MV2

FRAME GRABBER

USER'S GUIDE

Part Number: 24806

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WARNING

MetraByte Corporation assumes no liability for damages consequent to the use of this product. This product is not designed with components of a level of reliability suitable for use in life support or critical applications.

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INTRODUCTION

1.1 GENERAL INTRODUCTION

MetraByte's MV2 Frame/Line Grabber is a 512 x 512 x 8-bit frame/line grabber for real-time digital image processing on the IBM ® Personal Computer XT/AT ™ or compatible. The board digitizes an analog video signal, stores the digitized image in a video memory bank, and allows text/graphics to be overlayed from an EGA/VGA compatible graphics adapter card. The digitized image can be displayed through a VGA compatible graphics adapter. If desired, the image can be stored on a hard or floppy disk. The MV2 accepts monochrome video input signal from RS-170 or CCIR compatible sources; interlaced or non-interlaced cameras.

The MV2 features 256 KB of dual-ported video memory and an 8-bit digitizer which achieves 512 x 512 resolution in 1/30 of a second. The MV2 supports a variety of system configurations and is equipped with the following connectors:

- DB-15 for I/O of video, synchronization, and timing signals
- DB-9 allows display to analog, multisync monitors
- BNC for video sources

MV2 features video adjustments including: gain, offset, dc restoration, synchronization, and any of three 256 x 8 Color Display Look-up Tables. Image data can be stored line by line using Fast Host Access or parts of an image can be stored using DMA.

The MV2 is also accompanied by a subroutine library, MVLIB-2, which allows the user to create flexible custom designed video data acquisition and manipulation programs. Custom programs may be written in Microsoft C or 8086 Assembly Language.

1.2 SYSTEM REQUIREMENTS

Minimum Hardware Requirements for the MV2 include:

- IBM Personal Computer XT or AT or compatible, equipped with:
  - 640 Kbytes RAM
  - 1.2 MB, 5 1/4" Floppy Disk Drive
  - 20 MB hard drive
  - MS-DOS version 3.0 or greater.
- EGA or VGA Graphics Adapter Card* (See Appendix A.)
- Analog Multisync RGB Display Monitor
- NTSC, CCIR, RS-170, or CCD Line/Frame camera

NOTE
One Multisync Monitor is mandatory; however your application may require two.

1.3 ORDERING INFORMATION

Table 1-1 provides the part numbers and a general description of each part associated with the MV2 Board. Detailed descriptions of the options and accessories are provided in Chapter 6.

Table 1-1. MV2 Ordering Information

MV2 Boards and Interface Boxes	
Part No.	Description
MV2-170	MV2 Frame/Line Grabber with RS-170 interface.
MV2-CCIR	MV2 Frame/Line Grabber with CCIR interface.

*If you have an older VGA card with an EGA-type connector, please contact MetraByte's Technical Support Staff prior to installing the MV2.

Table 1-1. MV2 Ordering Information

Part No.	Description
Cameras	
JE2362	RS-170 CCD Camera w/ 16 mm a/i lens
CT-3800	RS-170 CCD Camera with fixed iris lens
JE2352X	CCIR CCD Camera
CAM-PS	12 Vdc @ 300 mA wall-mount external power supply with screw terminal output connectors (for cameras)
Cables	
Part No.	Description
C-BMM-5	BNC Cable, male to male, 5'
C-BMM-15	BNC Cable, male to male BNC Cable, 15'
C-BMF-5	BNC Cable, male to female BNC Cable, 5'
C-BMF-15	BNC Cable, male to female BNC Cable, 15'
C-BTM-15	BNC Cable, thin, male to male, 5'
ADP-FFT	BNC "T" Adapter, female/female/female
ADP-FMT	BNC "T" Adapter, female/male/female
ADP-FF	BNC to BNC Adapter, female to female
ADP-BR	BNC to RCA Adapter
ADP-99M	9-pin male (DB-9) to 9-pin (DB-9) male adapter
ADP-915M	9-pin male (DB-9)to 15-pin (DB-15) male adapter
ADP-915F	9-pin male (DB-9) to 15-pin (DB-15) female adapter
CMV-9MM-5	DB-9 Cable, male to male, 5'
CMV-9MM-15	DB-9 Cable, male to male, 15'
CMV-15MM-5	DB-15 Cable, male to male, 5'
CMV-15MM-15	DB-15 Cable, male to male, 15'
CAM-PS-JE	Power cable for JE2362X/JE2362 cameras
CMV-CT-10	H/V Sync, power, and shutter control for CT-3800 camera
CAM-PS-JE	Power Cable. Connects camera power supply (CAM-PS) to JE2362 or JE2352X.
MV2-EGA	EGA Feature Connector Cable.
MV2-VGA	VGA Feature Connector Cable.
CMV-DBNC-5-6	DB-9 male to 5 BNC male connectors monitor cable
Trackballs and Digitizer Tablets	
Part No.	Description
MD7-1212	12" x 12" digitizer
TBALL	3-Button TrackBall
Software	
Part No.	Description
MVLIB-2	Subroutine Library for the MV2 Board

1.4 HOW TO USE THIS MANUAL

This manual is intended for a user familiar with personal computers. It refers to the MV2 Programmer's Guide and the Texas Instruments' TMS34061 (VSC) User's Manual. Contact MetraByte's Technical Support Department for more information regarding these documents.

Chapter 2, "Theory of Operation", provides a brief description of how the MV2 works. It describes video input, video memory, the Look-Up Tables (LUT's), and video output.

Chapter 3, "Switches, Jumpers, and Connectors", details the switch and jumper settings. The pinouts of all the connectors are described.

Chapter 4, "Getting Started", provides unpacking and inspection tips. It also describes how to copy and install the software. It also details how to install the MV2 board.

Chapter 5, "System Configuration", describes the components of an MV2 system: the graphics card, monitors, and cameras. It also describes how to install them in three different system configurations. The MVSETUP and KEYCAPT programs and their use are described. A quick start procedure and procedures for adjusting the Phase Locked Loop, Offset, and Gain are also given.

Chapter 6, "Register Descriptions", gives the details of the VSC and MV2 Registers.

Chapter 7, "Options and Accessories", briefly describes the cameras an other optional equipment available from MetraByte.

Chapter 8, "Warranty Information", describes MetraByte's warranty and return policy.

CHAPTER 2
THEORY OF OPERATION

2.1 GENERAL

This chapter describes the function of each major area of the MV2, and how each interacts with one another. In general, there are five primary components: video input, video memory, the Look-up Tables (LUT's), video output, and EGA/VGA interface. Figure 2-1 provides a block diagram of the MV2 Board. Refer to this as you read through this chapter.

The MV2 accepts a video input signal. This analog signal is translated to digital data, with appropriate timing and synchronization adjustments made. This signal is then stored in video memory or else passed through the Display Look-Up Tables (DLUT's). The DLUT's can be manipulated to make adjustments like psuedo-coloring to the image. Data originating from EGA/VGA card (via the Feature Connector) and has passed through the Overlay Look-up Tables (OLUT's) can then be overlayed on the image. The resulting image is then displayed. This data can also be stored in a database or sent out the PC Bus for storage. Parts of an image can be stored using either Direct Memory Allocation (DMA) or Fast Host Access (FHA).

2.2 VIDEO INPUT

The source video input signal can originate from either RS-170/CCIR compatible image sensors, or interlaced/non-interlaced scanners. In both instances,the source video signal enters the MV2 through either the DB-15 or BNC connector. Gain and offset adjustments are made and it is sent through an 8-bit Analog to Digital (A/D) converter. Appropriate timing and synchronization adjustments are made to this digital signal, ensuring an accurate representation of the original analog signal.

2.3 VIDEO MEMORY

The MV2 has a total of 256 Kbytes of video memory available. This Image Memory is the storage area for acquired or retrieved images. The memory bank is dual-ported and thus, can be accessed by the MV2 during acquisition and display operations. Additionally, it is mapped into the PC's I/O address space and can be accessed at any time by I/O read and write instructions.

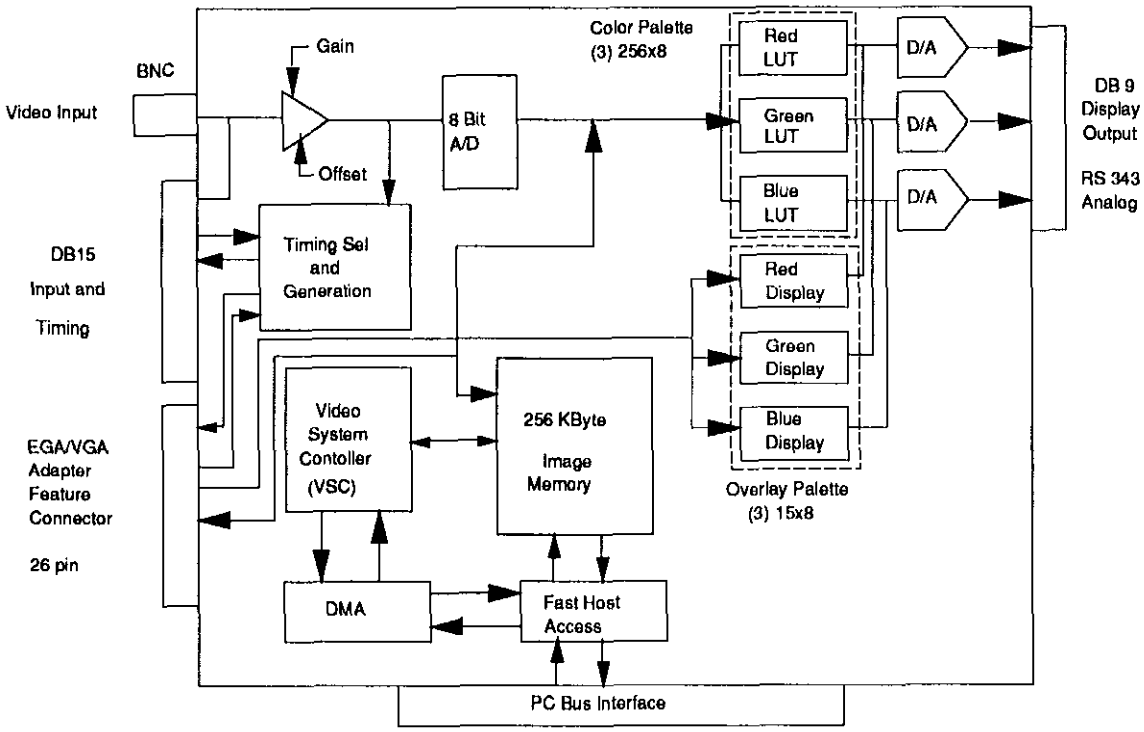

Figure 2-1. Functional Block Diagram

2.4 LOOK-UP TABLES (LUT's)

There are two types of Look-Up Tables provided on the MV2 Board. There are three 256 x 8 Display Look-up Tables. These select the various colors and pixel intensities used to psuedo-color the displayed image. Over two thousand different colors from a pallette of 16 million can be programmed.

The other type of Look-up Tables are the Overlay Look-Up Tables. These three 15 x 8 LUT's are used to colorize text or graphics originating from the graphics card's Feature Connector. This data is displayed when the MV2 is either in text or overlay mode. (This is described in more detail in the MV2 Programmer's Guide.)

2.5 VIDEO OUTPUT

Once the signal has gone through the DLUT's, it is then translated back into an analog signal by the red, green, and blue digital to analog (D/A) converters. The output of each D/A is combined with RS-343 sync signals, so that it can drive an RGB (Red/Green/Blue) monitor.

Separate sync outputs are provided for use with monitors or cameras which require sync connections. Horizontal Sync (Camera Connector) and Vertical Sync (Camera Connector) are made available on separate digital output lines.

CHAPTER 3
SWITCHES, JUMPERS, AND CONNECTORS

3.1 GENERAL

This chapter described the function of the switches, jumpers, and connectors found on the MV2 board. The switches and jumpers should be set prior to installing the board.

Descriptions of connector pinouts are provided for reference purposes only. MetraByte has several cables available for use in common system configurations. It is highly recommended that you use these cables.

3.2 BASE ADDRESS SWITCH

The Base Address Switch is used to set the Base Address of the Board. The MV2 has a default base address setting of 300 (hex). This base address may be occupied within your computer. Base addresses may be assigned within the range 100 to 3F0 (hex). Check your system configuration and Operator's Manual for available addresses.

The Base Address Switch is a six-gang, DIP switch located to the left of the PC interface connector. See Figure 3-2. To set the appropriate base address, use a pen-tip to move the individual switches into the OFF position. (The lower 4 bits are not adjustable.) For example, to set a base address of 300 (hex), move switches 1 and 2 into the OFF position as shown in Figure 3-1.

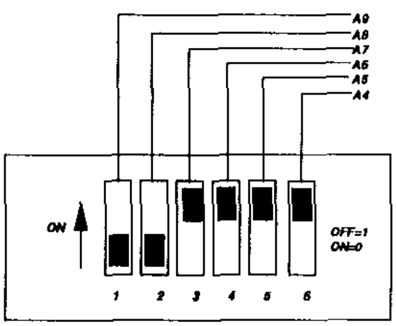

Figure 3-1. Example of Setting Base Address Switch

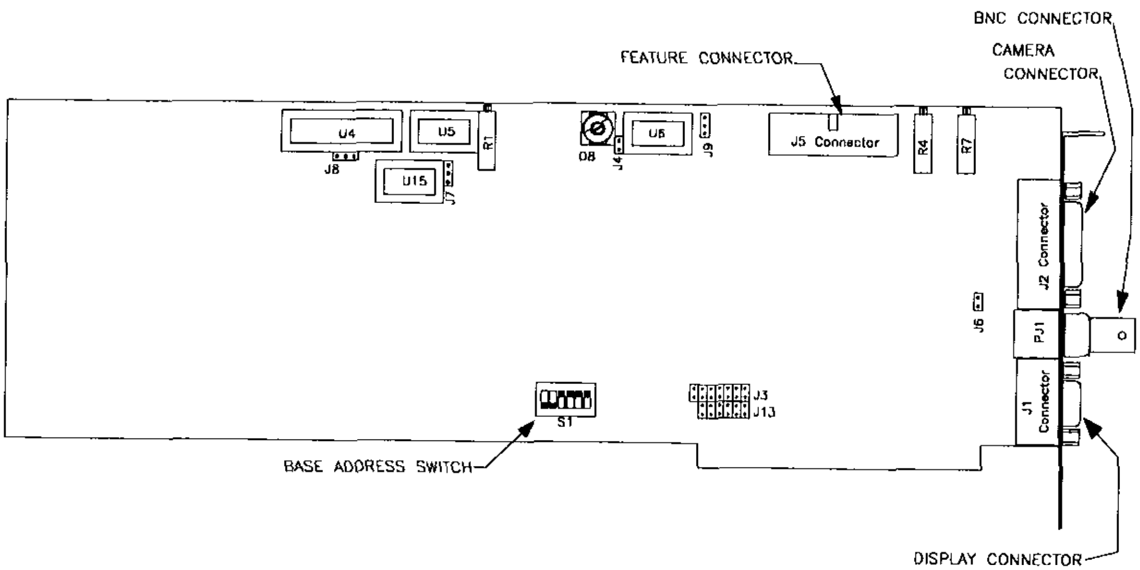

Figure 3-2. Location of Base Address Switch and Connectors

3.3 CONNECTORS

The MV2 is equipped with 4 different connectors which allow a variety of system configurations. Among these connectors are: (1) An EGA/VGA Feature Connector, (2) a BNC Connector, (3) a 9-pin Monitor Connector, and (4) 15-pin Camera Connector. Figure 3-2 shows the location of each connector.

Each connector has a MetraByte supplied cable which meets its specifications. If you wish to make your own cables or to modify the MetraByte supplied ones, refer to the following subsections.

3.3.1 EGA/VGA Feature Connector

The MV2 supports true character/graphics overlays with the stored video image when connected to either an EGA or VGA compatible graphics adapter card. Many of these standard adapter cards have what is know as a "Feature Connector". This Feature Connector has all the necessary video related signals which is used by the MV2 to merge the video image and characters/graphics.

The EGA Feature Connector cable (MetraByte Part# MV2-EGA) has two pieces. The 32-pin angled male adapter connector plugs into the EGA card's Feature Connector. The 26-pin header connector plugs into the MV2's Feature Connector, located at the top of the PC board. (See Figure 3-2.)

The standard VGA Feature Connector (MetraByte Part# MV2-VGA) has the 26-pin header on one end to connect to the MV2 and a 26-pin edge finger connector on the other end to connect to the VGA card's Feature Connector.

Figure 3-3 describes the signal conductor on the MV2's Feature Connector connector.

GND	26	25	VIDEO BIT 0*
GND	24	23	VIDEO BIT 1*
GND	22	21	VIDEO BIT 2*
ENABLE VIDEO	20	19	VIDEO BIT 3*
ENABLE SYNC	18	17	VIDEO BIT 4
ENABLE PIXEL CLOCK	16	15	VIDEO BIT 5
NOT USED	14	13	VIDEO BIT 6
GND	12	11	VIDEO BIT 7
GND	10	9	PIXEL CLOCK*
GND	8	7	VIDEO BLANK*
GND	6	5	HSYNC*
NOT USED	4	3	VSYNC*
NOT USED	2	1	NOT USED

* SIGNALS SUPPORTED FOR EGA INTERFACE
ALL SIGNALS SUPPORTED FOR VGA INTERFACE.

Figure 3-3. MV2 Feature Connector Pinouts

3.3.2 BNC Connector

A standard BNC connector is provided to aid in single camera installation. The location of the BNC connector is illustrated in Figure 3-2.

3.3.3 Monitor Connector (DB-9)

The DB-9 Monitor Connector allows easy connection of a standard RGB Multisync monitor. Figure 3-4 lists and describes each of the connector's pins. See Chapter 5 for information regarding the installation of the display monitor.

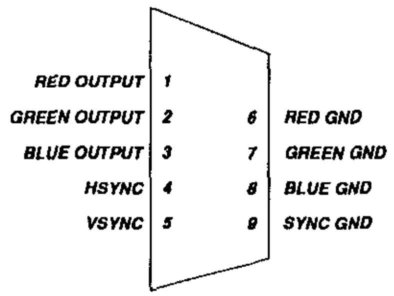

Figure 3-4. Display Connector Pinouts

3.3.4 Camera Connector

A DB-15 Interface Connector (Refer to Figure 3-2 .) is provided to aid the user in connecting a camera to the MV2 Board. Instructions for connecting the Camera are provided in Chapter 5.

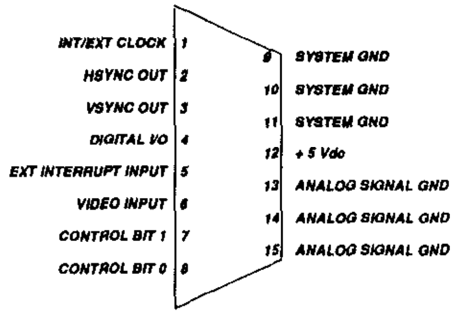

Figure 3-6. Camera Connector (DB-15) Pinouts

3.4 JUMPER SETTINGS

There are several jumpers which must be set on the MV2 board. These jumpers should be set in the appropriate positions before you install the board into your computer. Figure 3-5 shows the location of the jumpers.

Blanking Pedestal Level

The jumper at location J6 (Refer to Figure 3-5.) is used to set the Blanking Pedestal Level. If the jumper is set between positions 1 and 2, the blanking level is 7.5 IRE. Likewise, if the jumper is across pins 2 and 3, the blanking level occurs at 0.00 IRE. The setting of this jumper is dependent on the type of monitor used. Refer to the documentation included with your monitor for more information.

Clock Jumper

The Clock Jumper at location J7 (See Figure 3-5.) selects between the internal system clock or an external clock input. When the jumper is placed in the position marked "1" then , the external clock mode is selected.

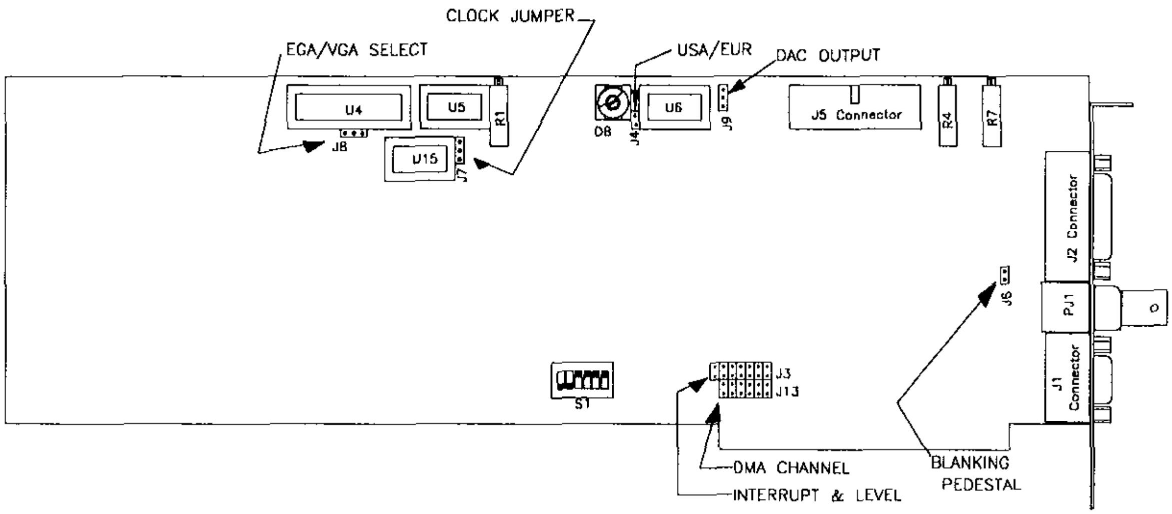

Figure 3-5. Jumper Locations

DAC Output Jumper

The jumper at location J9 (See Figure 3-5.) is used to set the DAC analog R,G,B outputs to be RS-343 compatible - if positioned between pins 2 and 3. If the jumper is in pin position 1 and 2, the R,G,B output will not have any sync information.

DMA Channel Select Jumpers

The DMA Channel Select jumpers (J13) are used to select the appropriate DMA channel on the PC backplane. Figure 3-5 shows the location of these jumpers. There is one set of three jumpers for the three DMA Request signals and one for the DMA Acknowledge signals. Each individual jumper represents a single channel (1 to 3). Be certain to select the same channel for both the Request and Acknowledge signals.

EGA/VGA Selection Jumper

The jumper at location J8 (Refer to Figure 3-5) is used to identify if an EGA or VGA graphics adapter card is to be connected to the MV2 through the Feature Connector. If the jumper is in the position marked "1" then an EGA card is expected to be installed. If it is in position "2", then a VGA card should be connected to the MV2. When a VGA graphics adapter card is being used, the EGA oscillator, Y1, has to be removed.

Interrupt Select Jumpers

J3 (Refer to Figure 3-5.) holds the interrupt select jumpers. Place the jumper across the pins marked with the appropriate interrupt level. The only source of interrupts are the VSC and/or an external interrupt.

USA/EUR Jumper

This jumper (J4) selects whether the MV2 has been configured for use in the USA or Europe. (Refer to Figure 3-5 for jumper location.) It is factory-configured for your application. If it is set in the incorrect position, return the board to the factory as described in Chapter 8. DO NOT attempt to re-configure the board.

CHAPTER 4
GETTING STARTED

4.1 GENERAL

Setting up your MV2 system requires several steps:

- Loading in and configuring the software
- Adjusting any switches or jumpers on the MV2
- Installing the MV2 board
- Installing the Camera and Monitor(s).
- Initializing the MV2 System
- Starting-up the MV2 System

This chapter details the preliminary steps for getting your MV2 system up and running - namely, installing the MV2 board and the MVLIB-2 software. The other information is provided in Chapter 5, Configuring the System. It is essential that the system be correctly configured prior to execution of the *MV.EXE* program (found on the MVLIB-2 Diskettes).

4.2 UNPACKING AND INSPECTION

After you unpack the board from its outer shipping material:

1. Remove the item from its packing material, while placing one hand firmly on a metal portion of your computer's chassis. This will prevent any damage to the board components due to possible static electricity build-up during transit.

2. After allowing a moment for static electricity discharge, carefully unwrap the board from the anti-static bag.

3. Inspect the board for any possible damage. If any sign of damage is detected, proceed as directed in Chapter 8.

4.3 COPYING THE DISKETTES

The MVLIB-2 software is included in the rear of the MVLIB-2 Programming Guide. Before you install the MVLIB-2 Software, first create a back-up copy of the MVLIB-2 Diskettes, following the general procedure outlined below.

To make a back-up copy:

1. Turn on your computer and display.

2. Switch to the directory containing the *DISKCOPY.EXE* file.

3. At the DOS prompt, type:

   ```
   DISKCOPY {source drive designator}: {copy drive designator}:
   ```

4. The system will prompt you through the disk copying process. Insert the source diskette into the specified drive. Then, it will ask you to insert the target disk into the other drive. This is a blank, formatted disk which is to be your back-up disk. When the copying process has been completed, the computer will ask **COPY ANOTHER (Y/N)?**. Continue until you have copied all of the MVLIB-2 diskettes.

5. When your copy has been completed, put the original MVLIB-2 disks in a safe place. Label the back-up disks "MVLIB-2 Copy". Use these diskettes to install the software.

4.4 LOADING THE SOFTWARE

Installing MVLIB-2 requires the use of the DOS **COPY** command. If you are unsure as to how to use this command, refer to the DOS manual provided with your computer.

To install the MVLIB-2 files:

1. Turn on your PC and its display. You should see a prompt which indicates you are at the DOS level.

2. The following instructions create a special directory for the MVLIB-2

files and assume this directory is called **MV2** . At the DOS prompt, change to the root directory (or other directory you want the MV2 directory to be branched off from); i.e. type:

```
cd \
```

3. Next, create the MV2 directory. Type:

   `mkdir \mv2` OR `md \mv2`

4. Change to the MV2 directory by typing:

```
cd \mv2
```

5. Place the MVLIB-2 Copy disk into the floppy drive (assuming this is drive a:) and type:

```
copy a:*.*
```

6. Repeat step 3 until all of the MVLIB-2 diskettes have been copied onto the hard drive.

The MVLIB-2 Software has now been loaded. This software is more fully described in the MVLIB-2 Programming Guide.

4.5 INSTALLING THE BOARD

This section describes only how to install the actual MV2 Board. Installation of cameras and displays are described in Chapter 5. Note also that before you run the *MV.EXE* program provided with the MV2, you must configure your system as described in Chapter 5.

> *NOTE*
>
> If you are planning to use the MV2 with an EGA card, install the EGA side of the MV2 to EGA interface cable before you install the MV2 board.

To install the MV2 Board:

1. Turn the power to the computer and its attached peripherals off.

2. Unplug the power cords of the computer and its options from the electrical outlets. Make a note of where all the cables and cords are attached to the rear of the system unit and disconnnect.

3. Remove the cover of the computer. Refer to the documentation accompanying your computer for more details.

4. Choose an available option slot. Ideally, the MV2 should be installed to the right (Use the front of the computer as a reference) of the Graphics Card. This will simplify connecting the MV2 to the Graphics Card.

5. Hold the MV2 in one hand. With the other hand, touch any metallic part of the computer cabinet. This procedure will safely discharge any static electricity which has built-up in your body.

6. Set the desired Base Address and change any jumper positions on the MV2 Board. In particular, make sure the board is properly configured to function with your Graphics card. See Chapter 3.

7. Align the gold edge connector with the edge socket and gently press the board downward into the socket. Screw the back adapter plate to the computer back panel. You may need to loosen the adapter plate screw in order to push the board fully into the socket. Re-tighten the adapter plate screw.

At this point, you have only partially installed the MV2 System. Before you replace the computer's cover, proceed to the System Configuration steps outlined in Chapter 5. This chapter describes how to connect your peripherals and make any necessary adjustments. Once you have completed the procedures outlined in Chapter 5, replace the cover on the computer. (See the computer's documentation for more information.)

CHAPTER 5
SYSTEM CONFIGURATION

5.1. GENERAL

There are several steps which must be taken to complete the installation of the MV2 System. Once the board has been installed and the software has been loaded you will need to:

- Become familiar with the system components
- Choose a hardware configuration.
- Install the peripherals for that configuration.
- Configure the software.
- Verify that your hardware has been installed correctly.
- Make any necessary adjustments to the gain and offset.

This chapter also provides a brief troubleshooting guide for the most commonly encountered installation errors.

5.2. SYSTEM COMPONENTS

The primary components of any MV2 system are: the MV2 Frame Grabber, an EGA/VGA Graphics Adapter card, an Analog Multisync Monitor, and a camera. An additional TTL-type (or Multisync) monitor may be required for certain configurations.

EGA/VGA Graphics Adapter Card

The MV2 Frame Grabber acts as the central processing point and may work in conjunction with or isolated from the Graphics Adapter Card. When connected to a Graphics Card, the MV2 supports true character/graphics overlays over a stored video image.

The MV2 is connected to the Graphics Card via its Feature Connector. This connector provides the necessary video-related signals used by the MV2 to merge the video image and characters/graphics. Specialized cabling is provided by MetraByte for interfacing the MV2 to the Feature Connector.

MV2-EGA Cable. This is a ribbon cable with contains a 32-pin angled male adapter, which plugs into the EGA card's Feature Connector. The other end has a 26-pin female header connector which plugs into the MV2's Feature Connector. (See Figure 3-5 for location.)

MV2-VGA Cable. This cable is comprised of 26-pin female header and a 26-pin Edge Finger Connector. The Edge Finger Connector plugs into the VGA's Feature Connector and the female header should be connected to the MV2. This cable cannot be used with a VGA card equipped with an EGA-like connector (older model VGA's). If you have a VGA card like this, please contact MetraByte's Technical Support Staff.

Monitors

The MV2 can be installed in either one or two monitor configurations. Regardless of which configuration is chosen, the monitor which is connected to the MV2 <u>must be an Analog Multisync</u> monitor. A TTL-type monitor could be damaged. A standard RGB Multisync monitor will require MetraByte's DB-9 Video Output Cable (Part Number CMV-9MM-5 (15)). However, if you have an analog monitor (such as an Electrohome) with separate R, G, B, HSYNC, and VSYNC BNC connectors, this will require MetraByte's Monitor Cable (Part Number CMV-DBNC-5-6).

Cameras

The MV2 supports RS-170 or CCIR compatible cameras; in addition to interlaced, non-interlaced cameras. MetraByte sells several of these cameras - see section 1.2 Ordering Information. Installation and cabling procedures are given in the documentation provided with each camera. The Computar CT3800 Camera requires MetraByte's CMV-CT-10 cable, shown in Figure 5-1.

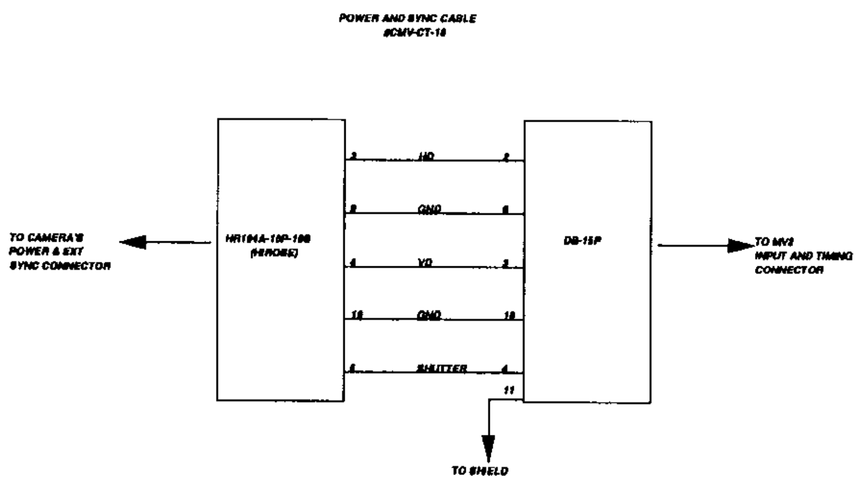

Figure 5-1. CMV-CT-10 Cable Signals

5.3. TYPICAL SYSTEM CONFIGURATIONS

The MV2 can be installed in any one of three configurations:

- Stand-alone with two monitors
- Graphics Card Dependent with two monitors
- Graphics Card Dependent with one monitor

Which configuration you choose is dependent upon the application and your level of familiarity with the MV2.

When starting up a computer system with the MV2 for the first time, it is good practice to have the monitor connected to the graphics adapter card. Once the computer system is properly set-up for the MV2, then the Analog Multisync monitor can be connected to the MV2's DB-9 connector. It is possible to have a two monitor system where one monitor is connected to the graphics adapter card and the other is connected to the MV2.

BEFORE YOU BEGIN YOUR INSTALLATION

1. Make sure that the MV2 has been set for the correct Base Address and that all other switches have been set correctly.

2. Ensure that the software has been loaded as described in Chapter 4.

3. Install the MV2 Board as described in Chapter 4.

4. Be sure that your work area provides enough room for two monitors and a camera.

5. Have all necessary cables and peripherals handy.

STANDALONE WITH TWO MONITORS

In Standalone Configuration, the MV2 is used independently from your Graphics card. The Multisync monitor is connected to the MV2 and another TTL-type or Multisync monitor (for VGA) can be connected to the Graphics card. Note that in this configuration, overlay mode is not enabled.

It is suggested that you use the MV2 in this configuration if you are a new user and have only one Multisync monitor available.

Requirements

To connect the MV2 in this configuration, you will need:

- MV2 Frame Grabber
- EGA/VGA Card
- Two monitors - at least one of which is a Multisync monitor
- Camera
- MV2 to EGA cable *OR* MV2 to VGA cable
- 2 monitor cables
- Camera Cable

Installation

1. Power the computer down.

2. Connect a Multisync monitor to the MV2, using the appropriate cable. Plug one end into the signal input connector(s) on the monitor. Plug the other end into the DB-9 Monitor connector on the rear of the MV2.

3. Connect the secondary monitor to the Graphics Card. Plug one end of a Monitor cable into the monitor and the other end into the Graphics card.

4. Connect the camera to the MV2. Plug one end of the Camera Cable into the Camera and one end into the MV2 board.

5. Make sure all connections are secure and power-up the computer. You should see a DOS prompt on the secondary monitor.

Now, configure your system using *MVSETUP* and proceed to the quick start-up procedure. Use the secondary monitor as a reference and the primary monitor as your "palette". The primary monitor (the one connected to the MV2) will be where the image is displayed.

GRAPHICS CARD DEPENDENT - TWO MONITORS

In this configuration, the MV2 is used in conjunction with your graphics card. Two monitors are connected to the system, offering ease of use to first-time users. This configuration features one monitor which can be used in overlay mode with another "reference" monitor used in text mode.

This configuration is useful when "debugging" video related software or using the MV2 in a presentation or educational training session, or when you first start up your system.

Requirements

To connect the MV2 in this configuration, you will need:

- MV2 Frame Grabber
- EGA/VGA Card
- Two monitors - at least one of which is a Multisync monitor
- Camera
- MV2 to EGA cable *OR* MV2 to VGA cable
- 2 monitor cables
- Camera Cable

Installation

1. Power the computer down.

2. Connect the MV2 to the Graphics card using the appropriate cable*. For an EGA card - plug the angled EGA connector into the EGA's Feature Connector first. Then, plug the Header Connector into the MV2's Feature Connector. For a VGA card - fit the Edge Finger Connector onto the VGA's Feature Connector. Then plug the header connector into the MV2.

3. Connect a Multisync monitor to the MV2, using the appropriate cable. Plug one end into the signal input connector(s) on the monitor. Plug the other end into the DB-9 Monitor connector on the rear of the MV2.

4. Connect the secondary monitor to the Graphics Card. Plug one end of a Monitor cable into the monitor and the other end into the Graphics card.

5. Connect the camera to the MV2. Plug one end of the Camera Cable into the Camera and one end into the MV2 board.

6. Make sure all connections are secure and power-up the computer. You should see a DOS prompt on both monitors.

---

*When connecting the MV2 to an EGA card, it may be necessary to remove the MV2 and plug the EGA side of the cable into the EGA card. Then, replace the MV2 and plug in the MV2 side of the cable.

Now, configure your system using *MVSETUP* and proceed to the quick start-up procedure. Use the secondary monitor as a reference and the primary monitor as your "palette".

GRAPHICS CARD DEPENDENT - ONE MONITOR

In this configuration, the MV2 is used in conjunction with your graphics card. One monitor is connected directly to the MV2. This monitor can be used in all modes.

This configuration is a preferred way of operating the MV2, if you are familiar with the command sequence to be used.

Requirements

To connect the MV2 in this configuration, you will need:

- MV2 Frame Grabber
- EGA/VGA Card
- One Multisync monitor
- Camera
- MV2 to EGA cable *OR* MV2 to VGA cable
- a monitor cable
- Camera Cable

Installation

1. Power the computer down.

2. Connect the MV2 to the Graphics card using the appropriate cable*. For an EGA card - plug the angled EGA connector into the EGA's Feature Connector first. Then, plug the Header Connector into the MV2's Feature Connector. For a VGA card - fit the Edge Finger Connector onto the VGA's Feature Connector. Then plug the header connector into the MV2.

*When connecting the MV2 to an EGA card, it may be necessary to remove the MV2 and plug the EGA side of the cable into the EGA card. Then, replace the MV2 and plug in the MV2 side of the cable.

3. Connect a Multisync monitor to the MV2, using the appropriate cable. Plug one end into the signal input connector(s) on the monitor. Plug the other end into the DB-9 Monitor connector on the rear of the MV2.

4. Connect the camera to the MV2. Plug one end of the Camera Cable into the Camera and one end into the MV2 board.

5. Make sure all connections are secure and power-up the computer. You should see a DOS prompt on both monitors.

Now, configure your system using *MVSETUP* and proceed to the quick start-up procedure.

5.4. ENABLING KEYCAPT.COM

KEYCAPT.COM is a TSR (Terminate and Stay Resident) program which automatically resets the bits of the Miscellaneous Register on the Graphics Adapter Card. (These can get modified by running MV_DRAW.) It is essential that you run this program before working with third party software packages.

For example, you will need to enable this program if you use a word processing program with an MV2 configuration. A typical scenario is as follows. You have just finished capturing several images and modifying them using the **MV.EXE** program (See the MV2 Programmer's Manual for more information.). You then exit out of **MV.EXE** and return to the DOS level. Now you try to run your word-processing program and the screen(s) is blank. At this point you will have to activate the **KEYCAPT** program.

It is suggested that you call this program from your *AUTOEXEC.BAT* file. (See your DOS manual for more information regarding this file.) To do this, modify your *AUTOEXEC.BAT* file to include the following line: **`{path}keycapt`**.

Otherwise, whenever you need to use the program, you will need to:

- Switch to the directory where it is located, i.e:
  `cd \mv2`

- Load the program by typing:
  `keycapt`

NOTE
If you are reluctant to load the **KEYCAPT** file into the *AUTOEXEC* file, consider this. It is pretty hard to switch directories and enable a program when you can't see the prompts!!!!

Once loaded, the **KEYCAPT** program can be invoked at any time by pressing the appropriate Hot Key Combination -

[Alt][Shift][F10] for EGA systems.
[Ctrl][Shift][F10] for VGA systems.

5.5. CCIR APPLICATIONS

If you are using CCIR, be sure to copy the European version of the VSC Configuration file (*CONFIG.EUR*) to the *CONFIG.VSC* file.

5.6. SOFTWARE CONFIGURATION

Before you invoke the **MV.EXE** program or call the **`mv_draw()`** routine (See the MV2 Programmer's Guide.), you will need to configure your software. MetraByte provides a program, **MVSETUP**, which will do this for you. To configure your system:

1. Change to the directory where the MVLIB-2 Software has been loaded. If you followed the directions given in Chapter 4, this would be **MV2**, i.e.:

   ```
   C:\ cd \mv2
   ```

2. At the DOS prompt, type **`mvsetup`**, i.e:

   ```
   C:\MV2  MVSETUP
   ```

The program will then prompt you through the Setup Procedure as follows. You can exit from the Setup program at any time by pressing [Esc].

```
                        MV Setup Program

Drive Letter for CONFIG.SYS file:


                        Select Boot Drive
-----------------------------------------------------------------
Enter drive letter where the New/Revised  CONFIG.SYS is to be
placed.  Then hit ENTER.
Hitting 'ESC' will exit program
-----------------------------------------------------------------
```

Enter the letter (usually C or D) of the hard drive where your *CONFIG.SYS* is located. You do not need to enter a colon (:). The **MVSETUP** program assumes that the *CONFIG.SYS* file is located in the root directory (\) of the given driver. If you wish to locate it elsewhere, copy this file from the root directory to the desired directory.

```
                        MV Setup Program

Drive Letter for CONFIG.SYS file: C:\
Standalone Frame Grabber Setup: NO

                       Frame Grabber Setup
-----------------------------------------------------------------
Default response (MV2 Connected to VGA/EGA card) is NO.

Enter 1 of the following...
o   The word YES if MV2 is not connected to
    EGA/VGA followed by 'Enter'.
o   'Enter' for default
o   'Esc' to exit
-----------------------------------------------------------------
```

In a Standalone Frame Grabber setup, the graphics card <u>is not connected</u> to the MV2. If the MV2 is connected to the Graphics card, enter **NO**; otherwise enter **YES**. The next screen will appear.

```
                         MV Setup Program

Drive Letter for CONFIG.SYS file: C:\
Standalone Frame Grabber Setup: NO
Full path name to MVINIT.SYS: C:\MV2
                  General pathname to MVINIT.SYS
-----------------------------------------------------------
The default path is ....   (c:\)

Enter one of the following...
o    The complete path to MVINIT.SYS followed by 'Enter'
o    'Enter' to use the default Path
o    "Esc" to exit setup
-----------------------------------------------------------
```

If you need to, enter the path to your *MVINIT.SYS* file. (This is loaded in with the rest of your MV2 software.). You will not need to do this if you chose a standalone frame grabber setup. The following screen should display.

```
                         MV Setup Program

Drive Letter for CONFIG.SYS file: C:\
Standalone Frame Grabber Setup: NO
Full path name to MVINIT.SYS: C:\MV2
Declare type of graphic card: EGA


            Specify type of Graphics Card in system
-----------------------------------------------------------
The default Card type is ...(EGA)
Enter one of the following...
o    The word VGA or EGA followed by 'Enter'
o    'Enter' to default monitor
o    'Esc' to exit setup
-----------------------------------------------------------
```

MVSETUP will automatically sense the type of Graphics card you have installed in the system. If you wish to change it, enter the type of Graphics card you have - i.e., either EGA or VGA.

```
                        MV Setup Program

Drive Letter for CONFIG.SYS file: C:\
Standalone Frame Grabber Setup: NO
Full path name to MVINIT.SYS:
Declare type of graphic card: EGA
Declare Base Address:

                    Specify the Base address
-----------------------------------------------------------------
The default Base Address is ...(&H300)

Enter one of the following...
o   A number in the range of &H100 to &H3F0
    (256 to 1008 decimal) followed by 'Enter'
    The address must be a MODULA 16 number.
o   'Enter' to default address
o   'Esc' to exit setup
-----------------------------------------------------------------
```

Enter the Base Address assigned to the board. Valid Base Addresses range from &H100 to &H3F0 (256 to 1008 decimal). Decimal values are entered as is, Hex value must be precede by an ampersand (&) and H. For example, the decimal value 512 would be entered by pressing [5][1][2]. The hex equivalent value has to be entered as [&][H][2][0][0]. Next, the following screen will appear.

```
                      MV Setup Program

Drive Letter for CONFIG.SYS file: C:\
Standalone Frame Grabber Setup: NO
Full path name to MVINIT.SYS:
Declare type of graphic card: EGA
Declare Base Address: &H300
Declare Interrupt Level:
               Specify the Interrupt level to use
------------------------------------------------------------
The default Interrupt level is ...(5)

Enter one of the following...
o   Either 2,3,4,5,6,7 followed by 'Enter'
o   'Enter' to default level
o   'Esc' to exit setup
------------------------------------------------------------
```

Enter the Interrupt Level assigned to the board. Valid Interrupt Levels range from 2 to 7.

```
                    MV Setup Program

Drive Letter for CONFIG.SYS file: C:\
Standalone Frame Grabber Setup: NO
Full path name to MVINIT.SYS:
Declare type of graphic card: EGA
Declare Base Address: &H300
Declare Interrupt Level: 5
Declare DMA channel:
                  Specify the DMA level to use
---------------------------------------------------------
The default DMA level is ...(3)

Enter one of the following...
o   Either 1 or 3 followed by 'Enter'
o   'Enter' to default monitor
o   'Esc' to exit setup
```

Enter the appropriate DMA level. Valid DMA levels are 1 or 3. The program will then ask you if the setup information chosen is correct. Answer with the appropriate response.

```
                  VI Setup Confirmation
---------------------------------------------------------
Enter one of the following...
o   'N' if the above entries are NOT OK
o   'Enter' to continue
o   'Esc' to exit setup
```

If you press ↵ two prompts will appear on the screen. (An example of these is shown below.) Otherwise, depending on your answer, you will be allowed to change your responses or will be exited from the setup program.

```
Backing old CONFIG.SYS file to CONFIG.BAK and creating new CON-
FIG.SYS

Backup file already exists

Delete it? (Y/N)
```

```
Backing old AUTOEXEC.BAT file to AUTOEXEC.BAK and creating new
AUTOEXEC.BAK

Backup file already exists

Delete it? (Y/N)

.
.
.

If you use European standard camera, copy file config.eur to
config.vsc
```

If you choose to delete your back-up files, the existing *AUTOEXEC* and *CONFIG* files will be written to the *.BAK* files.

3. Now, reboot your system by pressing Ctrl Alt Del.

> *CAUTION*
>
> This procedure adds a command line to your *AUTOEXEC.BAT* file. If you take your MV2 board out of the system, be sure to remove the added line before you shut the computer down. Otherwise you will be unable to boot-up your system.

You are now ready to start-up your system using the procedure outlined in the next section.

5.7. QUICK START-UP

This section outlines a brief procedure for starting-up the MV2. It uses the *MV.EXE* program and assumes that the software has been installed as described in the MV2 Programmer's Manual. This procedure does not describe the *MV.EXE* program in detail. Additional information regarding this program is contained in the MV2 Programmer's Guide.

NOTE
If you start to run the program *MV.EXE* and receive an error message indicating that the environment variables have not been set using *MVSETUP*, and you did run the MVSETUP program, you will need to change the environment size using the DOS **SHELL** command (i.e., **SHELL = COMMAND.COM /E:800 /P**). Refer to the DOS Manual accompanying your computer.

The procedure also assumes that **MVSETUP** has been run and the MV2 and its associated hardware have been installed as described. Before you start, make sure that power to the camera and monitor(s) has been turned on.

1. Once you have installed your system, change to the directory containing the *MV.EXE* program, i.e:
   cd \mv2

2. Activate the program, type:

   mv

3. Cycle through the View Modes by pressing Ctrl V. You should see:

   text mode - the menu
   camera mode - some kind of image or noise line
   image mode - a crosshair cursor on a lined background
   overlay mode - the menu overlayed on the image mode's screen

   If you don't see anything in camera mode:

   a. Make sure that camera has been installed properly and all cables securely fastened.

b. Make sure the power has been turned on to the camera.
c. Try adjusting the offset and gain pots as described in the next section of this manual.

If you don't see anything in image mode:
a. Make sure the monitor(s) has been installed correctly and that the cables are securely fastened.
b. Make sure the power has been turned on to the monitor(s).

4. Try acquiring an image. Switch to Camera mode. Press Ctrl V continuously. Then, press Ctrl A. This brings in the image; but does not acquire it. An image should appear on the display. Make any adjustments necessary.

If the image is unclear:
a. Focus the camera.
b. Adjust the offset and gain pots as described in the next section of this manual.

If the image is too light or dark:
a. Adjust the lighting.
b. Adjust the gain pot. (See the next section of this manual.)

If no image appears on the display proceed to step 5. Otherwise, once the image is to your liking, press Ctrl A again. This acquires the image into video memory. You should be able to view the acquired image by changing to Image mode.

5. Now, see if you can bring a stored image up on the monitor. Press Ctrl V to change to the image mode. Now, press Alt D
At the prompt `Infile name`, type `fractal.sif`. A picture should be displayed. This may take a while so be patient.

If no picture appears do the following:
a. Make sure the power to the monitor(s) has been turned on and that all cables are securely fastened.

b. Press Ctrl Q to exit out of the *MV.EXE* program.
Check the directory for the file **`fractal.sif`**. If it is not present, copy it from the original MV2 disks into the directory. Repeat the above procedure.

6. Press Ctrl Q to exit out of the *MV.EXE* program.

Additional information regarding *MV.EXE* can be found in the MV2 Programmer's Manual.

5.8. SYSTEM ADJUSTMENTS

This section describes how to make system adjustments, like changing the Offset and Gain settings and adjusting the Phase Locked Loop. These procedures are not difficult to perform; however it does take practice to recognize when your image is as sharp and clear as it can be. It is suggested that you practice these procedures a few times, in order to get a feel for the settings required by your environment.

Figure 5-2 shows the location of the potentiometers which must be adjusted in these procedures.

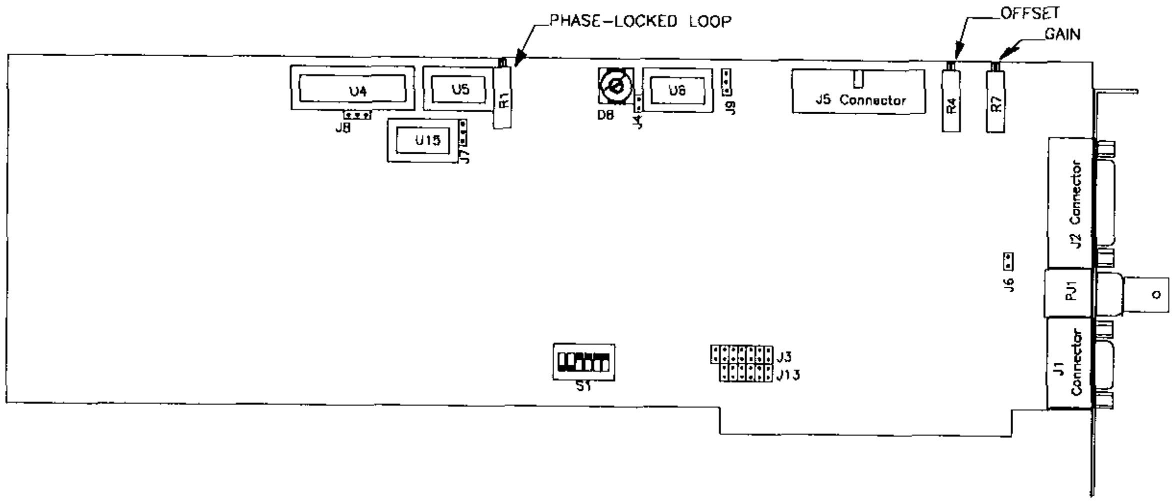

Figure 5-2. Location of Adjustment Pots

5.8.1 Phase-locked Loop Adjustment

This section describes how to adjust the image synchronization or "fine-tune" the image which has been displayed. This is necessary so that the most accurate representation possible is achieved. To synchronize the MV2:

1. Install the MV2 Board in the PC as described in section 4.7. Do not replace the cover of the PC.

2. Install the camera and monitor as described in sections 4.8 and 4.10.

3. Make sure all of the power cords for the computer, camera, and monitor are plugged in. Turn on the computer, camera, and monitor.

4. If necessary, wait until the camera has warmed-up.

5. Using a non-metallic alignment tool, turn the potentiometer (R1) nearest to

U15 clockwise as far as it will go.

6. Make sure the desired source is generating input. Using the alignment tool, slowly turn the potentiometer counter-clockwise until the edges of the image are locked and straight.

8. If necessary, re-adjust the potentiometer until the image's edges are sharp and still.

5.8.2 Offset and Gain Adjustments

The MV2 has been factory configured to display a video signal sourced from an RS-170/CCIR (or compatible) camera. However, under certain conditions - for example, a different brand/type of camera being used - the setting of the board's offset and gain potentiometers will need to be adjusted. See Figure 5-2 for the location of these pots.

In order to perform these adjustments, the board, camera, and display should already be installed. If this has been done and an image appears follow Procedure A. If no image appears, follow Procedure B.

> *NOTE*
> These procedures involve moving a potentiometer (pot) in a specified direction and should be performed with the board components facing you. Additionally, they require the use of a non-metallic alignment tool.

PROCEDURE A - IF AN UNCLEAR IMAGE APPEARS

If the image is unclear, and you have focused the camera to the best of your ability, try adjusting the Offset Pot (R4). First, move the Offset Pot using an alignment tool slightly clockwise. Observe the displayed image. Then move the Offset Pot to a slightly counter-clockwise position and observe the image. Note which image appears to be clearer. Then, move the Offset Pot in that corresponding direction.

If, at this point, the image is sharp but too light or dark, you will need to adjust the Gain Pot (R7). This is explained in Procedure C.

PROCEDURE B - IF NO IMAGE APPEARS

If no image appears, first set the Gain Pot (R7) to the middle position of its rotation. Then, move the Offset Pot, using the alignment tool, counter-clockwise until the pot "clicks". Watch for an image to appear. If no image appears, then slowly move the Offset Pot clock clockwise until the image appears.

When you have an image, it can be sharpened by adjusting the Offset pot as described in procedure A.

PROCEDURE C - LIGHTENING/DARKENING AN IMAGE

If the image is too dark or light and the lighting conditions are not poor, try adjusting the Gain Pot (R7). Using an alignment tool, move the Gain Pot slightly clockwise. Observe the displayed image. Then move the Gain Pot to a slightly counter-clockwise position and observe the image. Note which image appears to be lighter/darker. Then, move the Gain Pot in that corresponding direction.

CHAPTER 6
REGISTER DESCRIPTIONS

6.1 GENERAL

This chapter describes the Video System Controller (VSC) Registers and the MV2 Status Registers used by the MV2. The chapter focuses on the use of the MV2 Status Registers. Only an overview of the VSC registers is given. These VSC registers should not have to be manipulated by the user. Refer to the Texas Instruments' TMS34061 User's Guide for more detailed information. (A copy of this document can be obtained from MetraByte's Technical Support Staff. See Chapter 8 for more information.)

6.2 VSC REGISTERS

This section describes those registers which affect the operation of the MV2 such as the Video Control Registers, Offset Control Registers, Synchronization Control Registers, Look-up Table Address Register, and Display Control Registers. Each of the registers controls the way the image is interpreted, stored, or displayed. A general register address map is given in Table 6-1.

Table 6-1. Register Address Map

Base Offset(hex)	Register	Type	Function
0000-3C0F	XFER RAM to SAM	Write	Transfer Video Data From RAM to SAM
4000-7C0F	XFER SAM to RAM	Write	Transfer Video Data from SAM TO RAM
8000-840E	XY Indirect IMEM	Read/Write	R/W Image RAM
9800	VSC Reset	Write	Software Reset to the VSC
A000	Status Register 1	Read/Write	Clock source, Sync Source, A/D Enable control
A001	Status Register 2	Read/Write	Acquisition/Display Control
A002	Status Register 3	Read/Write	Read:VSC sync, Write: DB015 Control Bits
A003	DMA Enable	Write	Enable MV2 for DMA transfer cycles
A004	DMA Start Cycle	Write	Start the DMA transfer cycles
A005	Fast Host Access Write	Write	Host to SAM write data transfer
A006	Fast Host Access Read	Write	SAM to Host read data transfer
A007	Clear Fast Host Access	Write	Clear Fast Host Access read/write function
A800	Fast Host Access Port	Read/Write	Host from/to SAM data read/write port
B000	DAC RAM write mode	Read/Write	Color pallete write mode address register
B001	DAC Color Palette	Read/Write	Color pallete register
B002	DAC Pixel Mask	Read/Write	Pixel read mask register
B003	DAC RAM read mode	Read/Write	Color palette read mode address register
B004	DAC overlay write mode	Read/Write	Overlay palette write mode address regis-ter
B005	DAC overlay palette	Read/Write	Overlay palette register
B006	DAC (reserved)		
B007	DAC overlay read mode	Read/Write	Overlay palette read mode address register
C000-D006	VSC internal regis-ters	Read/Write	Configure and program VSC

6.3 MV2 REGISTERS

There are several on-board MV2 registers:

- Status Registers 1,2, and 3
- DMA Control Registers
- Fast Host Access Registers
- DAC Overlay Registers

6.3.1 MV2 Status Registers

There are three Status Registers used on the MV2 PC Board. Status Register #1 contains the signals for synchronization and clock control. Status Register #2 contains signals which are used for acquisition and display control. These Status Registers are read/write registers. Status Register #3 is used for two different functions. In the read mode, it is used as a status register. The host can read the status of the HSYNC, VSYNC, Composite Blank, and odd field indicator control signals. In the write mode it is used to set the two digital control bits which are connected to the DB-15 connector.

STATUS REGISTER #1 (A000)

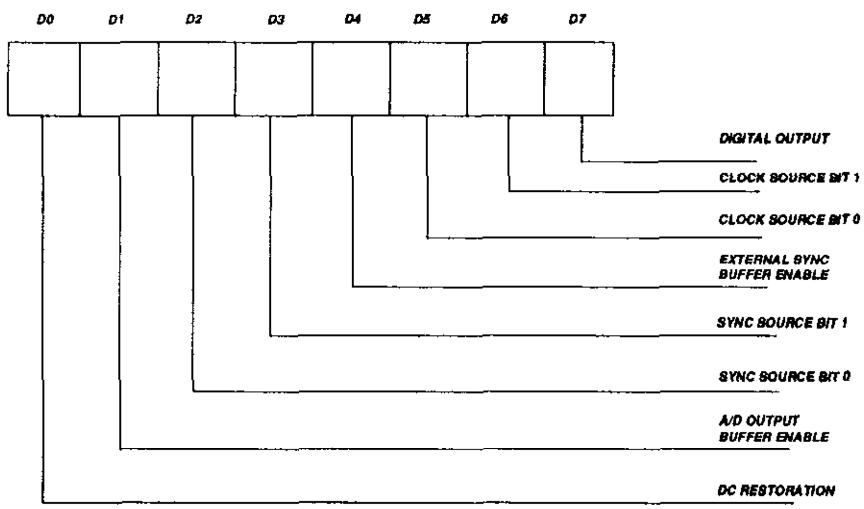

Figure 6-1. Status Register #1 Bit Assignments

Digital Output Control (D7)
This is a general purpose output control bit. It is connected to J2, pin#4. It can, for example, be used to control the aperture setting of a camera. This bit can be used with the other two TTL output bits, CTL0 (J2, pin #8) and CTL1 (J2, pin #7) for up to eight different control states.

Clock Source Bits (D6,D5)
There are two control bits which are used to select the source of the on-board clock. These signals are called CLK0 and CLK1 and are located at bit locations DB5 and DB6, respectively, in Status Register #1. The table below states the different conditions.

Table 6-2. Clock Source Bits

CLK1	CLK0	Description
0	0	RS-170/CCIR Interlaced (10.080 MHz.)
0	1	Undefined
1	0	External Clock (20.160 MHz. max.)
1	1	EGA (16.257 MHz.) or VGA (28.322 MHz.)

The RS-170 interface requires a 10.080 MHz. clock frequency. This frequency is used as the clock input to the 8-bit analog-to-digital (A/D) converter. This permits the analog video data from a camera, for example, to be converted to its digital equivalent in order for the image to be viewed through the display monitor or stored in the video image memory. It is also used to clock the digital-to-analog converter (DAC). The external clock input allows an external clock source to be used.

The EGA clock source is generated from an on-board oscillator operating at a frequency of 16.257 MHz. This clock is used as the clock source for the EGA graphics card. In this mode of operation, the EGA text/graphics is overlayed onto the video image which is being clocked out to the DAC at this frequency.

When a VGA graphics adapter card is being used, the interface is the same as the EGA case, except, the frequency is approximately 28.322 MHz. The EGA oscillator, Y1, has to be removed when operating in the VGA mode. Also, the jumper at location J8 has to be in the pin positions 2 and 3. The pixel clock from the VGA board is used as the source.

The video image can also be displayed through a standard VGA's DAC at the RS-170 frequency. Since the video image is "interlaced", an Analog Multisync monitor has to be connected to the VGA board. There is circuitry on the MV2 PC board which allows the video data, pixel clock, and sync signals to drive the feature connector.

External Sync Buffer Enable
This bit allows the HYSNC and VSYNC generated from the sync stripper, the VSC, or the EGA/VGA to be driven off board through the DB-15 connector, J2. If the SYNC SOURCE bits (See 6.3) are set to allow an external HSYNC and VSYNC (SYNC0 = 0 and SYNC1=1) as the source then this bit will automatically be disabled. The user must make sure that there are no conflicts if another source is used, this enable bit is set, and external HSYNC and VSYNC are set as inputs.

Sync Source Bits (D3,D2)
There are two control bits used to select the source of the horizontal (HSYNC) and vertical sync (VSYNC) signals. These two bits are named SYNC0 and SYNC1. Table 6-3 defines their states.

Table 6-3. Sync Source Bits

Sync Control Bits		Description
SYNC1	SYNC0	
0	0	**Mode 0** - RS-170/CCIR Input
0	1	**Mode 1** - Video System Controller (VSC)
1	0	**Mode 2** - External HSYNC, VSYNC
1	1	**Mode 3** - EGA or VGA

The sync source is available from the four sources as described above in the Table. If it is desired to view the camera image through the display monitor then the RS-170 input should be selected. This state is also used when the camera image is to be stored in the video memory. This process is known as "acquiring" the image. The Video System Controller (VSC) can be the sync source in the case of displaying the stored image.

Some video sources can supply separate sync signals. The MV2 can be programmed to accept these signals, when programmed in mode 2. The signals have to be TTL compatible. The EGA/VGA sync signals can be used as the source, for example, when EGA/VGA text/graphics are to be overlayed on the stored image.

Figure 6-2 illustrates the data flow when the Sync Control is set from a composite video signal (RS-170 camera).

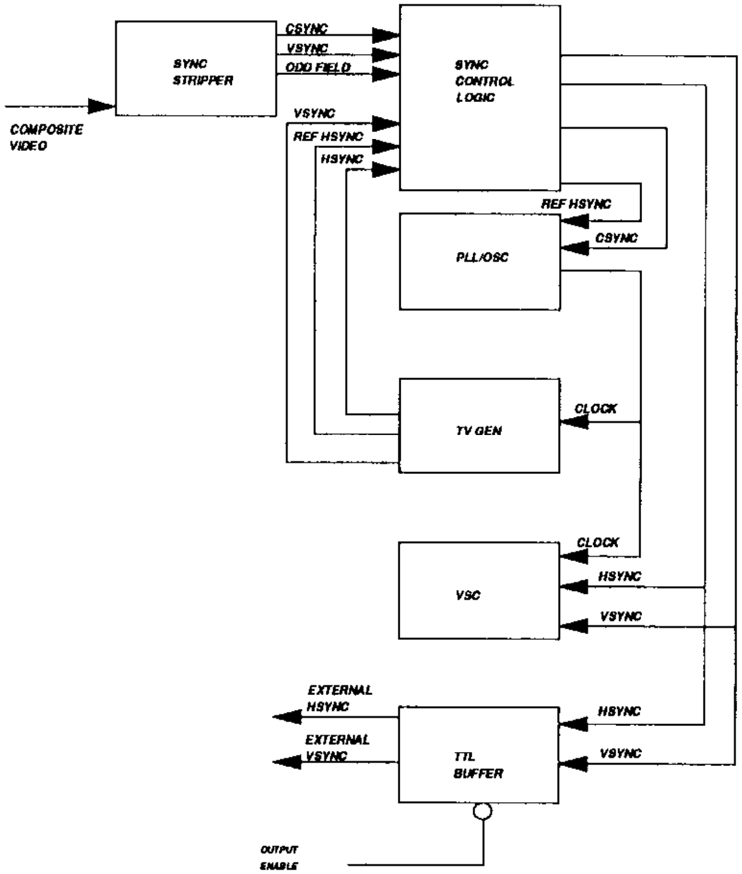

Figure 6-2. Sync Mode 0 - RS170 Sync Source

Figure 6-3 illustrates the data flow when the Sync Control is set from the VSC.

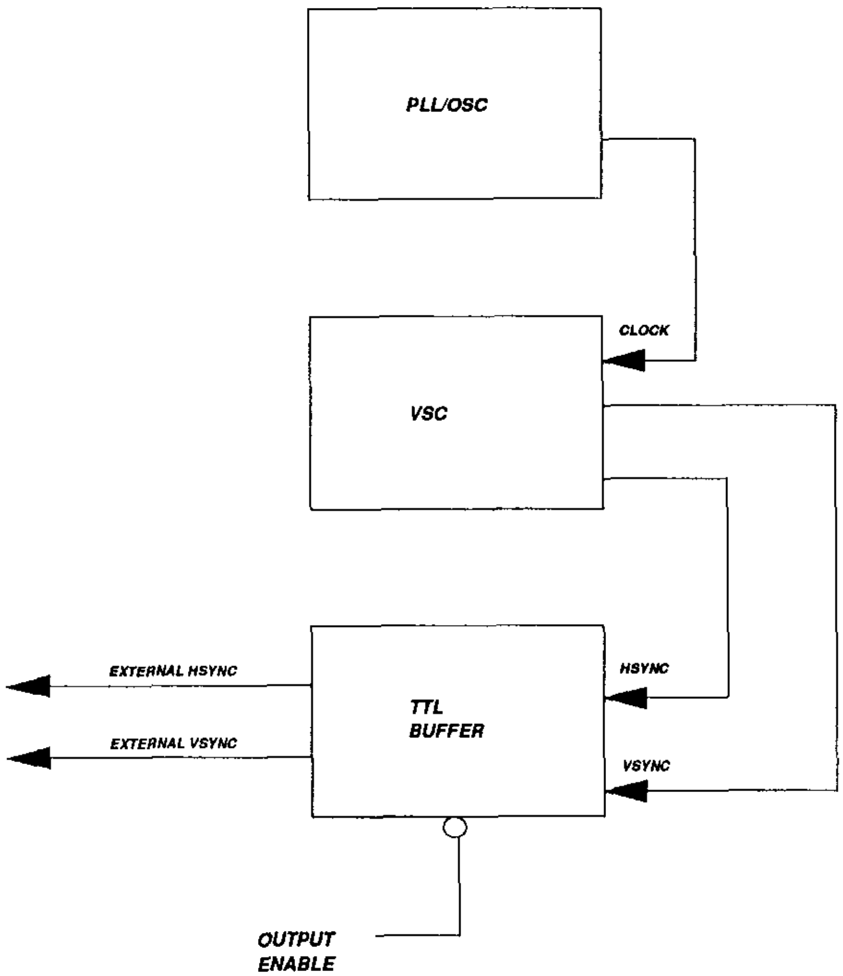

Figure 6-3. Sync Mode 1 - VSC Sync Source

Figure 6-4 illustrates the data flow when the Sync Control is set from an external HSYNC and VSYNC signal.

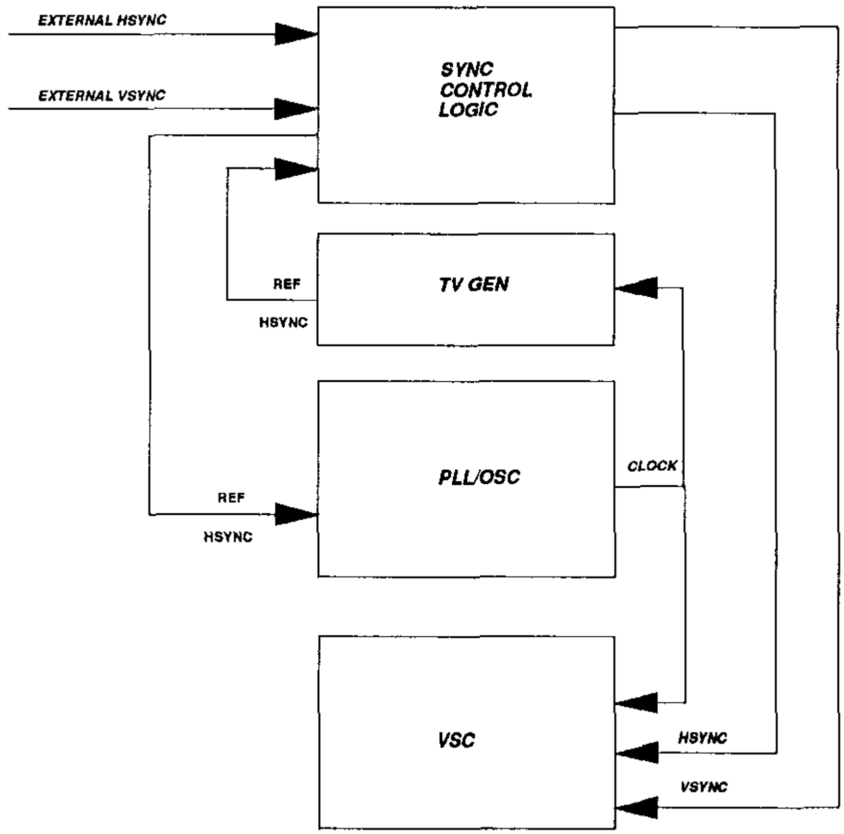

Figure 6-4. Sync Mode 2 - External HSYNC,VSYNC Sync Source

Figure 6-5 illustrates the data flow when the Sync Control is set from an EGA PC card.

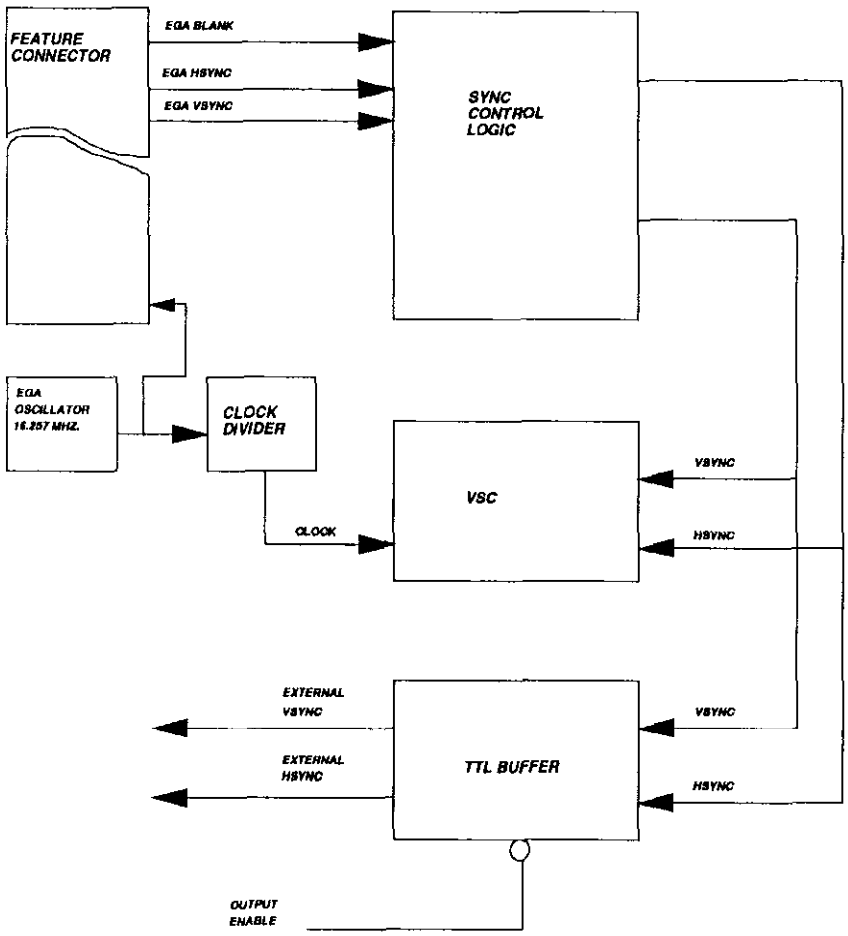

Figure 6-5. Sync Mode 3 - EGA Sync Source

Figure 6-6 illustrates the data flow when the Sync Control is set from an VGA PC card.

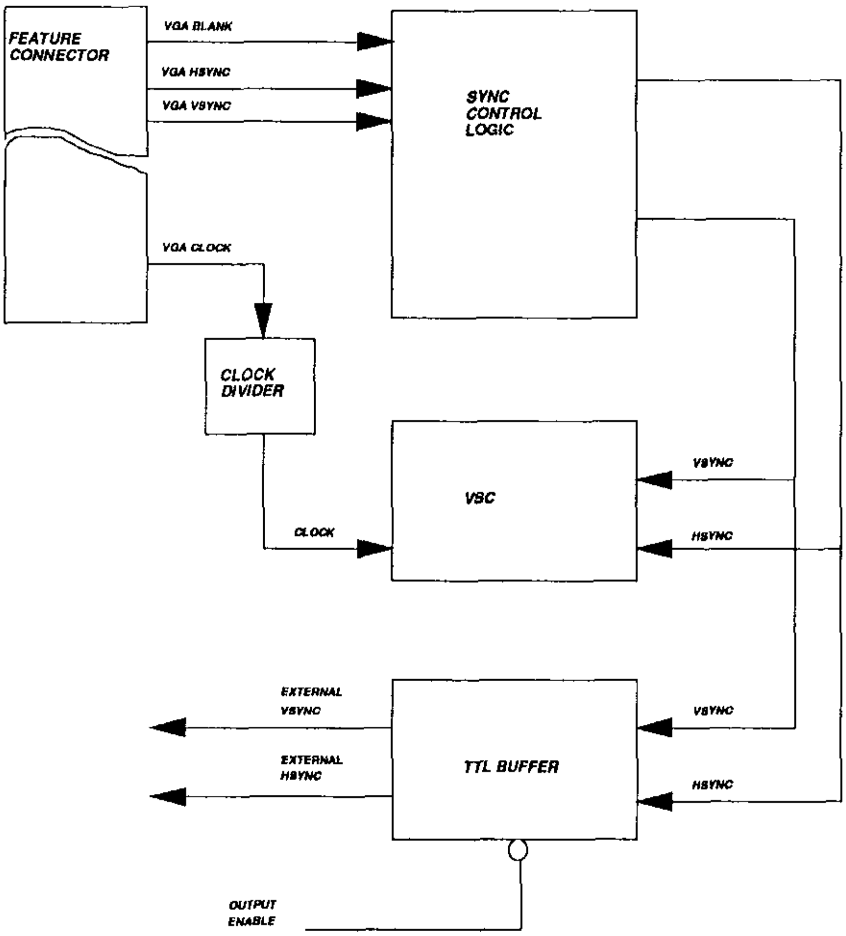

Figure 6-6. Sync Mode 3 - VGA Sync Source

A/D Output Buffer Enable
This bit enables the output buffer of the A/D. This bit is enabled during image acquisition to allow the digital data to be stored in the video frame buffer.

DC Restoration Enable

DC Restoration adjusts the signal so that it maintains approximately the same offset voltage through the transformation process. This is necessary to ensure that the video signal's black level is always digitized as one value.

DC Restoration should be enable when using RS-170/CCIR format. This is because RS-170/CCIR ensures that the signal level immediately following the sync pulse corresponds to the black level. This correction of the DC bias occurs at horizontal line rates. If RS-170/CCIR is not used, it is suggested that DC restoration be disabled. Formats other than RS-170/CCIR may not contain black level data.

STATUS REGISTER #2 (A001)

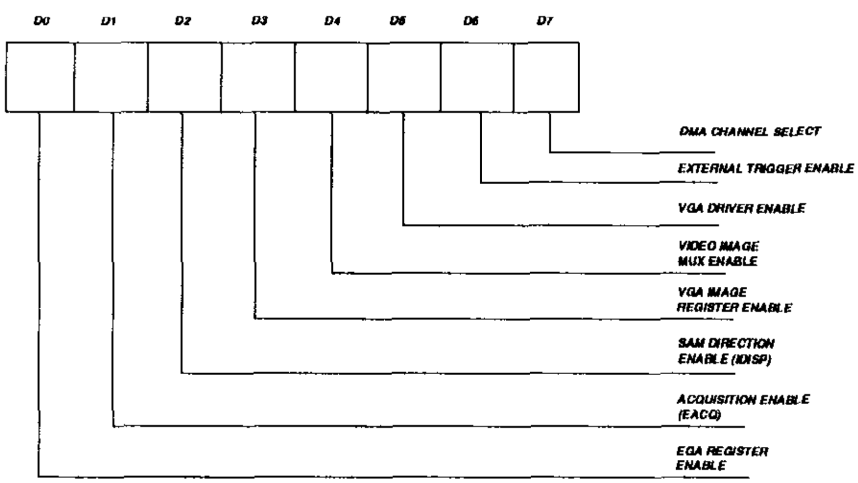

Figure 6-7. Status Register #2 Bit Assignments

DMA Channel Select

There are two sources for DMA operation on the MV2 board. DMA can be used with the Video System Controller (VSC) during the X-Y Indirect address mode for the + X increment operation only. (See the VSC Operator's Manual for more information.) DMA operations can also be performed to the Fast Host Access (FHA) interface. When the bit is set to a logic "0", the VSC DMA operations will occur. If it is set to a logic "1", then FHA DMA cycles will be performed.

External Trigger Enable

This bit, when set to a logic "1", will allow an interrupt, which is externally sourced, to be generated and serviced by the Host PC. The interrupt, for example, could initiate the start of a frame acquisition.

VGA Driver Enable

This bit allows the MV2 Sync signals and pixel clock to drive the feature Connector when the MV2 is interfaced to a VGA card. The video image (which can be a "live" image from a camera or a stored image from the video memory) can be displayed through the VGA card's DAC.

Video Image MUX Enable

This bit allows the HSYNC, VSYNC, and BLANK signals from the EGA/VGA card to drive the MV2's DAC directly. Otherwise, these signals are generated on the board. These bits are directly connected to the VGA DAC pixel data input. This bit is active low.

EGA/VGA Image Register Enable

This bit allows the video pixel data to drive the VGA Feature Connector, allowing a "live" camera or stored image to be displayed through the VGA card's DAC.

SAM Direction Enable(IDISP)

This bit is used to set the display modes of the MV2. The signals are located in bit position D2 of Status Register #2. The IDISP (Image Display) signal is used to enable the clock to the SAM (Serial Access Memory) portion of the VRAM (Video RAM). This signal is active high.

This bit is used in combination with the EACQ bit, and Fast Host Access Read/Write Enable registers to set the acquisition and display modes of the MV2. See section 6.5.2 for more information.

Acquisition Enable (EACQ)

This bit is used to set the acquisition mode of the MV2. The signal is located the bit position D1 of Status Register #2. The EACQ (Acquisition Enable) signal is used to capture a video image and store it in the video memory. This signal is active high.

EGA Register Enable

This bit allows EGA/VGA character/graphics digital data to address the overlay color palette of the DAC. In this manner, the character/graphics can be overlayed with the image which is stored in the frame buffer. If this bit is disabled (logic "0") then only the image will be displayed on the monitor.

STATUS REGISTER #3 - I/O WRITE (A002)

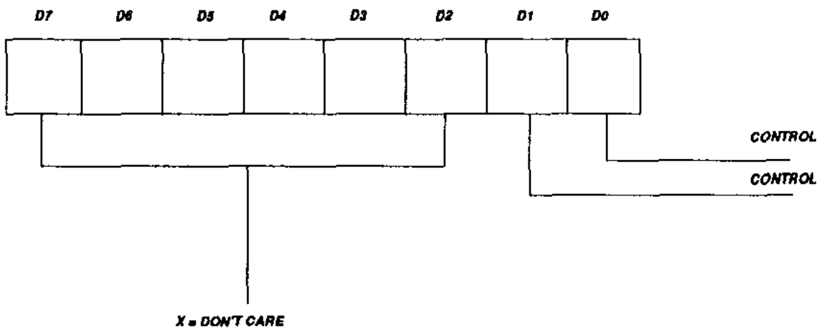

Figure 6-8. Status Register #3 Bit Assignments

Control Bits (CTL0,CTL1)

These two TTL compatible output bits are general purpose bits. These bits can be used for programmable camera function control (i.e., auto focus, aperture). If these two bits are used in conjunction with the "DIG OUT" bit in Status Register #1. (D7), then eight states can be generated.

STATUS REGISTER #3 - I/O READ

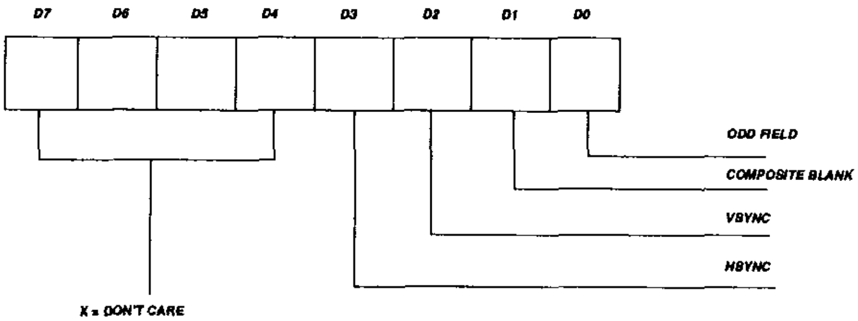

Figure 6-9. Status Register #3 Bit Assignments

Odd Field

This is a TTL signal which is generated from the on-board Sync Stripper (U19). When this bit is a logic "1", the video source will be sending the odd field portion of the interlaced frame of video data.

Composite Blank

This is a TTL signal which is produced by the VSC during horizontal and vertical sync times.

VSYNC

This is a TTL signal that controls the start of a frame of video data. It is used to reset the vertical counters to start the beginning of a frame.

HSYNC

This is a TTL signal which controls the beginning of the acquisition of a line of video data. A high going transition initiates a transfer of line data in the camera's CCD array.

6.3.2 Fast Host Access Registers

The Fast Host Access Registers can be used in combination with the EACQ and IDISP Control Bits (D1 and D2 on Status Register #2) to perform Fast Host Access Read and Writes. Both the Fast Host Read and Write signals are active low. This circuitry allows the Host PC to have a direct interface to the SAM portion of the VRAM.

Table 6-4 shows the different configurations for all four control bits.

Table 6-4. VRAM Acquisition and Display

Fast Host Access Write Register	Fast Host Access Read Register	EACQ	IDISP	Description
1	1	0	0	Display, VRAM to DAC
1	1	0	1	Image Clock Off
1	1	1	1	Acquisition, Camera to VRAM
1	0	0	0	Fast Host Access Read
0	1	0	1	Fast Host Access Write

FAST HOST WRITE ENABLE REGISTER (A005)
The FHA Write Enable Register (See Figure 6-10.) Is used to set the MV2 in the FHA write mode. In this mode, the host can directly write to the SAM portion of the VRAM. This operation allows the DRAM portion of the VRAM to be written to quickly.

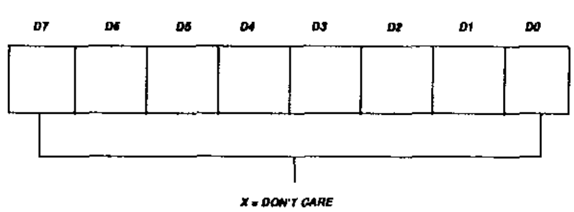

Figure 6-10. Fast Host Access Write Enable Register

FAST HOST READ ENABLE REGISTER (A006)

The FHA Read Enable Register (See Figure 6-11.) is used to set the MV2 in the FHA Read mode. In this mode the host can read data directly from the SAM register.

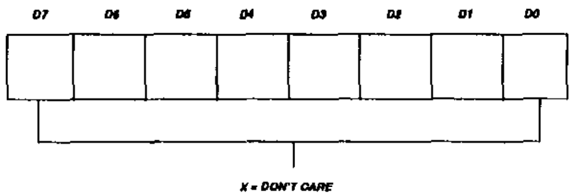

Figure 6-11. Fast Host Access Read Enable Register

FAST HOST ACCESS CLEAR REGISTER (A007)

The FHA Clear Register is used to terminate the FHA Read or Write operation. This register is write only and must be written to before the FHA cycle begins and also when the FHA cycle is completed.

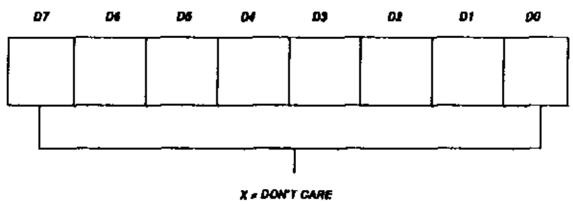

Figure 6-12. Fast Host Access Read Enable Register

6.3.3 DAC Registers

There are four DAC Control Registers which are used to manipulate the RAM (Overlay) color palette:

- DAC Write Mode
- DAC RAM Read
- DAC Color Palette RAM Register
- DAC Pixel Read Register

Each is described below.

DAC WRITE MODE REGISTER (B000)

The DAC RAM (Overlay) Write Mode Register is used to set the initial address in order to perform an I/O write to the RAM (Overlay) color palette inside the DAC. This address only has to be set only once because after each write operation the logic within the DAC will automatically increment the address to the next RGB location.

D7	D6	D5	D4	D3	D2	D1	D0
AB7	AB6	AB5	AB4	AB3	AB2	AB1	AB0

Figure 6-13. DAC Write Mode Register

DAC RAM (OVERLAY) READ MODE REGISTER (B003)

The DAC RAM (Overlay) Read Mode Register is used to set the initial address in order to perform an I/O read to the RAM (Overlay) color palette inside the DAC. The auto increment mechanism works in the same manner as described above.

D7	D6	D5	D4	D3	D2	D1	D0
AB7	AB6	AB5	AB4	AB3	AB2	AB1	AB0

Figure 6-14. DAC RAM Mode Register

DAC COLOR (OVERLAY) PALETTE RAM REGISTER (B004)

The DAC RAM (Overlay) Palette Register is an 8-bit register which is used to write/read the red, green, and blue color values to/from the RAM (Overlay) color pattern.

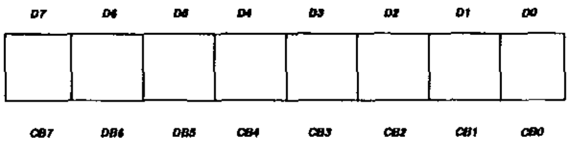

Figure 6-15. DAC Color Palette RAM Register

DAC PIXEL READ MASK REGISTER (B002)

The DAC Pixel Read Mask Register is an 8-bit register which is used to mask the RAM color palette bits. The contents of this register are bit-wise logically ANDed with the RAM color palette bits. In the case of the MV2, the eight video image bits are connected to the RAM color bits.

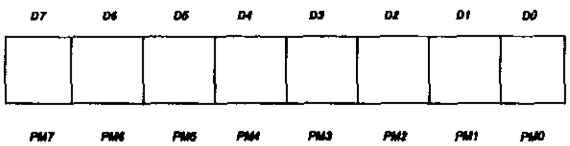

Figure 6-16. DAC Pixel Read Mask Register

6.3.4 DMA Registers

The MV2 will support DMA (Direct Memory Access) operations to the VSC during the during +X increment X-Y Indirect Address mode cycles and during FHA Read or Write cycles. The DMA controller on the host must be previously initialized for the particular DMA cycle which is to be performed and the correct DMA channel must be selected on the MV2 PC Board.

The DMA cycles are initiated by performing an I/O write operation to offset address location 0A004H. All the data bits are "don't cares". This operation will set the DMA Request signal on the PC Backplane. The jumper block J13 has to be correctly set before performing any DMA operations. These jumpers will set up the proper DMA channels (See Chapter 3). The "DMA_SEL" (DMA SELECT) is used to select DMA operations between the VSC or the Fast Host Access (FHA) interface. This signal is located at bit position 7 (DB7) of Status Register #2. A logic 0 will select the VSC while a logic 1 will select the FHA interface. The DMA Enable bit also has to be set. This bit is at location DB0 at offset address location A003H.

When performing DMA operations via the VSC X-Y Address Mechanism and there is a need to update the VSC X-Y address registers, the DMA enable register bit has to be reset (DMA disabled) before accessing the VSC X-Y address registers. During the VSC DMA operations, this bit along with the DMA SELECT bit in Status Register #2, is used to set the function control input bits of the VSC. When the VSC X-Y DMA operations are to be continued, then the DMA Enable bit has to be set again. This procedure would be used if X-Y windows are to read from or written to image memory under DMA control because a new "Y" address has to be calculated after a row is accessed.

Some personal computers use dynamic memory controllers which perform an "early write" to the system RAM. This type of write operation is valid for both NON-DMA and DMA write cycles. Because of the ready logic circuitry in the VSC chip, the data from the image memory will not be valid at the beginning of the write cycle. Therefore, if VSC + X increments DMA read operations are used with personal computers using this dynamic RAM memory controller design, the image data which is read into the system RAM can be erroneous. Please refer to the technical reference manual accompanying your personal computer to find out if this type of memory controller design is used.

DMA ENABLE REGISTER (A003)

The DMA Enable Register will enable the MV2 for the specified DMA operation. This bit (DB0) is active high and an I/O write must be performed at offset address location 0A003h.

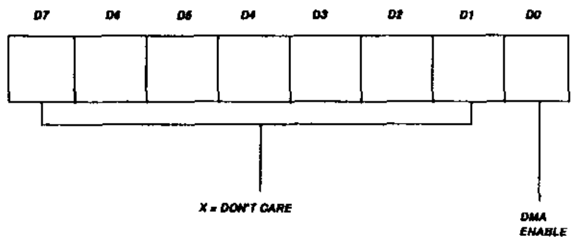

Figure 6-17. DMA Enable Register

DMA START CYCLE REGISTER (A004)

The DMA Start Cycle Register is used to start the DMA cycle operation on the MV2. When an I/O write is performed at offset address location 0A004H it immediately sets the DMA Request signal on the PC backplane.

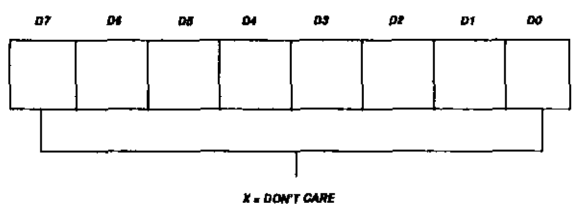

Figure 6-18. DMA Start Cycle Register

CHAPTER 7
OPTIONS AND ACCESSORIES

7.1 GENERAL

This chapter provides a brief description of each major MV2 peripheral (i.e., cables, interface boxes, and power supplies are not described.) sold by MetraByte. The chapter also gives specifications for each of these. This chapter is intended as a reference guide should you wish to expand your MV2 system. Contact MetraByte's Technical Sales Department to order any additional equipment.

Table 7-1 provides a listing of options and accessories for the MV2 system.

Table 7- 1. MV2 Options and Accessories

MV2 Boards and Interface Boxes	
Part No.	Description
MV2-170	MV2 Frame/Line Grabber with RS-170 interface.
MV2-CCIR	MV2 Frame/Line Grabber with CCIR interface.
MVIB-1	Generic Interface Box.
MVIB-PS	Interface Box Power Supply.

Cameras	
Part No.	Description
JE2362	RS-170 CCD Camera w/ 16 mm a/i lens
CT-3800	RS-170 CCD Camera with fixed iris
JE2352X	CCIR CCD Camera
CAM-PS	12 Vdc @ 300 mA wall-mount external power supply with screw terminal output connectors (for cameras)

Cables	
Part No.	Description
C-BMM-5	BNC Cable, male to male, 5'
C-BMM-15	BNC Cable, male to male BNC Cable, 15'
C-BMF-5	BNC Cable, male to female BNC Cable, 5'
C-BMF-15	BNC Cable, male to female BNC Cable, 15'
C-BTM-15	BNC Cable, thin, male to male, 5'
C-DBM-6	DB9 to BNC Cable, 1 DB9 to 4 male BNC, 6'
ADP-FFT	BNC "T" Adapter, female/female/female
ADP-FMT	BNC "T" Adapter, female/male/female
ADP-FF	BNC to BNC Adapter, female to female
ADP-BR	BNC to RCA Adapter
CMV-9MM-5	DB9 Cable, male to male, 5'
CMV-9MM-15	DB9 Cable, male to male, 15'
CMV-15MM-5	DB15 Cable, male to male, 5'
CMV-15MM-15	DB15 Cable, male to male, 15'
CAM-PS-JE	Power cable for JE2362X/JE2362 cameras
CMV-CT-10	H/V Sync, power, and shutter control for CT-3800 camera
CAM-PS-JE	Power Cable. Connects camera power supply (CAM-PS) to JE2362 or JE2352X.

Trackballs and Digitizer Tablets	
Part No.	Description
MD7-1212	12" x 12" Digitizer
TBALL	3-Button TrackBall

Software	
Part No.	Description
MVLIB-2	Subroutine Library for the MV2 Board

7.2 3-BUTTON TRACKBALL

The 3-Button TrackBall is a highly sophisticated opto-electronic pointing device designed for use in graphics applications. It is installed by plugging into a standard RS-232C port on your computer. Software driver support for use with DOS versions 2.0 or greater is provided.

Specifications:

Size:	7.5" L x 4.25" W x 2.63"H (187.5 mm x 106.3 mm x 65.8 mm)
Unit Weight:	12 oz. (340 g.)
Shipping Weight:	18 oz. (510 g.)
Ball:	2.25 " diameter (56.3 mm)
Trace Wheel:	1.5" diameter, 0.63" width (37.5 mm X 15.8 mm)
Buttons:	0.7" d x 0.5 " w, three buttons (17.5 mm x 12.5 mm)
Cable:	6 Conductor, shielded 4 ft. length (1.2 m)
Connectors:	25-pin DB25, D type sub-miniature female connector
Power Requirements:	Power is supplied by the RS-232C interface signals RTS (Request to Send), DTR (Data Terminal Ready), and RxD (Receive Data).
RTS and DTR:	+ 6V to + 15 V at 2.5 mA or -8 V to 15 V at 2.5 mA in any signal combination. Both signals must be high during operation.

RxD:	-6V to -15V at 2.5 mA

7.3 Digitizer Tablet

This is a Digitizer that makes use of an electrostatic coupling method, which is extremely resistant to noise interference and make stable, high, resolution reading possible. It can be connected to not only personal computers, but also a wide variety of computer and scan be used as a data input device in numerous field from CAD/CAM to electronic mail.

Specifications

Detection:	Data input is accomplished with the stylus pen based on an electrostatic coupling method. (The stylus pen can be interchanged with a ballpen.)
Effective Reading Area:	210 mm x 300 mm (A4 size)
Resolution:	0.1 mm
Reading Accuracy:	Within ± 0.5 mm.
Guaranteed Accuracy Height:	(thickness of paper, plastic, and other insulators on the board). Less than 0.5 mm.
Operating Speed:	60, 30, 15, or 7 point/sec
Scaling:	millimeter/inch
Operation Mode:	(1) Point (2) Switch stream 1 (3) Switch stream 2 (4) Steam

Pattern of Data Transfer:	(1) Binary Format (2) BCD Format
Interface:	RS-232C Standard
External Dimensions:	445 mm x 280 mm x 29.5 mm
Weight:	Less than 1.6 kg. (not including stylus pen and adapter unit)
Electrical Source:	AC adapter +12 V 500 mA
Environmental:	Operating Temp: 5° to 38 °C Operating Humidity: 20 - 80% Storage Temperature: 0° to 45 °C Storage Humidity: 10 - 90%

7.4 CT-3800 RS-170 CCD Camera w/ fixed iris

Electronically shuttered Computar 3800, with speeds of either 1/60 sec. or 1/1000 sec., can capture the important details of fast moving objects clearly, without distortion. From tiny components on high speed production lines to virtually any requirement for accurate viewing of moving or stationary objects. Shutter or conventional modes produce video that can be used with any professional VTR, frame store or image analysis system.

Highlights: 422 x 489 pixel array 1/2 CCD, 2 types of external sync (separate HD, VD, input and composite sync signal input); Interlace/Non-Interlace scanning; Switchable active or Disabled AGC & Gamma; Auto Iris capability.

Precisely and ruggedly built, computer 3800 helps you see better, longer.

Features

1/100 sec electronic shutter - Distortion free imaging of moving objects.

422 x 489 1/2 " Interline Transfer CCD - For high resolution NTSC imaging.

Switchable: Scan, AGC, Gamma, Shutter Mode - Many applications served with the same model.

Auto level control output - For applications with illumination changes.

Outstanding Low Light Performance - 0.41 lux faceplate illumination produces 1v P-P video.

Can be used with a wide variety of sync formats without special interfaces - Non-interlace, interlace, composite, and internal.

Specifications

CCD	MN3734 SK (Matsushita)
Image Format	1/2" Interline transfer CCD
Active Image Area	6.41 mm. H x 4.89 mm V.
Pixel Array	422 H. x 489 V
Pitch	15.2 H x 10.0 V µm
Electronic Shutter	1/60 sec or 1/1000 sec (internally selectable or by ext. signal)
Scanning	2:1 Interlace or non-interlace (Switchable)
Drive Frequency	HD 15.73 KHz.; VD 59.9 Hz.

External Sync	HD 15.734 Khz. ± 1%, 4 V P-P ± 1V negative VD 59.942 Hz. ± 1%, 4V P-P 1 V negative Composite 4V P-P ± 1V negative
TV Line Resolution	310 H,; 350 V.
S/N Ratio	50 dB TYP
Scene Illumination	3 lux w/o IR filter (min)
Video Signal Output	1.0V P-P into 75 Ohms.
Gamma	γ1.0 or γ0.6 (internally selectable)
AGC	Disable, + 0 dB enable, + 10 dB (internally selectable)
ALC Output	Video signal, 12 Vdc, Ground
Power	11-16 Vdc @ 240 mA < 500 MV P-P ripple
Lens Mount	"C"
Operation Temperature	0° to 50 °C
Operation Humidity	less than 70%
Storage Temperature	-20 ° to 60 °C
Storage Humidity	less than 90%
Size	1.77" W x 1.56" H x 4.39" L
Weight	8.8 oz.
Accessories	ALC connector

7.5 JE2362 RS-170 CCD Camera w/ 16 mm a/i lens

This newest generation MOS. sensor incorporates an innovative design that once and of all abolishes the word "smear" or "bloom" from the camera user's dictionary. Javelin's new monochrome JE2362 is the first moderately priced solid state camera to truly eliminate these effects. In the past, virtually all CCD and MOS. solid state cameras have exhibited a phenomena called "vertical smearing" - a nasty effect that occurs when the camera looks directly at a bright light source in a relatively dark background .

Features

Solid state image sensor eliminates bloom, smear, burn, lag, and residual image.

Greatly improved contrast over prior generation MOS. cameras.

Movable Tripod mount, top or bottom for application flexibility

Back Focus Adjustment Capability

External RS-170 2:1 sync or Internal Sync, plus optional External Composite Sync Capability

Optional non-interlaced scan

Switchable AGC on/off

Selectable Gamma Correction

Ideal for Inspection (manual or automated). Robotics (position control and pattern recognition), machine visions and image processing, vehicular rear vision, and surveillance

Specifications

Imaging Sensor:	MOS. Solid State
Scanning Area:	8.8 mm (H) x 6.6 mm V. (Equivalent to 2.3 " Tube)
Pixel Matrix:	576 (H) x 485 (V)
Scanning Format:	EIA RS-170 , 2:1 Interlace
Scanning Frequency:	Horizontal = 15.734 kHz. Vertical = 59.94 Hz.
Sync:	Horizontal and Vertical
Video Output:	1.0 V p-p (75 OHms unbalanced)
Minimum Scene Illumination:	5 lux 0.5 fc (f/1.4) , full video
Signal to Noise Ratio:	Greater than 46dB
Horizontal Resolution:	Greater than 450 TV Lines
Operating Temperature Ranges:	-10 to 50 ° C
Relative Humidity:	0 to approximately 95%
Lens Mount:	C-Mount with back focus
Power Requirements:	12 Vdc

Operating Current:	250 mA
Dimensions:	56 (W) x 48 (H) x 115 (D) mm
Weight:	350 g. less lens
Connections:	Power - 4-pin (HIROSE HR10A-7P-4S) Auto Iris - 4-pin (HIROSE HR10A-7P-4P) Ext. Sync - 6-pin (HIROSE HR10A-7P-6S) Video Out - BNC
Internal Controls:	(1) Gamma Selection (2) AGC On/Off
Recommended Power Supply:	PS812DC or JE12PP
Optional:	JE2362NI - non-interlaced version

CHAPTER 8
MAINTENANCE AND REPAIR

8.1 GENERAL

This section describes MetraByte's equipment warranty and details how to return equipment for repair. It also gives preventive maintenance procedures.

8.2 WARRANTY INFORMATION

All products manufactured by MetraByte are warranted against defective materials and workmanship for a period of **one year** from the date of delivery to the original purchaser. Any product that is found to be defective within the warranty period will, at the option of MetraByte, be repaired or replaced. This warranty does not apply to products damaged by improper use.

WARNING

MetraByte Corporation assumes no liability to damages consequent to the use of this product. This product is not designed with components of a level of reliability suitable for use in life support or critical applications.

8.3 RETURN-TO-FACTORY INFORMATION

Before returning any equipment to the factory for repair, you must first call the Technical Support Department at (508) 880-3000. They will try to diagnose and solve your problem over the phone. If they ascertain that the unit has to be returned to the factory for repair, they will issue a Return Material Authorization (RMA) number. Note that if the board is to be repaired under warranty, the Technical Support Department will need your invoice number and the data the board was purchased. Please reference the RMA number on any correspondence regarding the board.

When returning the Board for repair, please include the following information:

1. A brief description of the problem.
2. Your name, address, and telephone number.
3. The invoice number and the date when the board was purchased.
4. Repackage the board in its original anti-static wrapping (and handle it with ground protection) and ship it back to:

Repair Department
MetraByte Corporation
440 Myles Standish Boulevard
Taunton, Massachusetts 02780

Telephone:(508)880-3000
Telex:503989
FAX:(508)880-0179

Be sure to reference your RMA number on the outside of the package!

GLOSSARY of MICROCOMPUTER VISION/IMAGING TERMINOLOGY

- A -

Active Line Time The part of a composite video signal containing visual information. The sync and blanking periods comprise the non-active portion of the composite video signal. Also called the video or picture signal. See video signal

Access Time The time required to (1) store and retrieve data for transactions between main memory and system peripherals or (2) to retrieve a word (16-bits) of data from main memory.

Accuracy The maximum error of a measured value with respect to its true theoretical value.

Acquisition Time The time required for the "front end" of an image processing system to capture an input video signal and hold that signal to within a specified error band after a sample command is received.

Address (1) A unique digital code that identifies a register, memory location or add-on board within a microcomputer system where information is stored. (2) That portion of a program instruction that includes a specific memory location. (3) The act of storing or retrieving data from a specific memory location.

Address Bus The communication lines used to transfer address information between components in a microcomputer system (for example, the system processor and main memory). In a typical microcomputer system, the address bus consists of 20, 24 or 32 parallel lines.

Aliasing (1) An undesirable phenomenon wherein a sampled signal is degraded by false lower frequency components. Normally caused by sampling data at an insufficient rate. (2) The distortion of an image on a raster scan display caused when the detail of an image exceeds the resolution of the CRT.

Amplitude The voltage level of a

signal at a given point in time. In video signals, amplitude represents brightness.

Analog to Digital Conversion — **(A/D)** The process whereby an analog input signal is changed into a digital code. The digital value corresponds to the magnitude of the analog signal at the instant of acquisition.

Analog to Digital Converter — **(A/D or ADC)** An electronic circuit that a digital output code that is directly proportional to a continuous analog input.

Architecture — The specific components, and the way those components are interconnected, that make up a microcomputer system. Often used to describe the specific bus structure within a microcomputer.

Area Analysis — A method for determining the portions of a given image that fall within a specified gray level.

Aspect Ratio — The proportional measurement of image size in terms of horizontal length versus vertical height. For example, an image with an aspect ratio of 4:3 has a horizontal length that is 4/3 the vertical height.

Attenuation — The decay in signal amplitude caused by resistance in transmission lines.

* * * * *

- *B* -

Back Porch — See blanking level.

Background — An operation or application program that is not visible or under the direct control of the computer operator.

Backplane — The parallel circuit path that carries data and address information throughout a microcomputer system. See bus.

Bandpass Filter — A filter that allows a select range of frequencies to pass while attenuating all frequencies outside the range.

Bandwidth — **(BW)** The range of frequencies over which a microcomputer or microcomputer subsystem will operate to within specified limits.

Base Address — A memory location that serves as a reference point. All other memory address locations are derived by adding or subtracting to/from the base address.

Bit — The smallest unit of binary information. A bit will have a value of "1" or "0". Eight bits make up a byte of information and 16-bits make a word. Derived from **B**inary dig**IT**.

Blanking — The suppression of video information during sync and screen retrace periods. See blanking level.

Blanking Level The level separating the sync level and the video portions of a composite video signal. Also referred to as the front porch, back porch and pedestal, this level produces the blackest picture possible. See blanking.

Brightness The value that represents the gray scale level (from black to white) of a pixel.

Brightness Resolution The accuracy to which the brightness of a pixel can be measured. Normally given as a number of bits, for example, 4 -bits of resolution will yield 16 possible gray levels. See resolution.

Buffer A device used to store data temporarily, normally to compensate for differences in speed between system components.

Bus A communication network consisting of a parallel data path within the microcomputer system that is shared by system components. Usually described by the "width" of the parallel data lines available, typical microcomputer busses are 8-, 16- or 32-bits wide.

Byte Eight related "bits" of information processed as a unit. See bit and word.

* * * * *

- C -

CCD Camera A solid state camera that utilizes a charge-coupled device to digitize acquired images. CCD cameras read pixel brightness serially on a line by line scan pattern.

Cellular Analysis A method of assigning gray level and location information to individual pixels.

Central Processing Unit **(CPU)** The portion of a computer that performs data manipulation operations. A CPU contains three basic parts; a control unit to direct operations; an arithmetic/logic unit to perform basic mathematical and logic operations; and a register bank for use as temporary data storage. In a microcomputer system the CPU is normally a microprocessor integrated circuit.

Centroid The center of a given area in a single camera system.

Character See byte.

Charge Coupled Device **(CCD)** An image sensor whose basic component is a Metal-Insulator-Semiconductor (MIS) capacitor.

Clock A signal (or the circuit used to generate the signal) consisting of timing pulses that synchronize operations on a synchronous computer bus.

Microcomputer systems typically have a 4.77, 8 or 10 MHz clock. On asynchronous busses, a clock is usually provided but its use is not required.

Clock Rate The frequency of the timing pulses or clock in a system.

Color Video A method of producing color images by combining the three primary colors red, blue and green. A computer monitor using this method is referred to as an "RGB" monitor.

Combination Function An operation that defines how two (or more) images are mixed to form a new image.

Command The signal, word, characters, etc. within an instruction that tell a microcomputer to start, stop or continue an operation.

Composite Sync Signal The sync portion of a composite video signal used to synchronize the scanning of the display. It consists of the front porch, sync level, back porch and setup. See setup, video signal and blanking level.

Composite Video Signal A combined video signal that includes both video (picture) and sync signals. See composite sync signal, video signal, and setup.

Configuration (1) A system consisting of related hardware components or (2) a group of interrelated software modules.

Continuous Tone A photographic print on which the brightness levels appear consistent and uninterrupted.

Contouring (1) Bands of sharp changes in brightness level that appear in an image because of low brightness resolution. (2) The selection of particular brightness levels or minimum threshold levels required for digital data displays.

Contrast A relative measure of the brightness content of an image, contrast refers to the difference in intensity levels between the darkest and lightest parts of an image. An image with high contrast has a significant dark black and bright white content. An image with medium contrast has an even spread from black to white levels, while low contrast implies a limited spread of gray values.

Control Bus The portion of the system bus used for transmitting control signals.

Control Points In rubber sheet transformation operations, the spatial pixel locations that represent the geometric contortion to performed. Surrounding pixels follow in the transformation through spatial interpolation methods.

Convolution An image enhancement technique wherein the weighted average of the gray scale intensity of a pixel array is calculated and assigned to a "target pixel" in the center of the array. See convolution kernel.

Convolution Coefficient A numeric value that corresponds to the gray scale level of pixel within an array during a convolution.

Convolution Kernel A two dimensional array used in pixel point processing. Typical array sizes are 3 x 3 and 5 x 5.

Convolution Mask The array of convolution coefficients defining a group process.

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- D -

Data The basic information elements produced or processed by a microcomputer.

Data Acquisition The actual capture of information from "real world" sources such as sensors and transducers. Systems must capture data in an accurate and timely manner and then convert the data to a form that is useful for microcomputer processing.

Data Bandwidth The amount of data transferred to or from image store memory in a single cycle. Normally expressed as a number of bits.

Data Bus A bus that transfers data from one component of a microcomputer system to another. Data busses are typically 8-bits, 16-bits or 32-bits wide in a microcomputer system.

Data Channel An input/output channel to the computer.

Data Compression An operation that reduces the memory space required to store image data.

Data Conversion The process of changing data from one form to another. An image processing system will convert "real world" analog video signals into digital signals that can be processed by a microcomputer.

Data File Related pieces of data organized in a specific manner. Data files contain information, not instructions or programs.

Degrees of Freedom The flexibility inherent in the definition of an operation. Typically associated with the array or kernel size in a pixel group processing operation.

Default An action or value assignment that occurs automatically unless another is specified.

Differential Pulse Code Modulation (DPCM) An image data compression technique. With DPCM, only the difference in brightness levels between adjacent pixels (on a horizontal line) is stored in memory, as opposed to the absolute brightness level of each individual pixel.

Digital Data Information in the form of a signal with distinct elements or states. Data is represented as binary information having either a "1" or "0" state.

Digital Image An image composed of discrete pixels of digitally quantized brightness.

Digital to Analog Conversion (D/A) The process whereby a digital value or code is changed into an analog signal.

Digital to Analog Converter (D/A or DAC) An electronic circuit that converts a digital code into an output analog voltage or current. In an imaging system, a D/A converter will convert the binary code for a particular pixel into an analog voltage level required for video display.

Digitization The act of sampling and quantizing an analog video signal.

Dimension The defined size of an array.

Disk Operating System (DOS) A program that controls the transfer of data to and from a disk drive. DOS consists of three basic sections, an input/output system, a command processor and a number of utilities.

Display The visual presentation of an image or data on the screen of a monitor.

Drivers Software program that controls a specific hardware device such as a frame grabber board.

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- E -

Edge Detection Locating image edges through various pixel operations.

Edge Enhancement An operation that accentuates the edge details of an image. Three filtering procedures commonly used are shift and difference, gradient and Laplacian.

Edge Filter See bandpass filter.

Edge Following A method used to isolate regions within an image by following its edge.

Edge Response The distribution of intensity levels in the image of an edge.

Efficiency The ratio of a computer's output computational power to it's theoretical computational power.

Erect Image An image with a spatial orientation identical to the original object (the object under view).

Expansion Board A plug-in circuit board that increases the capabilities of a microcomputer. For example, a frame grabber board plugged into the backplane of an AT type microcomputer.

Expansion Slot The actual space provided within a microcomputer system for individual expansion boards.

External Access Memory Cycle The access cycle during which image data is retrieved or stored.

* * * * *

- *F* -

Field In an imaging system, the set of odd or even scan lines that are interlaced to make a frame. See frame.

File A collection of related programs or data treated as a unit by the CPU.

Flash A/D Converter An ultra-fast A/D conversion technique in which an array of 2_n-1 comparators (where "n" equals the resolution in bits) directly implement a quantizer. Typically used in video speed applications.

Foreground An operation or application that is visible and may be adjusted by the operator. See background.

Frame A single video image. In raster scan displays, frames are formed by interlacing two field scans. See field.

Frame Frequency The number of times per second a single frame is scanned in an imaging system. The standard frame frequency for the television industry in the USA is 30 frames/second.

Frame Grabber Board An image processing board that samples, digitizes, stores and processes video signals. Typically, a frame grabber board will plug into one expansion slot within a microcomputer.

Frame Process In image processing, refers to pixel point and/or pixel group processing. See pixel point processing and pixel group processing.

Frame Rate The frequency at which a displayed image is updated.

Frame Store Memory Video Random Access Memory (VRAM) used in image processing systems. This memory, often included on a frame grabber board, is used to store images as they are acquired or processed. Typical size is 512 x 512 x 8 bits.

Frequency Transform A procedure that breaks an image down into its' fundamental frequency components for subsequent analysis or filtering.

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- G -

Geometric Manipulation Any mathematical operation that changes the spatial geometry of an image. Examples include scaling, rotation, translation, and rubber sheet transformation. Also referred to as geometric operations.

Gradient The rate of change in pixel intensity.

Gradient Edge Enhancement An edge enhancement operation that has a directional characteristic. For example, with a 3 x 3 kernel (pixel array), a gradient operation may be used to enhance edges in any one of eight directions.

Gray Level The discrete brightness value assigned to a pixel. This value may range from black, through shades of gray to white. See gray scale.

Gray Scale The discrete video signal levels that fall between reference black and reference white. The number of levels depends upon the resolution of the converter within the imaging system. For example, a system that uses an 8-bit converter can produce an image with 256 gray levels. See brightness resolution.

Group Process See pixel group processing and convolution.

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- H -

Hardware The physically visible parts of a microcomputer system such as the CPU, printer, display monitor, frame grabber board, etc.

Hertz (HZ) A unit of measure for frequency or bandwidth. The same as cycles per second.

High Pass Filter An operation that enhances high spatial frequencies or attenuates low spatial frequencies within an image. High pass filtering is used to bring out details difficult to see in the original.

Histogram A graphic representation of the gray scale distribution within an image. Normally, the x-axis will represent the gray scale level and the y-axis will show the number of pixels. Histograms give a good indication of image contrast and brightness dynamic range.

Histogram Slide The addition or subtraction of a constant brightness to all pixels within an image.

Histogram Stretch The multiplication or division of all pixels in an image by a constant value.

Horizontal Blanking Period In a display, that part of the composite video signal during which the electron beam is cut off to allow the raster to return to the left side of the screen.

Horizontal Resolution The number of pixels contained in a single horizontal scanning line.

Horizontal Sync The portion of a video signal that indicates the end of a line of video information. The sync pulse is used in video equipment to maintain line synchronization with the incoming video signal.

Host Computer A microcomputer which has a number of peripheral devices or other microcomputers connected to it. The host provides data storage and performs computations for devices networked to it.

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- I -

Image A reproduction of an object formed by an optical or electrical device.

Image Analysis Any operation intended to numerically tabulate some aspect of an image.

Image Coding Any operation that reduces the amount of data required to store or display an image.

Image Contrast The intensity variations within an image.

Image Enhancement Any operation used to manipulate an image. Image enhancement operations include point, group and frame processes.

Image Processor A circuit that converts an image to digital form and then enhances it for further computer or visual analysis.

Image Restoration Filtering processes that remove the blurring and suppress the noise that occurs during image processing.

Image Subtraction A technique used to compare two images. The images are subtracted from one another, pixel by pixel, and analyzed for differences. Image subtraction is used in applications requiring error detection by the vision system.

Image Store Memory The memory array within an image processing system used for image/frame storage.

Input/Output **(I/O)** The channels used for transferring data into and out of a microcomputer system. I/O channels include communication ports and operator interface devices.

Input/Output Address A digital code that allows the microcomputer to distinguish between different boards within a system. Addresses are set with DIP switches or through automatic system configuration routines.

Input/Output Device A device used to channel data in and out of a microcomputer system. Typically a frame grabber board in a microcomputer based vision system.

Input/Output Mapping A procedure for interfacing devices to the CPU in addressable fashion without taking up memory space. Since the amount of address space and the set of I/O instructions are limited, data acquisition systems are normally memory mapped.

Intensity The radiated light energy of an image or portion of an image.

Interface The means by which multiple devices are connected and interact with each other.

Interlace A standard technique used in raster displays wherein the image consists of two successively scanned fields. In other words, a field of odd numbered lines is scanned followed (separated by a space equivalent to one line) by a field of even number lines. Interlacing is used to reduce flickering in a display.

Interpolation A mathematical technique used in some geometric imaging operations. If the output coordinates of a pixel do not coincide with a defined pixel grid point, interpolation divides that pixel's brightness and distributes portions to the four adjacent, valid pixel points.

Interrupt A signal that tells the microcomputer CPU to suspend its' current task in order to service a designated device or activity.

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- J -

Jumper A wire used to connect points within a circuit or system.

* * * * *

- K -

Kilo (K) In a microcomputer system, one kilo equals 1,024 or 2 to the 10th power.

Kbyte 1,024 bytes.

* * * * *

- L -

Laplacian Edge Enhancement An imaging technique in which edges are enhanced by accentuating all edge details without discriminating as to spatial orientation.

Line The coordinate giving the vertical position of a pixel within an image.

Linear Array A video detector consisting of one row of light sensitive semiconductor devices. Used in linear array cameras.

Line Segment Enhancement An operation that accentuates line segment details within an image. For example, with a 3 x 3 kernel size, line segments in either vertical, horizontal or either diagonal may be enhanced.

Lookup Table (LUT) High speed RAM that is used in image processing for storing values used in pixel processing. Input values are the original image, while the output values, modified by any point processing, are those to be displayed.

Low Pass Filter An operation that enhances low spatial frequences and attenuates high frequencies within an image. See high pass filter and band pass filter.

* * * * *

- M -

Machine Language A program or set of instructions that is written in binary code and may be executed directly by the microcomputer. Each type of CPU has a specific machine language. Also called object code or object language.

Macro A small set of program steps combined to act as a single more powerful step.

Mainframe A large-scale computer system. Mainframes are much faster than microcomputers and have a much higher storage capacity. Mainframes are used for applications requiring the high speed processing of very large volumes of data. See microcomputer and minicomputer.

Map A graphic representation of the mapping function. Used in pixel point processing, the map illustrates an input to output pixel brightness transformation.

Mapping Function A mathematical equation used in pixel point processing. It is the formula used to calculate the output pixel brightness that results from a given input pixel brightness.

Mass Storage A device such as hard disk drive or streaming tape drive used to store megabytes of data.

Mega (M) In a microcomputer system, M equals 1,048,576 or 2 to the 20th power.

Mbyte 1,048,576 bytes

Median Filter An imaging process used to achieve local smoothing. The operation involves changing the gray scale value of a pixel to the median gray scale value of the eight adjacent pixels.

Memory The hardware used in a microcomputer system to store and recall data.

Memory Cycle A system protocol used to move data into or out of image store memory.

Memory Cycle Time The time required to complete a single data access.

Menu A computer display that lists the available options for the computer operator. These displays are included in software programs to ease user interface.

Menu Driven Refers to a software program controlled by the user via menus.

Microcomputer A computer that is physically small, manufactured to be either portable or to fit easily on a desk or bench top. Normally the least expensive type of computer, microcomputers have sufficient storage capacity and computing power to satisfy most data acquisition applications. See mainframe and mini-computer.

Microprocessor (uP) A CPU consisting of semiconductor integrated circuit. Typical of the microprocessors used in microcomputers are the Intel 8088 family and Motorola 60800 family. See central processing unit.

Minicomputer A computer system that is larger and more powerful than a microcomputer but not as large or powerful as a mainframe. See mainframe and micro-computer.

Monitor The display screen used with a computer system.

Monochrome An image represented by a single color, typically black and white.

Mouse A small handheld device used in place of a keyboard to enter commands.

Multiple Image Pixel Point Processing A processing technique that involves the combination of two or more images. Images are added or subtracted pixel by pixel. This technique is useful for applications requiring image overlays, defect detection, etc.

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- N -

Nibble One half of a byte (4-bits).

Noise Undesirable electrical interference that degrades a signal. Sources of noise include CRT displays, AC power lines, digital switching circuits, etc.

Non-square Pixel A pixel with spatial dimensions other than 1 x 1. For example, an image with an aspect ratio of 4:3 yields non-square pixels with dimensions of 4 x 3.

Nonvolatile Memory Memory that retains its information when electrical power is removed.

Nyquist Theorem A theorem that applied to image processing systems, states that if an image contains no spatial frequency components higher than a specified frequency (f_c), then the original image can be reconstructed without distortion if it is sampled at a rate at least twice that of the specified frequency ($2f_c$).

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- O -

Operating System (OS) A program that governs overall operation of a microcomputer system.

Option An add-on microcomputer peripheral that expands the capability of a system.

Overhead The quantity of microcomputer processing resources such as time, memory, etc., required to complete a given task.

* * * * *

- P -

Parallel A/D See flash A/D.

Peak White Level A "whiter than white" level out of the normal range of the video signal. Often used to generate cursors and outlines.

Photometric An imaging operation that corrects image sensor response and geometric irregularities.

Picture Signal See video signal.

Pixel The smallest resolvable element or location within an image. Pixels are arranged in rectangular arrays to form complete images. Derived from **PI**cture **EL**ement.

Pixel Group Processing An image processing technique in which each pixel is processed according to its relationship to adjacent pixels. This weighted averaging of pixel arrays is used to facilitate spatial filtering.

Pixel Point Processing — An image processing technique in which image contrast is adjusted by multiplying or dividing individual pixels by a constant or image brightness is adjusted by adding or subtracting a constant value from individual pixels. See multiple image and single image pixel point processing.

Port — A microcomputer interface used to communicate with or control a remote peripheral.

Program — A full set of defined steps or instructions that a microcomputer will follow to accomplish a particular task.

Programmable Read-Only Memory — **(PROM)** Semiconductor memory that cannot be altered by the microcomputer once programmed.

Prompt — A message on the computer display that requests a user response.

Protocol — A formal set of conventions that set the relative timing, sequence of bits, and the characters and control codes used in microcomputer to peripheral data transfers.

Pseudocolors — In image processing, refers to colors derived from the gray scale and not the original image.

* * * * *

- *Q* -

Quantum — The analog difference between two adjacent codes for an A/D or D/A converter.

Quantization — The act of converting an analog pixel brightness value to a digital value.

Queue — A temporary storage area or list of tasks to be accomplished.

* * * * *

- *R* -

Random Access Memory — **(RAM)** Semiconductor memory that can be read and changed during microcomputer operation. Data can be written to a particular location without having to sequence through previous locations. RAM is volatile, so all data is lost on power down.

Range — The maximum allowable signal span, input or output, over which a device will operate to within specified limits.

Raster — The line pattern traced by rectilinear scanning in display systems.

Read Only Memory — **(ROM)** Semiconductor memory that contains fixed data that cannot be changed once programmed. Programming is accomplished during the manufacturing process.

Real Time — The ability to acquire and process data immediately, rather than storing the data for later processing. Requires very high speed data acquisition boards.

Reconstruction — The reforming of an analog video signal from digitally stored image data.

Reference Black Level — The maximum negative amplitude of the video signal.

Reference White Level — The maximum positive amplitude of the video signal.

Repeatability — An instruments ability to produce the same output repeatedly under identical conditions.

Resolution — The smallest detectable change in a measurement. Important resolution limits in an imaging system are those concerning brightness, spatial parameters and frame rate.

RGB Display — A display system that reproduces color images composed of Red, Green or Blue components.

Ribbon Cable — A flat cable with the conductors arranged side by side rather than in a bundle.

Routine — A set of instructions used to solve a specific problem.

Rotation — A geometric image operation used to rotate an image through an angle.

Rubber Sheet Transformation — A geometric operation that uses specified control points to contort an image.

Run End Coding — A data compression technique wherein the gray level and position of the first pixel in consecutive strings are specified. Typically used in images consisting of two gray levels on alternating strings.

Run Length Coding — A data compression technique that encodes the first gray level of each point by point sample along with its relative position in the succession of gray levels.

Run Time — The time during which a program is executing.

* * * * *

- S -

Sample — A discrete pixel of analog brightness. A sample is subsequently quantized yielding a pixel of digital brightness.

Sampling — The chopping of an analog video signal into discrete pixels. Does not include the quantizing process.

Sampling Theorem — See Nyquist Theorem.

Scaling — A geometric operation used to enlarge or shrink an image.

Sensitivity — The minimum change in input voltage to which an instrument can respond.

Sensor — A device that produces an electrical output that corresponds to a physical input (temperature, light, etc.).

Setup — In a composite video signal, setup is the difference between the reference black and blanking levels.

Shrink and Difference Edge Enhancement — A very simple edge enhancement operation. An image is skewed either up or to the left by one pixel and then subtracted from the original. This results in horizontal or vertical edge enhancements.

Simultaneous Contrast — A visual illusion that makes a region of an image appear brighter or darker depending upon the surrounding brightness.

Software — Computer programs, operating systems, high level languages, etc. that are held in some type of storage medium to be loaded into RAM for execution.

Spatial — The two dimensional characteristics of an image.

Spatial Convolutions — Mathematical operations used in performing convolutions.

Spatial Filtering — Operations that accentuate or attenuate spatial frequencies within an image. These operations include low pass and high pass filtering.

Spatial Frequency — The reciprocal of the line spacing in an image. Expressed as cycles/millimeter, it gives a relative rate of brightness change within an image. High spatial frequencies result in brightness fluctuations while low spatial frequencies produce regions of relatively constant brightness.

Spatial Resolution — The accuracy to which an image is divided into discrete pixels. For example, an image with a spatial resolution of 256 x 256 contains 65,536 discrete pixels.

Sync — Abbreviation for synchronization. The portion of a video signal that indicates the end of a field or line. The horizontal sync triggers the retracing of a line and the vertical sync triggers the beginning of a new field.

Sync Extraction — The detection of sync pulses within a video signal for use in synchronizing video equipment with the incoming signal.

Synchronous Computer A computer in which operations are coordinated by various timed signals. Typically involves timing operations to a system clock.

System Bus The bus used to transfer data between various components within a microcomputer system. It consists of the address bus, data bus and control bus.

System Overhead The amount of time a microcomputer spends performing supervisory functions rather than actual user programs.

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- T -

Terminal A computer system peripheral, typically consisting of a display, keyboard and printer. Terminals are often used for data entry at remote locations.

Transducer A device that converts physical parameters such as temperature, pressure, motion, etc. into an electrical voltage or current.

Translation A geometric operation that moves an image from one spatial location to another.

Turnkey A complete microcomputer system, including all the hardware and software required for a specific application.

Two Port Memory A memory architecture that gives two independent access paths to memory storage. This technique allows the time shared access of video data and data to be processed.

* * * * *

- U -

Undersampling The sampling of an analog video signal at a rate below that required by the nyquist theorem. See Nyquist theorem.

Unsharp Masking Enhancement An operation that produces a sharpened version of an image. It involves subtracting a brightness scaled, low pass filtered image from the original image.

Utility Programs Computer programs, dedicated to one particular task, that are helpful in microcomputer operation. Typical utilities perform file maintenance, print spooling, etc.

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- V -

Vertical Blanking The portion of a video signal that cuts off the

	display at the end of each field. See blanking and horizontal blanking.
Vertical Retrace	The returning direction of the electron beam during the vertical blanking period.
Vertical Sync	See sync.
Video Access Cycle	The timing cycle during which two port video store memory is accessed by input devices (cameras, etc.) and output devices (monitors, etc.).
Video Signal	The visually perceived portion of the composite video signal. The video signal will vary in gray scale level from reference white to reference black. Also known as the picture signal.
Volatile Memory	Memory that does not retain its content when power is lost. See nonvolatile memory.

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- W -

Word	Sixteen bits.