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μTech

Image/VGA-410 Frame Grabber User's Guide

MuTech Corporation

When Your Image Counts

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1 Introduction

1.1 Description of IV-410

Integrated VGA Controller

The Image / VGA-410 (IV-410) is a single slot, PCI Bus frame grabber and video digitizer with integrated VGA controller. It captures and/or display color and monochrome video on a standard VGA or Super VGA screen. It works as standard VGA Adapter in any of the PCI Bus slots. The IV-410 includes device drivers for Windows 9X, NT and Win2K. Drivers for other operating systems may also be available. Please contact the Customer Support Department of MuTech Corporation for the most up to date information on drivers.

NTSC or PAL

The IV-410 is capable of digitizing the video signal from a standard composite video or super-video camera. The video inputs can be either NTSC (RS-170) or PAL (CCIR). The digitized video data are stored in the on-board video buffer and mixed with the VGA signal for display on the computer monitor.

Trigger & Expo. Control

The IV-410 is capable of accepting an external Event Trigger, generating a general purpose Strobe Signal to control the exposure / integration of the camera, and receiving a Grab Trigger for capturing single or multiple frames of video.

SavagePro 3-D Accelerator Chip from S3

The IV-410 needs a PCI Bus slot. If there is a VGA adapter on the computer motherboard, the IV-410 can replace it and become the primary VGA display controller. The VGA controller of the IV-410 is the S3 SavagePro 3-D Accelerator Chip (possibly with different versions and different revisions). The IV-410 is delivered with onboard VGA BIOS from S3.

Connectors

The IV-410 has two connectors. The first is the Video Input Connector which takes either Composite Video Input or S-Video Input from a camera. This is a High-Density DB-15 male connector. This connector also provides connections for the Event/ Grab Trigger, the Strobe, and camera power output. The second is

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the VGA Output Connector, which provides VGA display signals to the computer monitor. This is a High-Density DB-15 female connector.

Major Components

The Image / VGA-410 board consists of the following major components:

- PCI bus interface
- VGA graphics controller
- RAMDAC
- Buffer memory
- NTSC/PAL Video decoder
- Input LUT
- Grab and Exposure Control Unit
- Sync and Timing Unit
- The auxiliary circuits

1.2 Options

The following options are available for the IV-410:

Options

- 8/16 MByte Video Buffer Memory
- Security Device -an 256 x 8 bit EEPROM (XICOR X24C02) with write protection jumper is implemented on the board (must be provided by OEM or software developer)

1.3 VGA Display Modes

Without the video window display, the IV-410 supports all VGA / SVGA display modes, only limited by the amount of on board memory.

When the video window is on, the display resolution and/or color depth are further limited. The IV-410 has shared memory architecture. In this architecture, the video display, the VGA overlay, the video capture, and the host access all compete for the

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same limited memory bandwidth. This will limit the maximum spatial resolution and/or color depth. The next table shows the resolution and color depth tested for the IV-410.

Screen Resolution	Maximum Colors	Refresh Rate
640 x 480	16 M	85
800 x 600	16 M	85
1024 x 768	16 M	85
1280 x 1024	16 M	75

Note The above listed resolution and color depth are also limited by the on board memory amount.

1.4 Video Capture

Video Inputs

The IV-410 board will digitize color/monochrome video either in Composite Video or in Super Video formats. It supports 1 S-Video input and 3 Composite Video inputs. Alternatively, 2 S-Video and 1 Composite Video inputs may be connected. The channel switching is under software control. Both monochrome and color video are digitized into 16 bit pixels in YCbCr 4:2:2 format (per the CCIR601 standard). The active video screen is captured into 640 x 480 pixels (NTSC) or 768 x 576 pixels (PAL). In each case the pixels are square (with a 1:1 aspect ratio). Capture and display of the video are real time (30 fps for NTSC, 25 fps for PAL).

Video Window

The IV-410 supports only one video window. Software can control the Gain of the video channel. Two 256 x 8 bit input LUTs (one for Luminance channel, the other for Chrominance) are available for linear / non-linear mappings of the video. There are 4 banks in each of the LUTs. The user may pre-load them with different look-up-tables and switch them during the vertical retrace periods. All LUTs may be bypassed.

Scaling & Mirroring

The captured video may be scaled to any size from the Grab Window. Horizontal mirroring (flipping), during capturing, is supported by the board.

Display Mixing

There are basically three different working modes for displaying and mixing of video and graphical content. They are the:

- Opaque Mode
- Color Key Overlay Mode
- Chroma Key Underlay Mode

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Opaque Mode

In the Opaque Mode, the video content is displayed in the video window and the graphical content is displayed on another part of the screen.

Color Key Overlay Mode

In the Color Key Overlay Mode, the graphical content may overlay the video content in the video window. This overlay is controlled by the Color Key (or Index Key). If the color of the graphical content is the same as the Color Key, the user will see-through that pixel and see the video content under it. Otherwise the user will see the graphical content.

Chroma Key Underlay Mode

In the Chroma Key Underlay Mode, the graphical content may underlay the video content inside the video window. This is controlled by the Chroma Key. If the video pixel color is within the Chroma Key color range, the user will see through the video pixel to the graphical content under it. Otherwise the user will see the video content.

Zooming

The captured video may be zoomed up to an arbitrary ratio, in both direction, on the way to be displayed on the monitor.

Trigger & Exposure Control

The IV-410 is designed for industrial use. It provides a general purpose Event Trigger Input, a general purpose Strobe Output and a Grab Trigger Input. The Event signal is used to start the camera control-capturing sequence. The Strobe could be used to reset the camera, to control the exposure / integration time, or to strobe a flash light. When the desired frame / field is ready, the Grab Trigger is used to capture the desired frame / field.

1.5 Software

Utility Programs

Several utility programs are delivered with the IV-410 board. They can be used for testing the installation, simple debugging, and demonstration purposes. Or they can be used as utilities for capturing video and saving to files. The utility programs provided support Extended DOS, Windows 9X, NT and Win2K. Also distributed are VGA drivers for Windows 9X, NT and Win2K (these drivers are available for down-loading from the S3 home page as well as from the MuTech home page). All drivers are directly licensed from S3.

MuTech does NOT modify any of the VGA drivers and does NOT have any expertise to provide customer support for them.

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MuTech does provide full customer support for the utility programs and the Software Development Kits described below.

1.6 Software Development Kits

MuTech offers Software Development Kits (SDKs) for OEMs or any users developing application programs for the IV-4XX Series Product Line. These SDKs support Extended DOS and Windows 9X, WinNT. Each of the SDK includes:

- LIBs and/or DLLs
- include files
- sample source codes (showing typical calling sequences and the usage of the core functions)
- make files

The major groups of functions in the SDKs are listed below. For each group, a simple description is given to show the tasks of functions in the group. For definitions of the logical windows/ frames used in this section, please refer to the *Image / VGA-4XX Software Development Guide*.

Board Initialization Group
: Included in this group are functions used to open/close the IV-410 board, to initialize the board to a default state, and to retrieve the information about the board, the current configuration, the SDK version, etc.

Capture Control Group
: This group consists of the functions which are used to control the Capturing Process. This includes defining the Grab Window, setting the Scale Factors, defining the Video Frame, and starting/ stopping the grabbing. Also, this group includes functions to wait for the Vertical Sync or for the End of a Frame.

Display Control Group
: This group consists of the functions which are used to control the Displaying Process. This includes defining the Display Image Frame, setting the Display Zoom Factors and setting the Image Windows on screen. Other functions in this group control the Overlay Mode and the settings of the Color/Chroma Key values.

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Front End Adjustment Group	The functions in this group control the adjustment of features of the input video signal. For example, the TV standard, the channel selection, the VCR mode, the AGC mode and the settings of the Contrast, Brightness are all controlled in this group.
Look Up Table Group	You can use the functions in this group to load the input video LUT, to use or to bypass the input LUT, or to switch the LUT banks.
On-board Memory Access Group	Functions in this group are provided to read/write the video memory buffer. When accessing the buffer through these functions, the SDK hides the low level details from the caller, and presents the video data as lines in a 2-D memory array.
File I/O Group	The functions in this group provide high speed image file read/ write, in one of the supported file formats (Bitmap, TIFF or TARGA).
Miscellaneous / Utility Group	Functions in this group provide support of some minor tasks for the user. For example, wait for VGA vertical retrace, etc.
Advanced Feature Group	This group includes the functions to handle Event signal, triggered capture, Strobe signal generation and different IRQ services.
	For details about the IV-4XX SDK, please refer to the *Image / VGA-4XX Software Development Guide*.

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2 Installation

2.1 System Requirements

Before installing the IV-410 Board, ensure that the following requirements are satisfied

- The system must have at lease one PCI slot available.
- If the system has a VGA controller on the motherboard, the IV-410 can be plugged into one of the PCI slots and take over as the primary VGA controller. If the system has a VGA adapter board, it must be removed and replaced by the IV-410 board.
- To capture an image, you must have one of the following cameras with composite or S-video output:
  - RS-170 monochrome or NTSC color camera
  - CCIR monochrome or PAL color camera

2.2 Package Contents

The standard shipping package of the Image / VGA-410 includes the following items:

- IV-410 Board
- *Image / VGA-410 User's Guide* (this document)
- IV-4XX Distribution Diskette(s), which contains the latest readme file, the software installer, the VGA drivers and the demonstration utility for desired Operating Environment (some Operating Systems must be specially ordered).

Product Options

The following options must be ordered separately:

- VC-DB15-4 Video Cable, which provides video inputs.

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- VC-DB15-10 Video Cable, which provides video inputs as well as other connections for Event, Trigger and Strobe.
- Image / VGA-4XX Software Development Kit (for the Operating System of your choice), which includes the diskette(s) and the *Image / VGA-4XX Software Development Guide* manual.

Please check your packing contents carefully; always check the readme file on the Distribution Diskette for the latest change of the package contents. If something is missing or damaged, you should immediately contact the MuTech Customer Support Department. The telephone number and email address are listed on the cover pages.

2.3 Hardware Installation

Note, we strongly recommend that the user read the readme file in the Image/VGA-4XX Series Distribution Disk first. It contains the latest information regarding hardware installation procedures.

The Image / VGA-4XX Series Boards are Plug and Play devices. There is no I/O address or Memory address to set.

Input Termination

The jumpers on the IV-410 board are for the input termination (75 Ohms). For most standard video sources, the video inputs should be terminated by 75 Ohms. These are the factory default settings, so there is no need to change the jumpers. If the user does need to change the termination, please refer to *Appendix A: Jumper Settings*.

2.4 Cable Connections

There are only two cable connections necessary for the IV-410. They are the VGA monitor cable and the video input cable.

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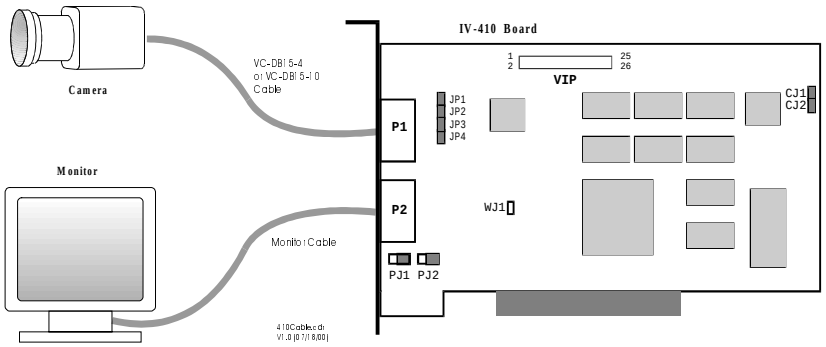


Figure 2.1: IV-410 Cable Connection Diagram

- The VGA output connector of the IV-410 is a DB-15 High Density **Female** Connector located in the lower part of the bracket. Attach the cable coming from your VGA monitor and secure the screws to complete this connection.
- The Video Input connector is a DB-15 High Density **Male** Connector located in the upper part of the bracket. If you purchased the MuTech VC-DB15-10 cable, plug it in, then connect the video group (C. Video or S-Video) and the trigger group (Event, Strobe or Grab Trigger) of connectors according to your application needs. For the cable color specification or if you plan to make your own custom cable, consult *"Specification of Connectors"* .

Note, it is not necessary to connect the video input signal in order for the IV-410 to work. However, the demonstration programs provided by MuTech do require that a video signal be connected.

2.5 Software Installation

The software installation can be divided into two parts.

1. Installation of the VGA driver(s).

2. Installation of the demonstration utilities.

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The following sub-sections describe these procedures.

MuTech recommends that the user read the readme file in the Image/VGA-4XX Series Distribution Disk first. It contains the latest information regarding the software installation procedures.

Windows NT Driver Installation

The installation procedures are described step by step in the readme file found on the *Image/VGA-41X VGA Driver Disk*. Please follow the instructions there.

Windows 95 Driver Installation

The installation procedures are different for first time installation and for new version upgrades. These procedures are described step by step in the readme file found on *the Image/VGA-41X VGA Driver Disk*. Please follow the instructions given there.

DOS Extender Distribution Software Installation

To install the Distribution Software provided by MuTech follow these procedures.

1. Put the Distribution Diskette in drive A.
2. **Under DOS,** change to A:\, run INSTALL, and then follow the instructions.
3. The installation/setup program will ask the user to enter the base directory for all the IV-4XX software. The default directory name is “C:\IV-400”, but the user can select a different drive/name. The installation setup program will create this base directory and several sub-directories on the drive specified by the user and copy all software into them.

Windows Distribution Software Installation

1. Put the *Image/VGA-4XX Series Distribution Disk for Windows* in drive A.
2. Open My Computer folder, and select A: drive. Double click on Setup.exe icon to start setup program. Follow the instructions on the screen to complete the installation.
3. There are total five drivers/programs that can be installed by the setup program: core driver, MCI driver, TWAIN driver, Video Capture driver, and IV-4XX Demo program.The user is able to choose which drivers should be installed.When the Setup Type dialog box is displayed, select Typical to install all drivers, select Compact to install only IV-4XX Demo program and core driver, select Custom to install specified drivers.

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4. Upon completion of the Windows setup, the program also have:

   - Created a variable called “IV-400” under the [MuTech] section of the WIN.IN file, and assigned the base directory name to it. This is used to locate all files needed by the IV-4XX software.
   - Created a program group called MuTech and setup an icon for the IV-4XX Windows demonstration program.
   - For Windows NT, the Windows registry will be modified to configure the kernel dirver.
   - Copied the driver files to:

for Windows NT,

C:\WINNT\SYSTEM32\DRIVERS\

and C:\WINNT\SYSTEM32

for Windows 9x,

C:\WINDOWS\SYSTEM

You need to restart the system to make everything effective. Also, this procedure is documented in the readme file of the *Image/VGA-4XX Series Distribution Disk.*

After the installation of the software, you can use it to check the IV-41X hardware as well as the software. Next section provides descriptions of the software usage.

2.6 Distribution Software

This section gives the descriptions of all software distributed with the Image / VGA-41X boards. The software includes drivers for Windows 9x and Windows NT/2000, a DOS demonstration utility named IV4DEMOW.EXE and a Windows demonstration utility, named CIV4DEMO.EXE for Windows 9x, named NIV4DEMO.EXE for Windows NT/2000.

Drivers

All VGA drivers for the IV-41X board are licensed from S3 Incorporated. MuTech provides these drivers for the convenience of our users. From time to time, S3 will either release newer

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versions of drivers or add driver supports to new operating systems, the user can download the latest drivers from the MuTech home page: website“www.mutech.com”.

The drivers provided for the S3 Chip are listed below:

- Windows 9X
- Windows NT 4.0

S3 Technical Support

Note, MuTech did NOT develop the VGA drivers, nor does it have the resource and expertise to support the VGA drivers. For any VGA driver issue or anything regarding the S3 SavagePro 3D Accelerator Chip, please contact the S3 Technical Support at:

(408) 980-5400

or visit:

http://www.s3.com/

or write to:

S3 Incorporated
2770 San Thomas Expressway
PO Box 58058
Santa Clara, CA 95052-8058

2.6.1 Windows Demonstration Utility

This section describes the basic functionality of the Demonstration Utility for Windows 9X and Windows NT/2000. If you are using only DOS, you can skip this section.

To start the DEMO utility, double click the program icon in the MuTech Program Group. When the program starts, it shows a group of menu selections. They are File, Grab, Trig/ Exp., Adjust, Snap, and Help. The following list describes the functions provided under each of the menus.

File

Load/Save image from/to file. The file formats supported are Bitmap, TARGA and TIFF. You can also save the current configurations to a file, and use it to override the defaults the next time you run the utility.

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Grab

Under this menu, you can start/stop the capturing, enable/disable the video display, set the grab to frame mode or field mode. You can also specify the start of capture on ODD/EVEN/NEXT field (for interlaced video). Mirroring mode can be turned on and off under this sub-menu, which is a new feature on the IV-410 board.

Trig/Exp.

Provides interfaces to Event, Strobe and Trigger features. You can control the following settings

- Select the Event channel/ the polarity of the Event Signal. Enable/disable/reset/generate the Event.
- Select the Strobe channel/ the polarity of the Strobe Output/ other Strobe parameters. Enable/disable the Strobe.
- Select the Trigger channel/modes/the polarity of the trigger signal. Enable/disable/reset/generate the trigger.

Adjust

Under this menu, the followings can be set or adjusted.

- Capture of scale factors (H & V)
- NTSC/PAL TV standard selection
- Red/Green/Blue/S-Video channel selection
- Color/Monochrome mode selection
- Camera/VCR mode selection
- Hue/Saturation adjustment
- AGC/Gain control
- Enable/bypass the LUT, and the selection of different LUTs
- Display zoom factors (H & V)
- Keying mode adjustment: selecting mode and changing key values

Snap

Use this menu to capture a single frame/single field.

Help

Use this to find information about the utility.

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2.6.2 DOS Demonstration Utility

This section describes the basic functionality of the DOS Demonstration Utility.

To start the IV4DEMOW utility, change to the IV-400 Base Directory. The default is “C:\IV-400”. If you have specified a different directory during installation, change to that one. Then change to the DOS4GW sub-directory under the Base Directory. Make sure the DOS4GW.EXE file is in the same sub-directory. Run IV4DEMOW from there. When the program starts, it shows a group of menu selections. They are File, Grab, Trig/ Exp., Adjust, Snap, Save Current Configuration, Show Board Information, and Exit. The following list gives the functions provided under each of the menus.

File — Load/Save an image from/to file. The file formats supported are Bitmap, TARGA and TIFF.

Grab — Under this menu, you can start or stop the video capture, enable or disable the video display, set the grab to frame mode or field mode, and specify the start of capture on ODD / EVEN / NEXT field (for interlaced video). Mirroring mode can be turned on and off under this sub-menu, which is a new feature on the IV-410 board.

Trig/Exp. — Provides interfaces to Event, Strobe and Trigger features. You can control the following settings

- Select the Event channel/ the polarity of the Event Signal. Enable/disable/reset/generate the Event.
- Select the Strobe channel/ the polarity of the Strobe Output/ other Strobe parameters. Enable/disable the Strobe.
- Select the Trigger channel/modes/the polarity of the trigger signal. Enable/disable/reset/generate the trigger.

Adjust — Under this menu, the follow settings and adjustments are possible.

- Capture of scale factors (H & V)
- NTSC/PAL TV standard selection
- Red/Green/Blue/S-Video channel selection
- Color/Monochrome mode selection
- Camera/VCR mode selection
- Hue/Saturation adjustment

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- AGC/Gain control
- Enable/bypass the LUT, and the selection of different LUTs
- Display zoom factors (H & V)

Snap	Use this function to capture a single frame or a single field.
Save Configuration	Use this to save the current state to a file and to override the defaults the next time the utility is run.
Show Board Information	Provides information about the IV-410 board

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3 Architecture

3.1 Block Diagram

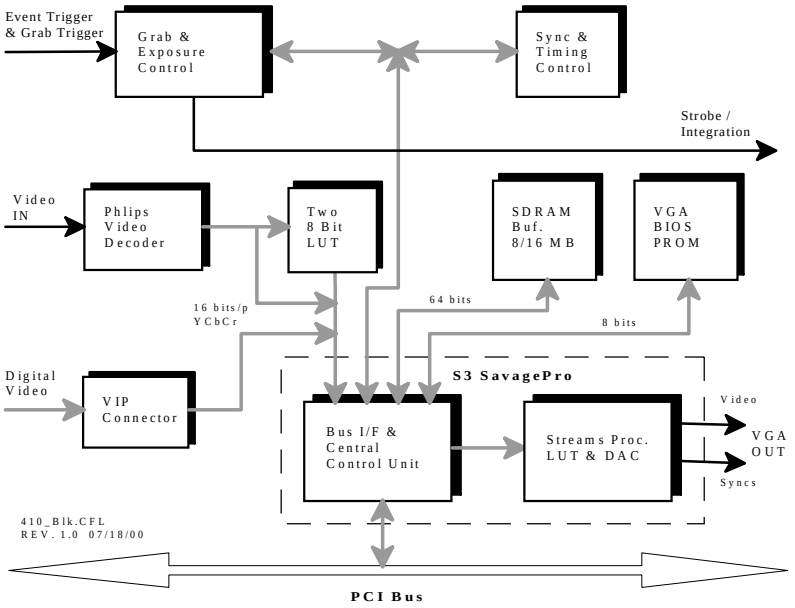


Figure 3.1: Image / VGA-410 Block Diagram

Figure 3.1 shows the major components of the IV-410 board. These major components are:

- Video Input and Decoder
- Input LUT
- Timing and Sync Control Unit
- Display Processor, PCI Interface, Stream Processor and

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RAMDAC

- video Buffer Memory - SDRAM 8 or 16MB
- VGA BIOS PROM

3.2 Overview of the Component Blocks

A simple functional description of each of the blocks is given in this section.

Video Decoder

The Video Decoder has the following functional blocks:

- **Video Input MUX:** Selects between 3 composite and 1 S-Video input signals. Alternatively, in 2 S-Video Mode, selects between 1 composite and 2 S-Video input signals.
- **A/D Converters:** Digitizes the video signal.
- **PLL:** Generates the video pixel clock which is locked to the video signal.
- **Digital Decoder**: Decodes the Composite Video or the S-Video into YCbCr CCIR 4:2:2 format.
- **Sync Separator:** Generates the H+V sync and the field signal needed by the rest of the board.

Input LUT

The input LUTs are 4 bank, 256 x 8 mapping tables, one each on the Y and UV channels. The LUT bank used is controlled by register settings, and is capable of being changed during video vertical sync time. The loading of the LUT is relatively slow and is not recommended during grabbing. The user should pre-load the banks with possibly needed LUTs before starting the grab.

The input LUT may be disabled by software. In this case the Y and the UV channels use hardware buffers to bypass the LUT. This function will send unmodified data to the display processor.

Grab & Exposure Control

This unit controls the triggered capturing, and provides the general purpose Strobe signal to control the exposure. This block includes the following sub-blocks:

Event Trigger Input: This TTL level input controls the enabling/ disabling of the event trigger as well as its polarity.

- **Strobe Generator:** This TTL level output strobe (used for exposure or integration control) can be generated from either

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the Event Trigger Input or a software command. The duration/ polarity are also controlled here.

Hardware can control the duration of HS and VS. Software can control VS.

- **Grab Trigger Input:** Controls the starting/stopping of the capturing. The polarity is also controlled by this unit.

Trigger Functions

These trigger functions are available.

- Stop acquire on trigger
- Start continue acquire on trigger
- Grab next frame.
- Grab next field.
- Grab next odd field.
- Grab next even field.

Frame Buffer

The Frame Buffer is described below:

- **Total Size:** 8 MB (16 MB optional).
- **Organization:** As a one-dimensional linear array (data are stored consecutively).
- **Locations:** The VGA data and video data share the same memory buffer, but at different segments. Usually, the VGA data occupies the first segment, and the video data is stored toward the end of the buffer.
- **Pixel Data Format**: The pixels are stored in the format Y-Cb-Y-Cr. Two luminance pixels (Y + Y) share the same chrominance components (Cb & Cr). In monochrome mode, a pixel still occupies 2 bytes. The format will be Y-dummy(0x80)-Y-dummy(0x80).

Bus Interface and Central Control Unit

This is the most complicated block. It consists of the following sub-blocks:

- **PCI Bus Interface:** Provides the interface for CPU access.
- **Capturing Control:** Controls the interface to the Video Decoder, and the start/stop of the video capture.
- **Memory Controller:** Interfaces with the Frame Buffer, generating the addresses as well as the control signals for the buffer memory.

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- **Display Controller:** Controls the data fetching, the timing, the sync signal generation etc. for the display process.
- **Other Interfaces:** Miscellaneous interfaces, e.g. on board serial interface.

Display Block

This block performs the function of displaying the VGA and video data to the monitor screen. It consists of:

- **Streams Processor:** Controls the data flow of the VGA and video streams for display.
- **LUT:** VGA Look-Up Table, defines the display palette.
- **Color Space Converter:** Transforms the YCbCr video data into RGB format.
- **Key & MUX:** Generates the KEY from Color/Chroma information, then uses the KEY to control the selection of the data to the DAC block.
- **DAC:** Converts the digital data into an analog RGB signal and drives the monitor.

VGA BIOS

This is an EPROM. The BIOS is read out during boot-up through the PCI interface block.

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Appendix A: Jumper Settings

There are two groups of jumpers on the Image / VGA-410 Board. The first group (JP) is for 75 Ohm termination of the video input signals. The second (PJ) is for camera power output control. The third (CJ) group is for user configurations controls. The last (WJ) is for Security PROM write protection. Table A.1 lists the IV-410 jumpers, their functions and their factory default settings.

Table A.1: IV-410 Jumpers and Factory Default Settings

Jumper	Function	IV-410
JP1	Terminate RED (V0) Channel with 75 ohms	IN
JP2	Terminate GRN (V1) Channel with 75 ohms	IN
JP3	Terminate BLU (V2) Channel with 75 ohms	IN
JP4	Terminate (V3) Channel with 75 ohms	IN
PJ1	Select +12V (R) or +5V (L) as Camera Power	RIGHT
PJ2	+12V is from PCI Bus (R - max. 0.5A) or Power Connector PW1 (L)	RIGHT
CJ1	User configuration jumper, IN = 0	IN
CJ2	User configuration jumper, IN = 0	IN
WJ1	Security PROM write protection, IN = Write Enabled	OUT

Figure A.1 shows the positions of the jumpers on the IV-410 board.

Note, On IV-410 board, the S-Video channel is always terminated with 75 Ohms.

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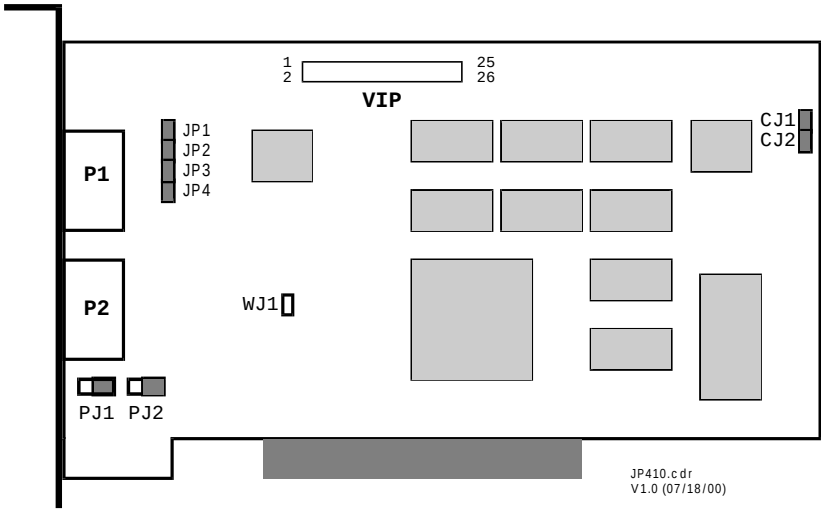


Figure A.1 Jumper Positions and Default Settings on IV-410 Board

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Appendix B: Specification of Connectors

There are three connectors on the IV-410 board.

- P1 is a DB-15 High Density male connector used for video input.
- P2 is a DB-15 High Density female connector used for VGA output.
- VIP is a 26-pin header (13 x 2) used as the Feature Connector.

This section gives the connection information for P1 and HP2. For connector P2 and HP1, the standard VGA pin-outs are used.

B.1 Video Input Connector (P1)

Connector P1 is used for Video input, Event Trigger / Grab Trigger input, camera power output and Strobe/Integration and Control output. The pin-outs are listed in the table below.

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Pin #	Signal Name	Description	VC-DB15-4 Color	VC-DB15-10 Color
1	V0	Video Input #0	Red	Red
2	V1	Video Input #1	Green	Green
6	V2	Video Input #2	Blue	Blue
14	V3	Video Input #3	N/C	N/C
11	LUMA0	S-Video Lum. Input	Black-DIN	Black-DIN
12	CHROMA0	S-Video Chrom. Input	White-DIN	White-DIN
7	AGND	Analog Ground		
13	EVENT0	Event Trigger 0 Input	N/C	Gray
9	TRIGGER0	Grab Trigger 0 Input	N/C	Black-BNC
3	STROBE0	Strobe/Integ. 0 Output	N/C	White-BNC
4	EVENT1	Event Trigger 1 Input	N/C	Yellow
5	TRIGGER1	Grab Trigger 1 Input	N/C	Brown
15	STROBE1	Strobe/Integ. 1 Output	N/C	Orange
8	+12V/+5V	Power Output	N/C	N/C
10	GND	Digital/Power Ground		

Table B.1: Pin Assignment and Cable Color of Video Input Connector (P1)

Figure B.1 shows the pin positions of the P1 Connector, when facing the pins.

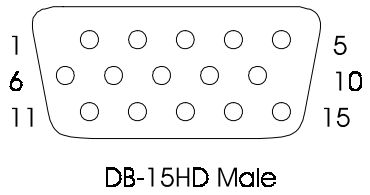


Figure B.1: DB-15 High Density Male Connector

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B.2 VIP Connector

Table B2 shows the signal on the VIP connector.

Pin #	Signal Name	Description
1	D0	Input Data (LSB-multiplexed YUV)
3	D1	Input Data
5	D2	Input Data
7	D3	Input Data
9	D4	Input Data
11	D5	Input Data
13	D6	Input Data
15	D7	Input Data (MSB)
17	CLOCK	Pixel Clock Input
8	HS	H Sync Input
12	VS	V Sync Input
10	FLD	Field Input (optional)
14	SCL	IIC Clock Output (optional)
26	SDA	IIC Data Input/Output (optional)
2, 4, 6, 16, 18, 20, 22, 23, 25	GND	Ground

Table B.2: Signals on VIP Connector

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Appendix C: Product Specification

This section lists the Image / VGA-410 Product Specifications for the purpose of reference.

Note, the specifications given here are subject to change without notice.

General
- Frame Grabber with integrated VGA on board
- Half size PCI standard board
- 8/16 MB SDRAM optional
- S3 Inc. 3-D Accelerator on board

Bus Interface
- PCI Bus Rev. 2.1 Compliant
- True Plug & Play, supporting Configuration space, I/O space and memory space
- Target/Master Device
- Max. read/write speed: 6 MB/s (32 bit access), 3 MB/s (16 bit access)
- Max. DMA speed: 50 MB/s

Video Input
- Input Mux - selects between 3 composite video and 1 S-Video input signals (possibly 2 composite video and 2 S-Videos)
- Video Decoder - luminance chrominance signal processing for standard PAL, NTSC
- Brightness, contrast, saturation and hue control
- VCR mode for stable video capturing
- YUV 4:2:2 output format with 8 bit resolution

Display & VGA
- Industrial standard DB-15 HD VGA Connector
- Integrated S3 Inc.3-D VGA Accelerator
- Max. VGA Resolution (W/O image window): depending on the memory option on board

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- Max. VGA Resolution (With image window):
  - 24 bit - 1280 x 1024
  - 16 bit - 1280 x 1024
  - 8 bit - 1280 x 1024
- VGA H/W zoom by 2, 4 (H - interpolated or repeat pixels)
- Image Window H/W Scaling by 2, 4 (H - interpolated or repeat pixels)

Keying & Mixing

There are four mixing modes:

- No Image Window
- Opaque Image Window
- Color Key - overlaying graphics & text on video
- Chroma Key - underlying graphics background behind video

Memory Buffer

- 8 MB SDRAM (16 MB optional)
- VGA & video data sharing the same buffer but stored in different segments
- VGA data can be double buffered
- Independent pixel depth when both VGA & video data are displayed:
  - VGA - 8 bit to 24 bit (256 to 16 M colors)
  - Video - 16 bit, Y-Cb-Y-Cr format (Y - 0x80 - Y - 0x80, if monochrome.)

Grab & Exposure Control

- Trigger - TTL input, software controlled polarity and enable
  - Edge or level trigger
  - Start on trigger
  - Stop on trigger
  - Grab next frame
  - Grab next field
  - Grab next odd field
  - Grab next even field
- Event - TTL input
  - Can be generated by either H/W or S/W
  - Enabled/disabled by software
  - S/W polarity control

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- Strobe - TTL output, software selectable polarity, hardware control of Event to Strobe delay and Strobe width
  - Hardware control of Event to Strobe Delay: in Vertical/ Horizontal Sync units
  - Hardware control of Event to Strobe Delay: on next Horizontal Sync, on next Vertical Sync (start on Odd or Even field)
  - Hardware Control of Strobe Width - from 1 to 4095 Horizontal or Vertical Syncs
  - Software Control Strobe Width - from 1 to infinite number of Vertical Syncs

Miscellaneous

- Supports IRQs on:
  - Video and /or VGA vertical retrace interval
  - Event Trigger, Grab Trigger and Capture Done
- +12 V Output on Video Input Connector for camera power
- Power consumption (values below not include camera power):
  - +5V <=1.6A (8 MB)
  - +12V <= 3mA
- Operating temperature: 0 - 70C
- Storage temperature: -40 - +125C

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