Matrox Meteor-II /1394

Installation and Hardware Reference

Manual no. 10763-101-0100

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Contents

Chapter 1: Introduction

This chapter outlines the key features of the Matrox Meteor-II /1394 board.

Matrox Meteor-II /1394

Matrox Meteor-II /1394 is an IEEE 1394-to-PCI adapter board that permits simplified, high-performance digital video capture using a computer. This board is available for the PCI form factor.

6-pin IEEE-1394 Connector — Input
6-pin IEEE-1394 Connector — Input
6-pin IEEE-1394 Connector — Input

Physical Layer

3.3V regulator

Link Layer

Optional isolation barrier

12V input

32

Host 32-bit PCI bus
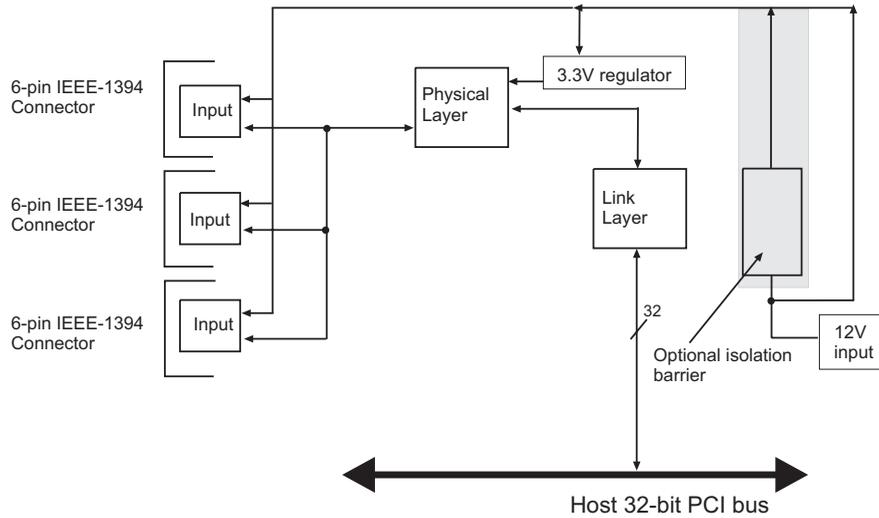
Acquisition features

Matrox Meteor-II /1394 has three IEEE 1394 input ports to which 1394 devices can be attached, as long as the configuration of devices complies with the IEEE 1394 tree topology. Serial data bus rates of 100, 200, or 400 Mbits per second are shared across the three ports. MIL-Lite can be used to grab from monochrome or color digital IEEE 1394 DCAM-compliant cameras.

Matrox Meteor-II /1394 can also supply power from your computer to the camera through the IEEE 1394 interface.

▲ *Caution*

Note that if you unplug an allocated 1394 camera while a MIL application is running, your computer might freeze.

Software

To operate Matrox Meteor-II /1394, you can purchase one or more Matrox Imaging software products that support the Matrox Meteor-II /1394 board. These are the Matrox Imaging Library (MIL) and its derivatives (MIL-Lite, ActiveMIL, ActiveMIL-Lite, and Matrox Inspector). Consult your software manual for supported Windows environments.

❖ Note that, although other software products might be available to operate Matrox Meteor-II /1394, 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: spatial filtering operations, morphological operations, measurements, blob analysis, optical character recognition (OCR), pattern matching, 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. Matrox Intellicam is included with MIL /ActiveMIL and MIL-Lite /ActiveMIL-Lite.

What you need to get started

To begin using Matrox Meteor-II /1394, 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 relatively up-to-date PCI chipset, such as the Intel 440BX, 810, 815E, 820, 840, or 850 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 /1394 package

When you unpack your Matrox Meteor-II /1394 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 /1394, you should receive the following items:

- The Matrox Meteor-II /1394 board.

- The *Matrox Meteor-II /1394 Installation and Hardware Reference* manual (this document).

- A 4-pin power cable.

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.

❖ Cables for Matrox Meteor-II /1394 are typically supplied with the camera.

Handling components

The electronic circuits in your computer and the circuits on Matrox Meteor-II /1394 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 Chapter 3.

More information   For in-depth hardware information, refer to Chapter 4.

If you want technical information about Matrox Meteor-II /1394, including specifications and connector descriptions, and pinouts, refer to Appendix B.

A history of the development of Matrox Meteor-II /1394 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]

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1. Most items can be accomplished with Matrox Inspector.

Need help?

Appendix A offers solutions to potential problems. If your Matrox Meteor-II/1394 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.

Chapter 2: Hardware installation

This chapter explains how to install the Matrox Meteor-II /1394 hardware.

Installing Matrox Meteor-II /1394

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 Matrox Meteor-II /1394 board.

❖ 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.

Use the following steps to install your Matrox Meteor-II /1394 board:

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 /1394 board and take note of the slot number you choose.

Connectors of an AGP slot

Connectors of PCI slots

or

Connectors of ISA slots

▲ *Caution* Some computers have a large, black-ridged heat sink that prevents boards from using most PCI board 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 /1394 board.

4. Carefully position Matrox Meteor-II /1394 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.

SCREW

METAL
PLATE

MATROX METEOR-II

PCI form factor

32-BIT PCI BOARD SLOT
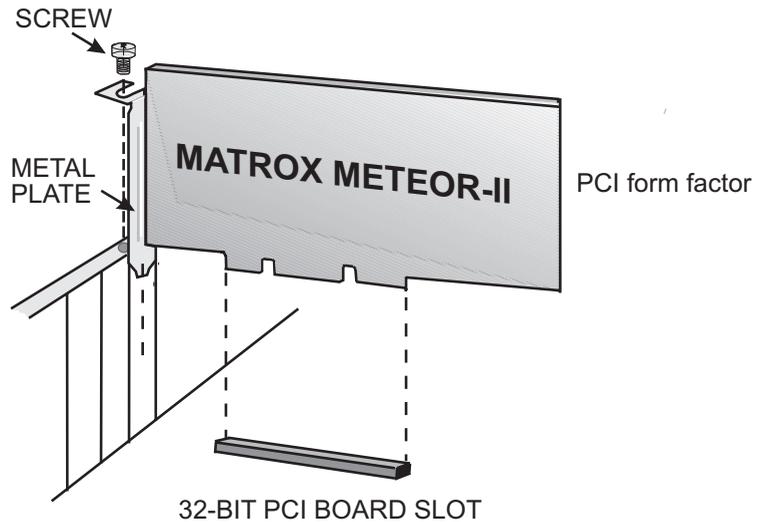
5. Once perfectly aligned with an empty slot, press the board firmly but carefully into the connector.

6. Anchor the board by replacing the screw that you removed.

7. Replace the cover of your computer.

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.

Connecting external devices

Matrox Meteor-II /1394 has four connectors, which are indicated in the diagram below. Three of these connectors are located on its bracket, and are discussed in detail in Appendix B.

1394 ports

Auxiliary power supply input
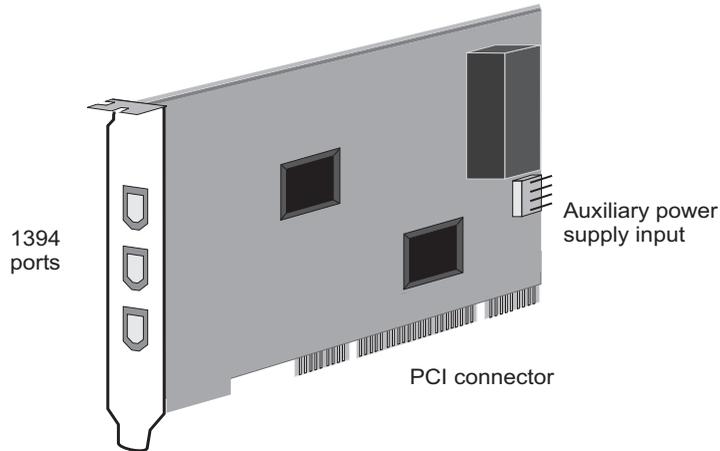
PCI connector

- **1394 ports.** Used to provide bi-directional serial communication and power. Each I/O port features a standard 6 pin connector. See Appendix B for pinouts.

- **Auxiliary power supply input**. Used to route power from your computer through the Matrox Meteor-II /1394 board to your camera.

Connecting a device to Matrox Meteor-II /1394

Connect devices to Matrox Meteor-II /1394's ports, using a 6-pin 1394 cable. The cable for the Matrox Meteor-II /1394 board is not available from Matrox, but 1394 devices, such as cameras, typically include a cable. See Appendix B for the pinouts, signals, and mating connector supplier.

Connecting Matrox Meteor-II /1394 to the auxiliary power supply input

To use Matrox Meteor-II /1394 to power your device:

1. Use the 4-pin power cable to connect the auxiliary power supply connector to the power supply (12 V) in the computer.

2. Connect your camera's 1394 cable to one of the board's ports. Note that the total current drawn by all the cameras is limited to 1.10 A.

Chapter 3: Installing software

This chapter explains how to install the Matrox Meteor-II software.

Installing the software

To install any Matrox Imaging software, place its CD in the appropriate drive; the *setup.exe* file will run automatically.

While installing the software, you will be asked to provide the following information:

■ The drive and directory in which to install the software.

■ The target operating system and compiler.

■ The type of Matrox hardware that is installed in your computer.

❖ If you have an MGA graphics board, you should install the display driver that is on the CD.

After installation, read the *readme* file(s) recommended by the installation program.

Note about Matrox Intellicam

MIL-Lite uses digitizer configuration formats (DCFs) to configure the camera interface on Matrox digitizers. The DCF defines, among other things, the video timing signals and the video data format.

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

Chapter 4: Hardware reference

This chapter explains the architecture of the Matrox Meteor-II /1394 hardware, as well as the available features and modes.

Matrox Meteor-II /1394 hardware reference

This chapter provides information on the architecture, operating modes, and supported features of the Matrox Meteor-II /1394 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.

Overview

Matrox Meteor-II /1394 is capable of acting as bus manager (cycle master), isochronous resource manager, and node controller ("root"). The cycle master triggers the data signal at 125-microsecond intervals. The isochronous resource manager is responsible for reserving, distributing, and managing the two modes of data streams (isochronous and asynchronous) along the available bandwidth. The root controller can control all peripheral devices connected (up to a maximum of 62).

The 1394 bus transfers real-time (isochronous) data streams through a four-layered architecture, two of which are implemented in hardware: the Physical Layer and the Link Layer.

Note that Matrox Meteor-II /1394 does not support the Matrox Meteor-II MJPEG module.

| | 6-pin IEEE-1394 Connector | Input | Physical Layer | 3.3V regulator | Link Layer | 32 | Optional isolation barrier | 12V input |

Host 32-bit PCI bus
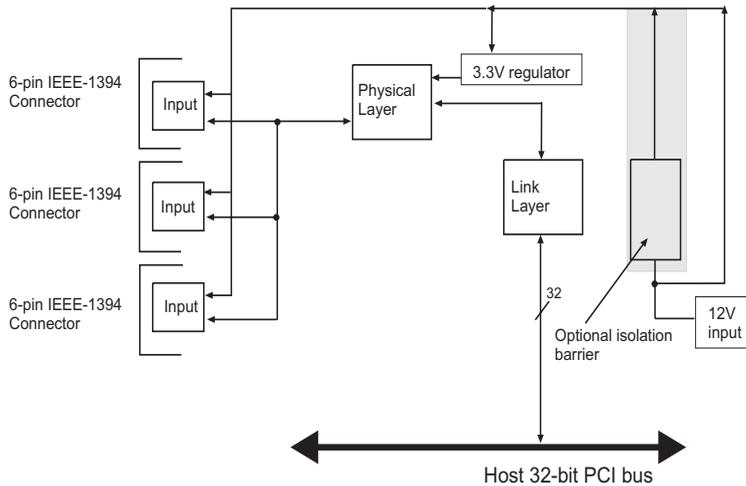
Inputs

Matrox Meteor-II /1394 has three IEEE 1394 input ports to which 1394 devices can be attached, as long as the configuration of devices complies with the IEEE 1394 tree topology. Serial data bus rates of 100, 200, or 400 Mbits per second are shared across the three ports. MIL-Lite can be used to grab from monochrome or color IEEE 1394 DCAM-compliant cameras. Note that YUV 4:2:2 data is grabbed in UYVY format.

Physical Layer

The physical layer (PHY) is part of a bi-directional interface between the link layer (Link) and the actual IEEE 1394 serial bus. The physical layer acts as a converter, reformatting the commands and digital data it receives, so that the data can be transmitted over the serial bus. The PHY monitors the line conditions to determining connection status, for initialization and arbitration, and for packet reception and transmission. The physical layer supports data transmission rates of up to 400 Mbits per second.

Link Layer

The link layer (Link) is the second component in the bi-directional interface between the physical layer (PHY) and PCI bus. The Link is a PCI-to-1394 Host controller and is compliant with both PCI and 1394 OHCI specifications. The link layer supports both asynchronous and isochronous data transfer between nodes. When transmitting packets, the Link must send a request to the PHY, which controls the direction of transmission between the two layers. The link layer also controls the transfer speed between itself and the PHY, and supports data transfers of 100, 200, or 400 Mbits per second. In addition, the Link is capable of transferring a cacheline of data at 132 Mbytes per second over the PCI bus after connecting to the memory controller on the Host. In order to overcome high or long PCI latency, the link layer also provides deep FIFOs.

Galvanic isolation barrier (optional)

The optional galvanic isolation barrier isolates the Matrox Meteor-II /1394's ground from that of the 1394 network. For example, 1394 network could consist of several PCs, or other devices such as a digital television or digital VCR. If each device in the network has a different ground, a potential difference is created across them; this situation is called a ground loop, and can eventually lead to loss of data, or even damage to system components. If a power surge occurs, the circuit tries to ground excess power, but the Matrox Meteor-II /1394 would be protected because its ground is isolated from the rest of the network.

Data interfaces

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

Although Matrox Meteor-II /1394 supports simultaneous input from multiple cameras, there are issues with respect to both the PCI bus and the IEEE 1394 bus that restricts the actual number. With respect to the PCI bus, the available sustained bandwidth is a factor, like other Matrox Meteor-II boards. However, Matrox Meteor-II /1394 has a much smaller FIFO, and is therefore more susceptible to long PCI bus latencies. With respect to the IEEE 1394 bus, Matrox Meteor-II /1394 OHCI-Lynx PCI-to-1394 Host controller is compatible with serial IEEE 1394 bus data rates of 100, 200, or 400 Mbits per second, and these rates are shared across the three input ports. Once a time slice is allocated, the device is guaranteed to have that time slice, and therefore transfer data; however, the time slices available will pose a limitation. In smaller systems, for example with two or three cameras, there should be enough time slices to handle the load.

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 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

☞ **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 NT, your computer will prompt you to go to the Event Viewer utility to identify the device that was unable to start. Click the **Devices** icon in the **Control Panel**. In the **Devices** dialog box, find your Matrox frame grabber in the presented list. If the **Startup** column reads **Automatic**, and the **Status** column is blank, the driver can be started by clicking the **Start** button.

❑ 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, display the **System Tools** and then the **Device Manager**. If you do not see a Matrox 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.

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

❐ Under Windows NT, go to the **Windows NT Diagnostics** property sheet (found under **Start Programs Administrative Tools (Common)**). Under the Resources page, check for devices that are sharing an IRQ with your Matrox frame grabber.

❐ 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.

☞ **Not enough memory to allocate buffer under Windows NT 4.0**

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

☞ **IRQ conflicts**

In general, PCI devices can share an interrupt line (IRQ). However, sometimes this might not be possible. One type of difficulty that you might run into is as follows:

■ IRQ conflict under Windows NT 4.0

In the event that your Matrox Imaging board(s) cannot share an IRQ line with other devices, allocate a different IRQ to each device in the IRQ Configuration Setup section of the BIOS Setup Program (accessible on bootup), if possible.

■ IRQ conflict under Windows 2000

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

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

Other possible solutions to the above problem:

■ 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 NT, go to **Windows NT Diagnostics** property sheet (found under **Start Programs Administrative Tools (Common)**). Under the Resources page, check for devices that are sharing an IRQ with your Matrox frame grabber.

- 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.

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 /1394 board.

Technical information

This appendix contains information that might be useful when installing your Matrox Meteor-II /1394.

Global information

■ Operating systems: 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 /1394 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:

  ❑ Support for up to 62 peripheral devices in a serial bus network.

  ❑ Compliant with IEEE and OHCI specifications.

  ❑ Support for data transfer rates of up to 400 Mbits per second.

  ❑ Optional galvanic isolation barrier to prevent data loss and protect electronic equipment.

▲ *Caution*   Note that if you unplug an allocated 1394 camera while a MIL application is running, your computer might freeze.
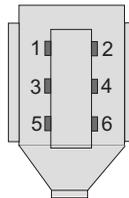
Board input and output connectors

Matrox Meteor-II /1394 has four interface connectors: three 1394 ports and an auxiliary power supply input:

1394 ports

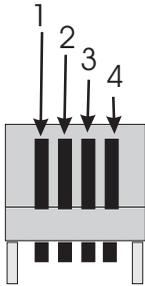Auxiliary power supply input
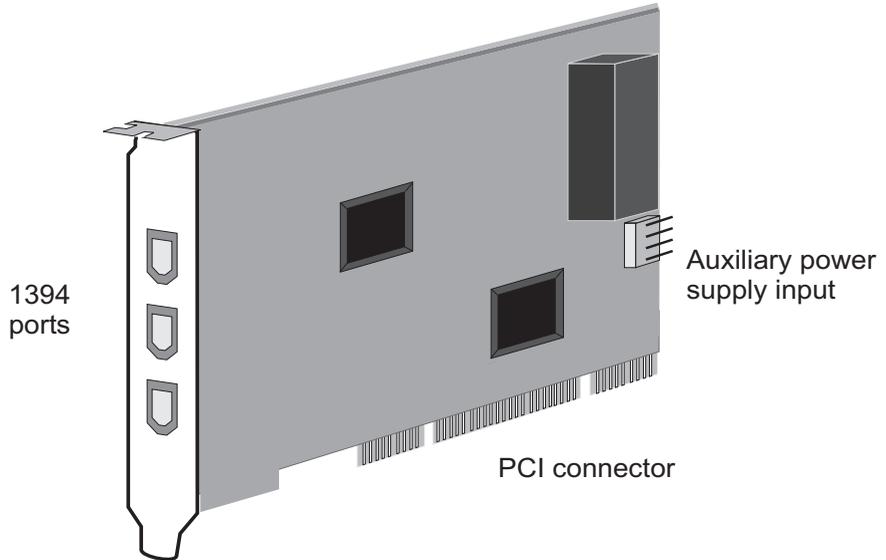
PCI connector

IEEE 1394 ports

Each IEEE 1394 port is a 6-pin connector. Its pinout is as follows:

Pin	Signal
1	+12 V, 1.1 A (max)
2	GND
3	/TPB
4	TPB
5	/TPA
6	TPA

Auxiliary power supply input

The auxiliary power supply input is a standard 4-pin male connector. Use the cable provided with your board to connect to the power supply of your computer.

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

Pin	Description
1	(not used)
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

Specifications

Electrical

Operating voltage and current:

- 5 V ±5%, 250 mA

- 12 V ±10%, 50 mA

Power consumption:

- 1.85 watts[1]

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1.   This number represents the total power consumption of the Matrox Meteor-II /1394 board only. It does not include the power consumption of a device attached to the 1394 network.

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).

Appendix C: 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.

- **Asynchronous function**

  A function that queues its command to the hardware and then immediately returns control to the caller.

  See also *synchronous function*.

- **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.

- **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*.

- **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.

- **LVDS**

  Low-Voltage Differential Signaling. It is a way to communicate data using a very low voltage swing (about 350mV) over two differential printed circuit board (PCB) traces or a balanced cable.

- **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.

- **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*.

- **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*.

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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
  Plattsburg, 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: