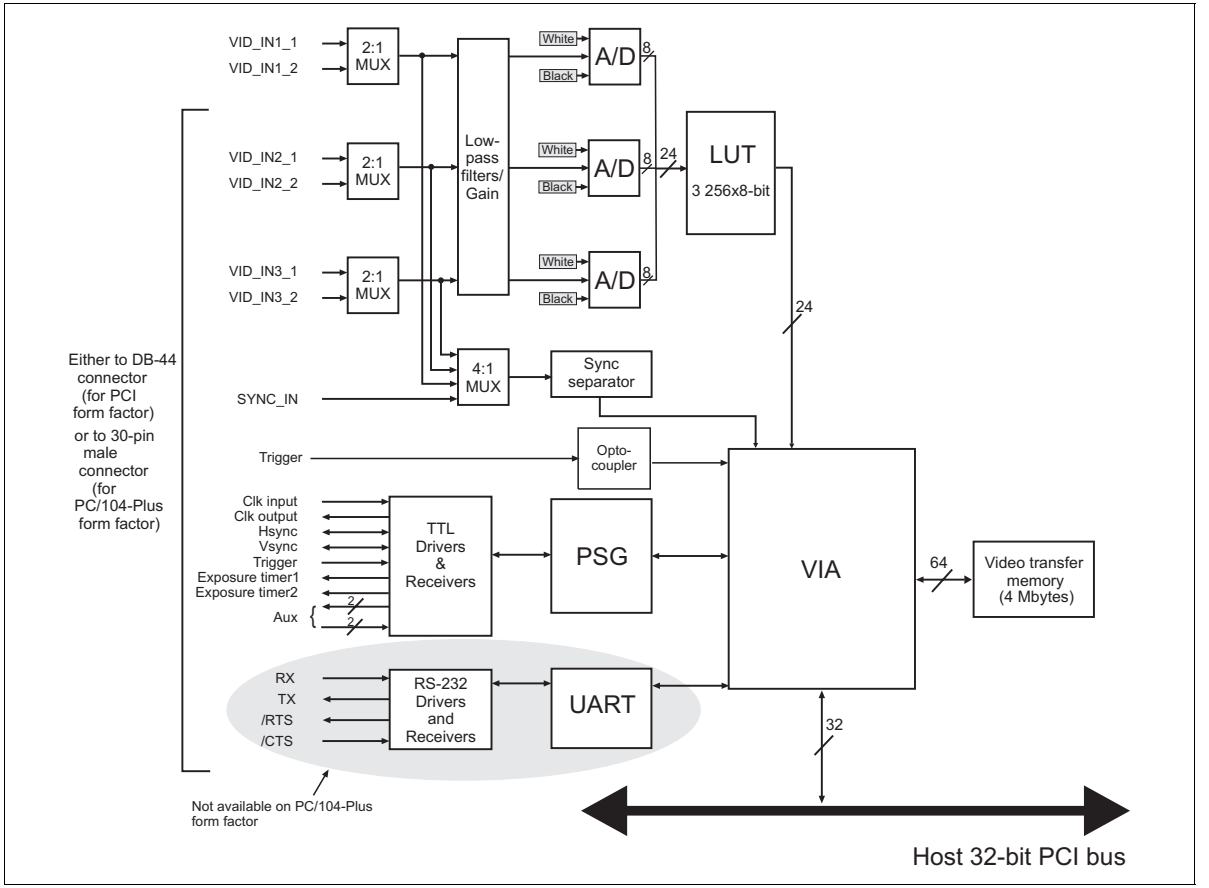
Matrox Meteor-II hardware reference

This chapter provides information on the architecture, operating modes, and supported features of the Matrox Meteor-II /Multi-Channel board.

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

Matrox Meteor-II /Multi-Channel grab section

The grab section of the Matrox Meteor-II /Multi-Channel board captures monochrome or component RGB video signals from standard and non-standard cameras. Six monochrome or two component RGB cameras can be attached.



Performance

The video timing parameters (including those for progressive scan) supported by the Matrox Meteor-II /Multi-Channel board are as follows:

	Max
Number of pixels / line (including sync and blanking)	4096*
Number of lines / frame (including sync and blanking)	4096*
Sampling rate (with external clock input, or in line-locking mode)	30 MSPS

Note that the maximum number of pixels per line that MIL supports is:

$$\frac{\text{Pixels}}{\text{Line}} \times \text{Number of Lines} \leq 4 \text{ Mbytes}$$

Input channels

The Matrox Meteor-II /Multi-Channel has six independent analog channels. These channels can support switching between input from two RGB or six monochrome cameras where the channels can be selected with the MIL-Lite *MdigChannel()* command.

Low-pass filter

The input low-pass filtering stage is used to limit high frequency noise and aliasing effects at the input of the A/D converters. The filters used on Matrox Meteor-II /Multi-Channel are 4th order Butterworth filters with a cutoff frequency of 10 MHz.

Gain

Matrox Meteor-II /Multi-Channel has adjustable gains. This allows you to optimize the video input signal range.

You can change the gain value using the MIL-Lite *MdigControl()* command. The supported gain factors are as follows:

Input video signal amplitude (excluding sync)	Total input video signal amplitude (including sync)	Required gain setting	MIL
0.0 V up to 0.5 V	0.0 - 0.7 Vpp	4	M_GAIN3
0.5 V up to 0.7 V	0.7 - 1.0 Vpp	2.8 (default)	M_GAIN2
0.7 V up to 1.0 V	1.0 - 1.4 Vpp	2	M_GAIN1

Input video signal amplitude (excluding sync)	Total input video signal amplitude (including sync)	Required gain setting	MIL
1.0 V up to 1.5 V	1.4 - 2.1 Vpp	1.3	M_GAIN0
1.5 V up to 2.0 V	2.1 - 2.9 Vpp	1	M_GAIN4

Discrete A/D converters

Three discrete A/D converters with external reference generation and sync slicing are used for component RGB digitization. The converters can be operated at up to 30 MSPS.

In addition, the converters black and white reference levels can be adjusted individually. The black and white reference levels can be adjusted between 0.6 V to 1.6 V and 1.6 V to 2.6 V respectively, in increments of 10.23 mV (98 distinct adjustments).

Use the MIL-Lite *MdigReference()* command to set the black and white reference levels.

PSG

The Programmable Synchronization Generator (PSG) is responsible for managing all timing and synchronization signals.

Phase-locked loop

The high-performance, low-jitter phase-locked loop (PLL) uses frequency synthesis techniques to generate the clock signal, when necessary.

The PLL can use the following sources as a reference:

- The on-board crystal oscillator.
- The horizontal video synchronization signal supplied by the video source (line-locked mode).
- The clock signal supplied by the video source (to generate a different clock).

When in line-locked mode and accepting a composite video signal, the PLL can synchronize to either serrated or block vertical synchronization signals.

When the input source supplies a sampling clock that does not require adjustment, the PLL is bypassed to avoid adding jitter to the supplied clock.

Synchronization

Matrox Meteor-II /Multi-Channel can operate in either **slave** or **master** mode.

Slave mode

- In **slave** mode, the video source provides the synchronization information to Matrox Meteor-II /Multi-Channel. It can accept one of the following synchronization schemes:

  - The video source encodes the synchronization signals on the analog video signal provided to the board.

  - The video source supplies the horizontal and/or vertical synchronization signals separately in TTL format.

  - The video source provides a composite synchronization signal in TTL format, separate from the analog video.

- Synchronization information can be sent either with the video data, or on a separate analog synchronization channel.

Master mode

- In **master** mode, Matrox Meteor-II /Multi-Channel generates (using the PSG) the horizontal and/or vertical (TTL) synchronization signals and supplies them to the video source. This allows the video source to synchronize to the board.

Trigger

Matrox Meteor-II /Multi-Channel accepts an external trigger input which allows image acquisition to be synchronized to external events. The board can operate in one of two modes, and the selected mode is specified by the DCF.

Matrox Meteor-II /Multi-Channel can operate 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 three ways:

- Edge-triggered monoshot acquisition: The VIA (Video Interface Asic) waits for the rising/falling edge to capture a single frame.

- Edge-triggered continuous acquisition: The VIA waits for the rising/falling edge to start a continous grab.

- Level-sensitive "continuous" acquisition: The VIA 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.

Matrox Meteor-II /Multi-Channel can also operate in asynchronous reset mode. In this mode, the digitizer resets the camera to begin a new frame when the trigger signal is received.

Direct TTL trigger

Trigger signals can be received in TTL format directly through the video-input connector. The TTL level signal must have a maximum amplitude of 5 V. A signal over 2 V is considered high while anything less than 0.8 V is considered low. The transition of 0.8 V to 2 V is considered to be the rising edge.

The trigger signal's pulse width must be greater than one pixel. You can determine the pulse width by taking the inverse of the *pixel frequency*. For example, if the pixel frequency is 12.27 MHz, the minimum pulse width is 1/12.27 MHz ≈ 82 nanoseconds.

Opto-isolated trigger

Trigger signals connected to the OPTOTRIG- and OPTOTRIG+ input pins, pass through an opto-coupler, a device that protects the board from outside surges; OPTOTRIG- is usually connected to the ground of the trigger source. The voltage difference across OPTOTRIG+ and OPTOTRIG- must be between 4.05 V and 9.16 V for logic high, and between -5.0 V and 0.8 V for logic low. Refer to Appendix B for the pinouts of these signals on your board.

UART

Matrox Meteor-II /Multi-Channel features a Universal Asynchronous Receiver/Transmitter (UART) that provides an RS-232 serial interface. For example, this allows you to remotely control a camera or a motion control unit, or communicate with a program logic controller (PLC). The UART is programmed using the MIL-Lite command ***MdigControl()*** with the M_UART... control types.

Note that the UART is not present on the Meteor-II /Multi-Channel for PC/104-*Plus*.

Lookup tables

Matrox Meteor-II /Multi-Channel has three 256x8-bit input lookup tables (LUTs), allowing independent re-mapping of three 8-bit input streams.

The LUTs on the Matrox Meteor-II /Multi-Channel for PCI support RGB 8:8:8 (24-bit) output pixel formats. The LUTs on the PC/104-*Plus* form factor support RGB 8:8:8, RGB 5:6:5, and RGB 5:5:5 output pixel formats. LUTs are programmed using the MIL-Lite command, ***MdigLut()***.

User bits

Matrox Meteor-II /Multi-Channel supports four auxiliary TTL user bits through the video input connector: two inputs and two outputs. These are available for controlling external events such as a strobe light or PLC. User bits are programmed using the MIL-Lite command ***MdigControl()***.

Using the auxiliary power supply

Matrox Meteor-II /Multi-Channel can supply power to your camera. Use the 4-pin power cable provided with your board to connect to the power supply of your computer. The operating voltage can be set to either 5 V or 12 V, but the current drawn by all cameras is limited to 1.5 A. The circuit uses an auto-resettable fuse. For further information on connecting to the auxiliary power supply connector, see the section, *Connecting Matrox Meteor-II /Multi-Channel for PCI to the auxiliary power supply input* in Chapter 2, and Appendix B. Note that this input is not available on the PC/104-*Plus* form factors.

Data interfaces

Video Interface ASIC

The Matrox Meteor-II /Multi-Channel board has a VIA, which acts mainly as a video-to-PCI bridge. The VIA is capable of high-speed image transfers to Host memory or other PCI devices across the PCI bus. It uses 4 Mbytes of video transfer memory to store data until the PCI bus becomes available.

Simultaneous data streams

Matrox VIA can manage up to two simultaneous data streams. For example, it can grab into video transfer memory, and concurrently transfer data over the PCI bus.

General features

The VIA is capable of separating image data into two or three, 8-bit components (for example, RGB packed to RGB planar). This mechanism is also used to merge line segments of monochrome multi-tap cameras.

PCI interface

Matrox Meteor-II has a 32-bit PCI bus interface, capable of a peak transfer rate of 132 Mbytes/sec.

The VIA's PCI interface

The VIA's PCI interface is 32 bits wide and operates at 33 MHz. It allows all VIA resources to be accessed through a 128-Mbyte memory region, mappable anywhere in the 4-Gbyte PCI address space.

Read pre-fetch and write posting buffers are integrated to optimize Host access.

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 Meteor-II board, please try the following:

- Check for disconnected power cords.
- Read the *Common problems and solutions* section in this appendix.

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.

For up-to-the minute release and customer support information, visit our website:

http://www.matrox.com/imaging

Common problems and solutions

Installation Problems

➘ **PC/104-*Plus* board cannot be stacked**

- If you cannot stack your PC/104-*Plus* board, check the connectors of the last board in the stack and determine if any of its PCI connector's holes are filled. If this is the case, cut the corresponding pins on your board. See the section *Installing Matrox Meteor-II /Multi-Channel for PC/104-Plus* in Chapter 2.
- If your computer has PC/104 modules, you must re-stack them so the PC/104 modules are on top of PC/104-*Plus* boards. Be sure to reset the rotary switches for your new stack configuration.

➘ **Board service fails to start**

This could happen due to the following two reasons:

- The MIL Matrox Meteor-II drivers are not installed correctly.

- When the board fails to start under Windows 2000, the driver might not have started. Right-click on **My Computer**, and select **Manage** from the presented menu. From the **Computer Management** explorer window, select **System Tools**, followed by **Device Manager**. If you do not see a Meteor-II device under **Matrox Imaging Adapters**, you will have to reinstall the driver.

- When the board fails to start under Windows XP, the driver might not have started. Click on the **Start** button, open the **Control Panel**, select **Administrative Tools**, and open **Computer Management**. From the **Computer Management** explorer window, select **System Tools,** followed by **Device Manager**. If you do not see a Meteor-II device under **Matrox Imaging Adapters**, you will have to reinstall the driver.

If the above solution for your operating system does not work, try the following.

- The driver also might not start due to too much or insufficient allocation of DMA memory. To address this problem, re-allocate DMA memory using the included *milconfig.exe* utility.

• There is a conflict in the BIOS Setup program. This problem generally occurs when there is a PCI memory mapping error or when there is a PCI-IRQ routing error. To resolve this problem with the PCI form factor, first try to swap boards from one PCI slot to another; for the PC/104-*Plus*, change the rotary switch settings. If the problem still persists, try upgrading your BIOS.

  If the above solution does not work, try the following to determine if there is an IRQ conflict.

  - Under Windows 2000, 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.

  - Under Windows XP, click on the **Start** button, open the **Control Panel**, select **Administrative Tools**, and open **Computer Management**. From the **Computer Management** explorer window, select **System Tools,** followed by **Device Manager**. From the **View** menu, select the **Resources by type**, and expand the **Interrupt request (IRQ)** folder. Check for devices that are sharing an IRQ with your Matrox frame grabber.

➘ **Not enough memory to allocate grab buffer**

This is the message that you will receive if you try to allocate a grab buffer that is greater than the amount of DMA memory specified during software installation. This problem can be addressed by changing the amount of DMA memory on your computer. Re-allocate DMA memory using the included *milconfig.exe* utility. Alternatively, uninstall and reinstall MIL and specify the appropriate amount of DMA memory.

Grabbing Problems

➘ **The trigger pulse is not being sent**

This happens when the opto-isolated trigger pulse is not connected. When using the opto-isolated trigger, both OPTOTRIG- and OPTOTRIG+ signals must be connected. OPTOTRIG- is usually connected to the ground of the trigger source.

➘ **IRQ conflicts**

In general, PCI devices can share an interrupt line (IRQ). However, sometimes this might not be possible. The types of difficulties that you might run into are as follows:

• IRQ conflict under Windows 2000/XP

- To resolve this problem with the PCI form factor, re-assign a different IRQ line to the PCI slot in which the Matrox Meteor-II board is installed.

- To resolve this problem with the PC/104-*Plus* form factor, change the rotary switch settings.

❖ Note that PCI devices cannot share interrupt lines with EISA or ISA devices.

Other possible solutions to the above problems:

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

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

- Under Windows XP, click on the **Start** button, open the **Control Panel**, select **Administrative Tools**, and open **Computer Management**. From the **Computer Management** explorer window, select **System Tools,** followed by **Device Manager**. From the **View** menu, select the **Resources by type**, and expand the **Interrupt request** (**IRQ**) 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 the Matrox Imaging Customer Support Group, you will need 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 Meteor-II).

- 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 necessary information.

Appendix B: Technical information

This appendix contains information that might be useful when installing your Matrox Meteor-II /Multi-Channel board.

Technical information

This appendix contains information that might be useful when installing your Matrox Meteor-II /Multi-Channel board.

Global 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 Meteor-II 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, 845PE, 850, 860, E7500, or E7505. If you need more specific information regarding potential problems, refer to Appendix A - *Troubleshooting*.

Technical features

- Six software selectable channels, which support switching between six monochrome or two component RGB video inputs. Any of these channels can serve as the sync channel; however, there is also a separate sync channel.

- Support for both single and dual-tap (channel) monochrome cameras.

- Support for an external trigger input in either next valid frame/field mode or asynchronous reset mode.

- Three 256 8-bit input lookup tables. The LUTs on the Matrox Meteor-II /Multi-Channel for PCI support RGB 8:8:8 (24-bit) output pixel formats. The LUTs on the PC/104-*Plus* form factor support RGB 8:8:8, RGB 5:6:5, and RGB 5:5:5 output pixel formats.

- 4 Mbytes of video transfer memory.

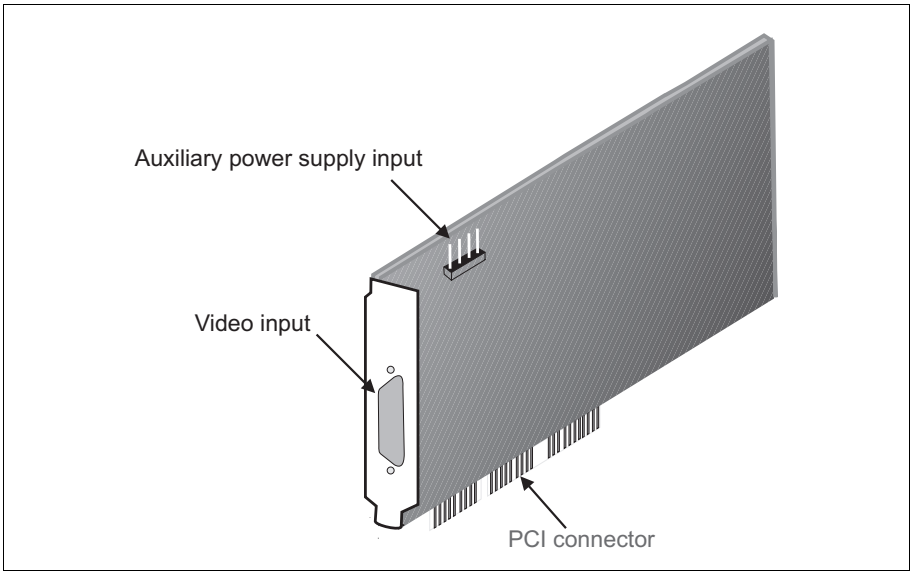
- Programmable reference levels.

- Various input gain settings.

- RS-232 port (UART) on Matrox Meteor-II /Multi-Channel for PCI.
- Strap-selectable 5 or 12 V DC output (PCI form factor only).

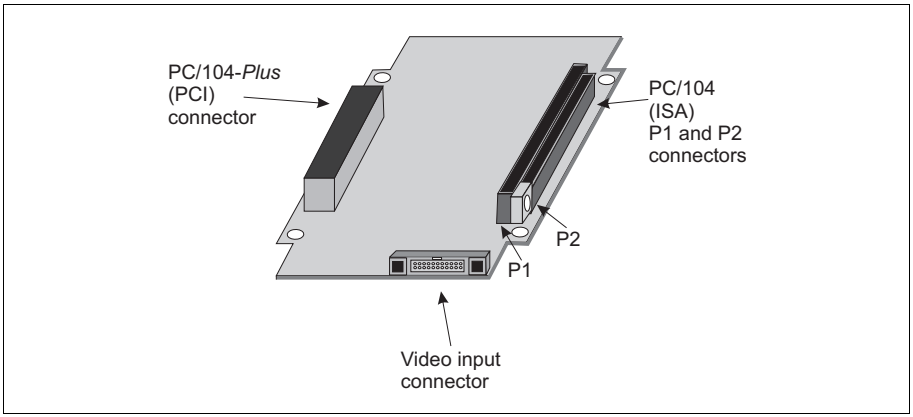
Board input and output connectors

The Matrox Meteor-II /Multi-Channel PCI form factor has three connectors: an auxiliary power supply input, a video input, and a PCI connector.



PC/104-Plus form factor

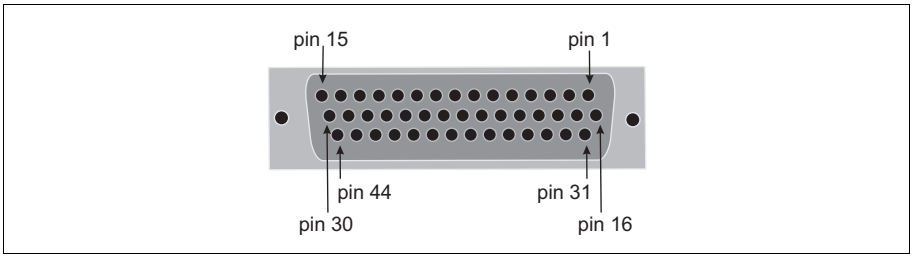
Matrox Meteor-II for the PC/104-*Plus* form factor (stand alone version) has four interface connectors: video input, a PC/104-*Plus* (PCI) connector, and two PC/104 (ISA) connectors.



Note that the video input connector for the PC/104-*Plus* board built for Matrox 4Sight-II is right-angled, unlike the one for the stand-alone version, discussed here. See *Note about Matrox Meteor-II /Multi-Channel for PC/104-Plus* in Chapter 2 for more details.

Video input connector on the PCI form factor

The video input connector is a high density DB-44 female connector on the PCI form factor. Its pinout is as follows:



Pin	Signal	Description
15	VID1_IN1	RED Analog Video Input (Channel 1).
44	VID1_IN2	GREEN Analog Video Input (Channel 1).
13	VID1_IN3	BLUE Analog Video Input (Channel 1).
43	SYNC_IN	Analog Video Input (SYNC).
11	VID2_IN1	RED Analog Video Input (Channel 2).

Pin	Signal	Description
41	VID2_IN2	GREEN Analog Video Input (Channel 2).
40	VID2_IN3	BLUE Analog Video Input (Channel 2).
35	OPTOTRIG+	Opto-Isolated trigger positive input.
34	OPTOTRIG-	Opto-Isolated trigger negative input.
20	TRIGGER	Non-Protected TTL trigger input.
19	CLK_IN_TTL	Clock input (TTL).
33	CLK_OUT_TTL	Clock output (TTL).
32	VSYNC_TTL	Vsync input or output (TTL).
2	HSYNC_TTL	Hsync input or output (TTL).
38	EXP(1)	Exposure #1 output (TTL).
23	EXP(2)	Exposure #2 output (TTL).
36	TX	Transmit (RS-232).
22	RX	Receive (RS-232).
6	CTS	CTS (RS-232).
21	RTS	RTS (RS-232).
39	USER1IN+	Auxiliary User Input #1 (positive).
12	USER1IN-	Auxiliary User Input #1 (negative).
9	USER2IN+	Auxiliary User Input #2 (positive).
10	USER2IN-	Auxiliary User Input #2 (negative).
24	USER1OUT	Auxiliary User Output #1 (TTL).
8	USER2OUT	Auxiliary User Output #2 (TTL).
1, 16	DC POWER	+12 V OR +5 V Power Supply.
7, 37	NC	Not connected.
3-5, 14, 17-18, 25-31,42	GND	Ground.

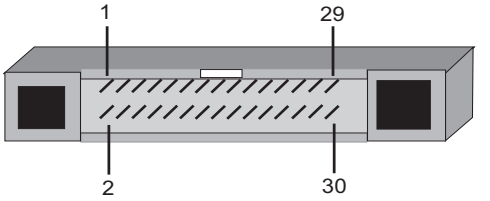
Use Matrox cable DBHD44-TO-8BNC to interface with this connector. It has eight BNC connectors and a high-density 44-pin D-Subminiature male connector. This cable allows you to attach up to six video sources, an analog sync, and a trigger input.

An open-ended version of this cable, the DH44-TO-8BNC/O, is also available and can be customized to access signals in addition to those described above. For customers planning to build their own cable, parts can be purchased from:

• Manufacturer:	NorComp Interconnect Devices
• Connector:	HDT44P

Video input connector on the PC/104-*Plus* form factor

The video input connector on the Matrox Meteor-II /Multi-Channel for PC/104-*Plus* is located on the top side of the board. Its pinout is as follows:



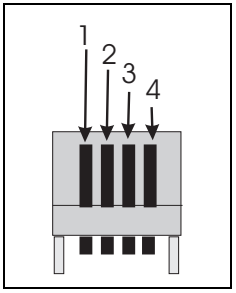
Pin	Signal	I/O	Description
2	VID1_IN1	I	RED Analog Video Input (Channel 1).
4	VID1_IN2	I	GREEN Analog Video Input (Channel 1).
6	VID1_IN3	I	BLUE Analog Video Input (Channel 1).
8	SYNC_IN	I	Analog Video Input (SYNC).
10	VID2_IN1	I	RED Analog Video Input (Channel 2).
12	VID2_IN2	I	GREEN Analog Video Input (Channel 2).
14	VID2_IN3	I	BLUE Analog Video Input (Channel 2).
15	USER(2)_IN	I	Auxiliary User Input #2.
16	USER(1)_IN	I	Auxiliary User Input #1.
17	USER(2)_OUT	O	Auxiliary User Output #2.
18	USER(1)_OUT	O	Auxiliary User Output #1.
19	EXP(1)	I	Exposure #1 (TTL).
20	EXP(2)	I	Exposure #2 (TTL).
22	TRIG	I	Trigger (TTL).
23	OPTOTRIG-	I	Opto-isolated trigger negative input.
24	OPTOTRIG+	I	Opto-isolated trigger positive input.
26	CLK_IN	I	Clock input (TTL).

Pin	Signal	I/O	Description
28	CLK_OUT	O	Clock output (TTL).
29	VSYNC	I/O	Vsync input or output (TTL).
30	HSYNC	I/O	Hsync input or output (TTL).
1, 3, 5, 7, 9, 11, 13, 21, 25, 27	GND		Ground.

Auxiliary power supply input

The auxiliary power supply input connector is a standard 4-pin male connector that routes power from the computer to a camera (via the DB-44). Use the 4-pin power cable provided with your board to connect to the power supply of your computer. The operating current is 1.5 A with an auto-resettable fuse. Note that this input is not available on the PC/104-*Plus* form factor.

The pinout of the auxiliary power supply input connector is as follows:



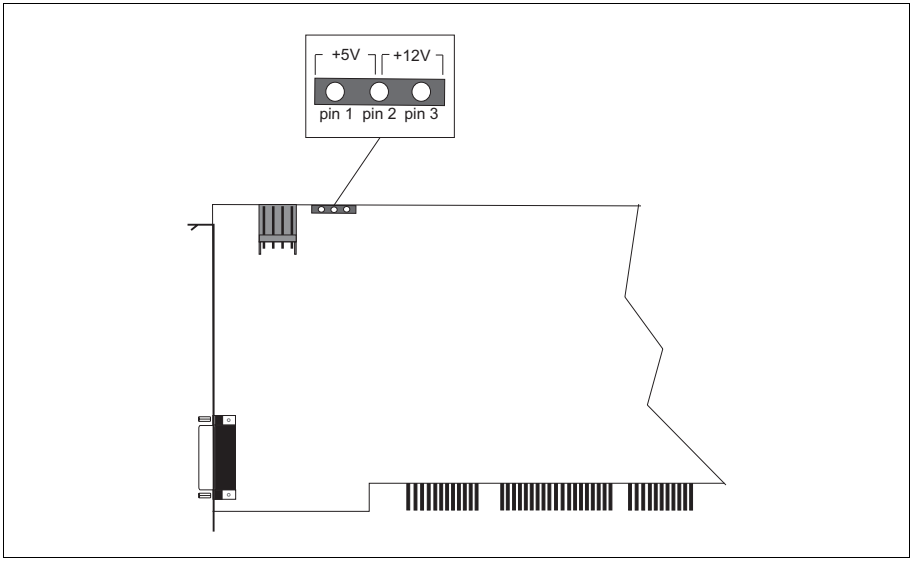
Pin	Description
1	+5 V
2	Ground
3	Ground
4	+12 V

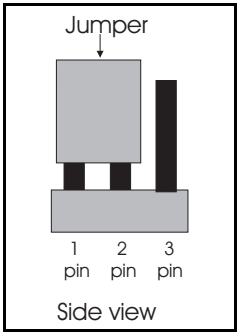
For customers planning to build their own cable, parts can be purchased from:

• Manufacturer:	VEN
• Connector:	2490-04PRT

Auxiliary power supply selection

The following diagram shows the location of the auxiliary power supply selection and their corresponding pin numbers:





As shown in the table below, place the jumper across pins 1 and 2 for a +5 V supply output and across pins 2 and 3 for a +12 V supply output.

Pin	Description
1-2	+5 V (default)
2-3	+12 V

By default, auxiliary power supply is strapped for +5 V (pins 1-2).

Specifications

Electrical

Form Factor	Operating Voltage and current					Power Consumption[1]
	5 V ±5%	-5 V ±5%	3.3 V ±5%	12 V ±10%	-12 V ±10%	
PCI	1.0 A	n/a	n/a	150 mA	75 mA	7.7 W
PC/104-*Plus*	140 mA	60 mA	1.03 A	15 mA	n/a	5.08 W

[1] This number represents the total power consumption of the Matrox Meteor-II board only. It does not include the power consumption of a camera which draws current through the auxiliary power supply input.

- Input signals in RS-422 format (if available):
  - Termination: 100 Ω.
  - Input voltage:
    - Differential range: 200 mV to 14 V.
    - Common mode range: -7 V to 7 V.
- Output signals in RS-422 format (if available):
  - Specified for a 100 Ω load.
  - Output voltage:
    - Differential range: 2 V to 5 V.
    - Common mode range: 1.5 V to 3 V.

- Input signals in TTL format:
  - No termination.
  - Input current: ± 1µA.
  - Input voltage:
    - Max of low: 0.8 V.
    - Min of high: 2 V.
    - Range: -0.5 V to 5.5 V.
- Output signals in TTL format:
  - No termination.
  - Output current:
    - Max of low: -60 mA.
    - Min of high: 30 mA.
  - Output voltage:
    - Max of low: 0.55 V.
    - Min of high: 2 V.

- Trigger input signal (opto-isolated):
  - Termination: 511 Ω series.
  - Input current:
    - Min of low: 0 µA.
    - Max of low: 250 µA.
    - Min of high: 5 mA[1].
    - Max of high: 15 mA[2].
  - Input voltage:
    - Min of low: 0 V.
    - Max of low: 0.8 V.
    - Min of high: 2 V.
    - Max of high: 5 V.

Environmental

- Min./max. ambient operating temperature: 0°C - 55° C.
- Min./max. storage temperature: -40° C - 75° C.
- Max. altitude for operation: 3000 meters.
- Max. altitude for transport: 12000 meters.
- Operating humidity: 20 - 80% relative humidity (non-condensing).

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1. A Min of 6.3 mA recommended.
2. A Max of 10 mA recommended.

Appendix C: Listing of Matrox Meteor-II /Multi-Channel Boards

This appendix lists specific versions and revisions of the Matrox Meteor-II /Multi-Channel board.

Revisions of Matrox Meteor-II /Multi-Channel

Board	Version	Description
Matrox Meteor-II /Multi-Channel for PCI	751-00 rev. A	Original version.
	751-01 rev. A	No functional change.
	751-02 rev. A	No functional change.
	751-0201 rev. A	No functional change. Note that MJPEG module support has been removed for some boards with this revision number. This is due to the discontinuation of this module.
	751-03 rev. A	VMChannel removed. MJPEG module support removed for all boards. Board now fits in a half-length PCI slot.
	751-0301 rev. A	No functional change.
Matrox Meteor-II /Multi-Channel for PC/104-*Plus*	886-00 rev. A	Original version.
	886-00 rev. B	No functional change.
	886-01 rev. A	Replaced expansion connectors (for 896-01). Note that MJPEG module support has been removed for some boards with this revision number. This is due to the discountinuation of this module.

Appendix D: Glossary

This appendix defines some of the specialized terms used in this Matrox Meteor-II document.

- ASIC

  Application-specific integrated circuit. An integrated circuit custom-made to meet the requirements of a specific application. It integrates several digital and/or analog functions into a single die. This results in a reduction in cost, board area, and power consumption, while improving performance when compared to an equivalent implementation using off-the-shelf components.

- Band

  One of the surfaces of a buffer. A grayscale image requires just one band. A color image requires three bands, one for each color component.

- 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.

- Bit

  A digit of a binary number. Images are described as 1-bit, 8-bit, 16-bit, etc. The numbers indicate the bits available to store the value of each pixel in the image.

- Bus

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

- Color component

  One of the components that make up a color space. Typically, each component of a color image is stored in a separate band of a multi-band buffer.

- Color space

  A color space is a way of representing and describing the complete range of perceived colors. A number of color spaces have been developed. Common color spaces are RGB and HSL. Both describe the same range of perceivable colors.

- 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.

- Display memory

  See *frame buffer*.

- Exposure time

  Refers to the period during which the image sensor of a camera is exposed to light. As the length of this period increases, so does the image brightness.

- 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.

- Frame buffer

  A frame buffer is a dedicated storage area often used for data transfers between devices of differing speeds. For example, since a computer sends out data faster than a screen can display it, the data is temporarily stored in the frame buffer. The buffer is generally thought of as a two-dimensional surface with a certain pixel depth.

- 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*.

- HSL

  A color space that represents color using components of hue, saturation, and luminance. The hue component describes the actual color of a pixel. The saturation component describes the concentration of that color. The luminance component describes the combined brightness of the primary colors.

- 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*.

- LUT mapping

  Look-up table mapping. A point-to-point operation that uses a table to define a replacement value for each possible pixel value in an image.

- MSPS

  Mega Samples per second.

- PCI

  Peripheral Component Interconnect. Present day standard expansion bus.

- 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*.

- Reference levels

  The zero and full-scale levels of an analog-to-digital converter. Voltages below a *black reference level* are converted to a zero pixel value; voltages above a *white reference level* are converted to the maximum pixel value. Together with the analog gain factor, the reference levels affect the brightness and contrast of the resulting image.

- RGB

  A color space that represents color using the primary colors (red, green and blue) as components.

- Synchronous function

  A function that does not return control to the caller until it has finished executing.

  See also *asynchronous function*.

- 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*.

- VIA

  Video Interface ASIC. A custom ASIC that connects all the data buses on the board (grab and PCI bus) to one another, and directs and monitors data flow "traffic". It is a video interface that provides various ways of inputting and outputting data.

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Regulatory Compliance

FCC Compliance Statement

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.

Note

This device complies with Part 15 of FCC Rules. Operation is subject to the following two conditions:

1. this device may not cause harmful interference, and

2. this device must accept any interference received, including interference that may cause undesired operation.

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 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 instruction manual, may cause harmful interference to radio communications. Operation of this device in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense. The user is advised that any equipment changes or modifications not expressly approved by the party responsible for compliance would void the compliance to FCC regulations and therefore, the user's authority to operate the equipment.

Industry Canada Compliance Statement

This digital apparatus does not exceed the Class A limits for radio noise emission from digital apparatus set out in the Radio Interference Regulations of Industry Canada.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de Classe A prescrites dans le Règlement sur le brouillage radioélectrique édicté par Industrie Canada.

EU Notice (European Union)

WARNING: This is a class A product. In a domestic environment this product may cause radio interference in which case the user may be required to take adequate measures

AVERTISSEMENT: Cet appareil est de la classe A. Lorsque cet appareil est utilisé dans un environnment résidentiel, il peut entraîner des interférences radioélectriques. Dans ce cas, l'usager peut être prié de prendre des mesures correctives appropriées.

This device complies with EC Directive 89/336/EEC for a Class A digital device. It has been tested and found to comply with EN55022/CISPR22 and EN55024/CISPR24 when installed in a typical class A compliant host system. It is assumed that this device will also achieve compliance in any Class A compliant system.

Le présent appareil numérique répond aux exigences stipulées dans la directive européenne 89/336/EEC prescrite pour les appareils numériques de classe A. Ce produit a été testé conformément aux procédures EN55022/CISPR22 et EN55024/CISPR24 dans un système hôte typique et conforme à la classe A. On peut présumer que cet appareil sera aussi conforme s'il est utilisé dans n'importe quel système de classe A.

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: