

# Bt848EVK

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## *Technical Reference Manual*

### Introduction

Thank you for your interest in the Bt848EVK kit. Bt848EVK uses Brooktree's Bt848 video capture processor enabling unprecedented price and performance levels in terms of full-motion video capture and display quality. In addition to providing capability for high-quality live video in a scalable window, Bt848EVK comes with capture drivers enabling simultaneous capture to disk for further processing by the system. Among the many features supported, Bt848EVK enables board and system vendors to produce graphics-independent video solutions based on the high-bandwidth PCI bus and span across many different system platforms. The PCI bus mastering capability of the Bt848EVK solution eliminates the need for a local frame buffer, dramatically reducing cost and enhancing performance.

The intent of the Bt848EVK kit is to provide tools that significantly simplify our customers' efforts to bring Bt848-based products to market. The tools include software drivers, and design documentation, as well as a starting point for enhanced designs that incorporate additional added-value features.

The Bt848EVK evaluation kit is ideal for evaluation of the bt848 device as well as evaluating the design and architecture of the Bt848EVK board. In addition, the Bt848EVK manufacturer's kit provides the tools necessary to make board-level changes, including the schematics and source files for the layout.

Thank you for your consideration of the Bt848EVK kit, we hope that it enables your company to quickly bring successful multimedia products to market. If you have any questions regarding the contents of this kit, please call the Brooktree Applications Engineering Department at 1-800-2BT-APPS, or send a fax to (619) 452-1249. Our internet address is [apps@brooktree.com](mailto:apps@brooktree.com). We can also be reached through our main number at (619) 452-7580.

*Included in this manual are:* Bt848EVK User's Guide (UG848\_1B)  
Bt848EVK Hardware Reference Guide (UG848\_2A)  
Bt848 Software Specifications (UG848\_3A).

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# Bt848EVK

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## *User's Guide*

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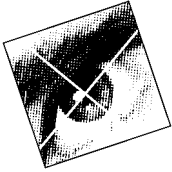
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# Bt848EVK User's Guide

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## **Quick Start**

For those wishing to get started right away with the Bt848EVK kit, the following procedure will get you on-line in minimal time.

### **Installing the Hardware**

- Place the Bt848EVK board in any available PCI slot.
- Connect your video sources (RF, Composite Video, S-Video) to the Bt848EVK board.
- Connect the audio output on the Bt848EVK board to your sound card.

### **Installing the Software**

- Microsoft® Windows95™ and Video for Windows™ Version 1.1e are required to operate the Bt848EVK software. Refer to the Microsoft reference manuals if you are unfamiliar with either of these applications.
- To install the Bt848EVK software place the CD-ROM in the CD-ROM drive and type "setup."
- Follow all screen prompts during the automatic software installation.

## **Getting Started**

### **Kit Contents**

The Bt848EVK evaluation kit (Bt848EVK) contains the following hardware, software, and documentation:

- Bt848EVK board
- Bt848EVK CD-ROM
- Bt848EVK Technical Reference Manual

Additional items included in the manufacturing kit (Bt848MDK):

- ORCAD™ and GERBER™ files



## System Requirements

### Minimum set

- Pentium™ 90 MHz PCI system with 8 MB of RAM
- Hard disk drive with 25 MB of available space
- 256-color VGA display
- Microsoft Windows95

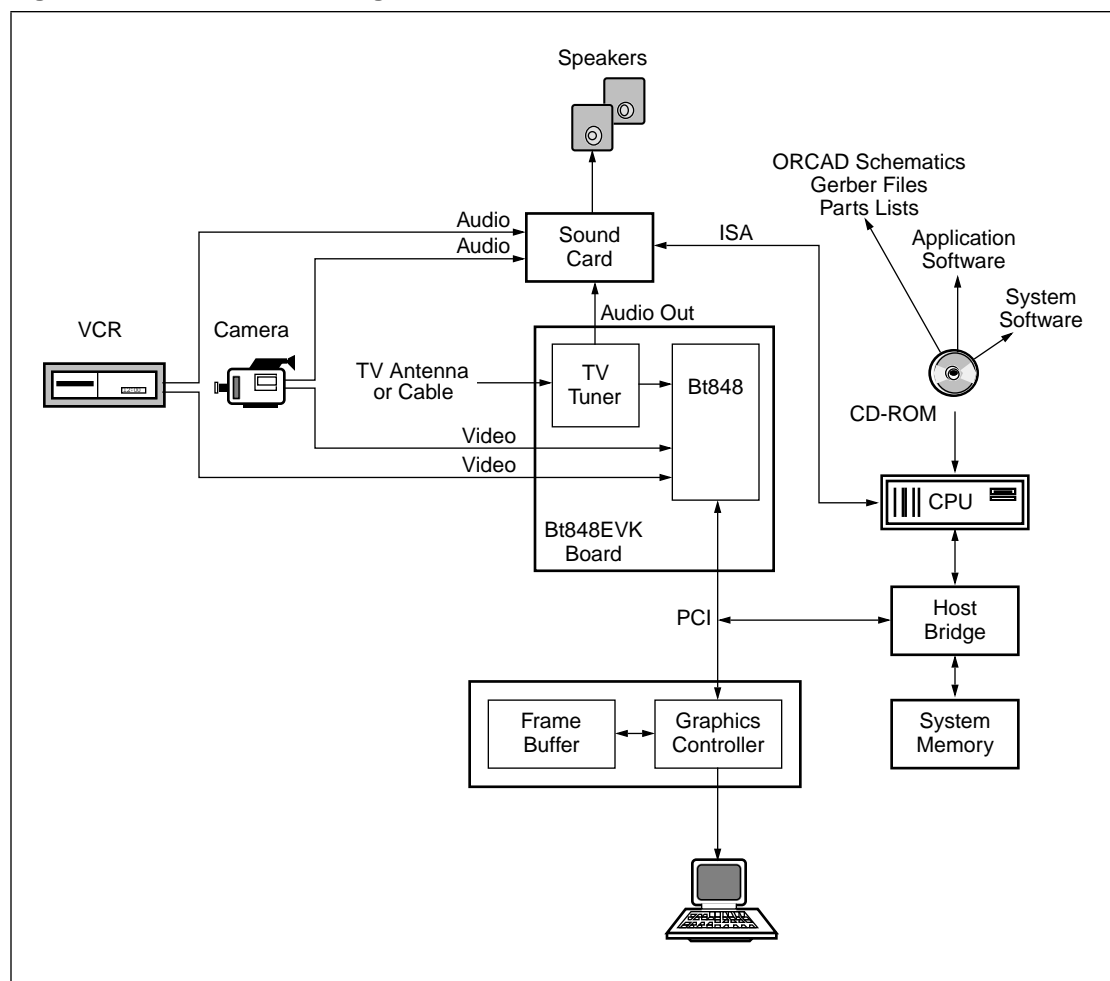
### Recommended set

- An additional 8 MB of system memory (total of 16 MB of RAM) are recommended

## Compatible Graphics Boards

The graphics board used with the Bt848EVK board should include 1 MB of linear frame buffer and a hardware cursor. The graphics driver software must be based on Windows95 and must include a Direct Draw Interface™ (DDI) provider software. Figure 1 illustrates the Bt848EVK block diagram.

Figure 1. Bt848EVK Block Diagram





## Installing the Bt848EVK Board

Be sure that the power is off and that you have removed any static-electric charge from your body by touching an object made of metal. The Bt848EVK board can be installed in any available PCI slot.

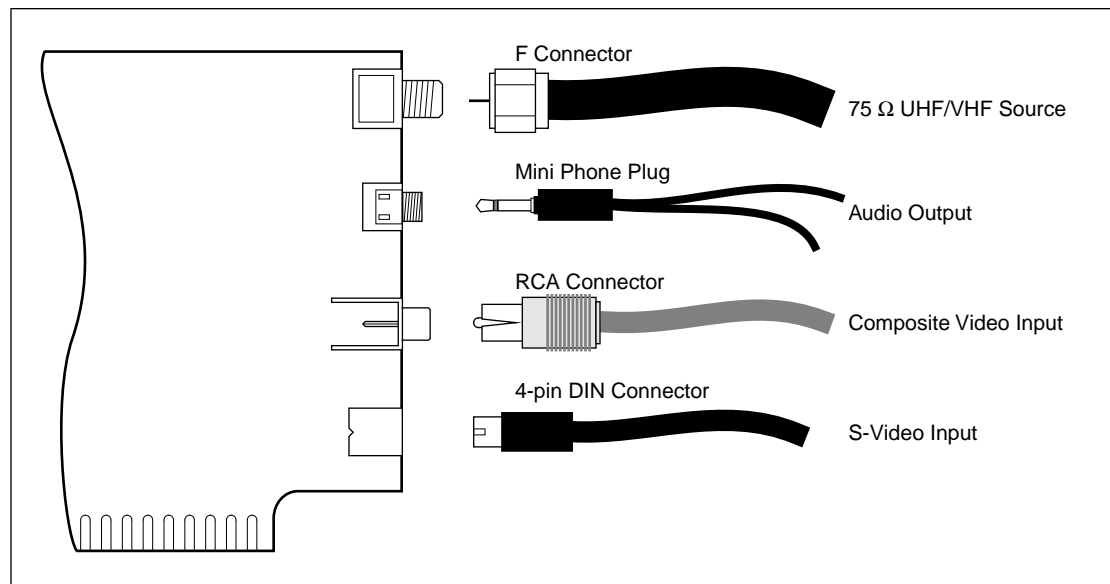
- Remove the cover mounting screws on your computer. Carefully slide the cover forward and off.
- Hold the Bt848EVK board by its top corners, and align the connector pins on the bottom with the slot guide. Press down gently but firmly until the card is seated. Observe static-electric safe handling procedures.
- Follow all suggested safety guidelines in your computer manufacturer's owner's manual.

## Video Source Installation

The Bt848EVK board is designed to interface directly to any video input device. NTSC/PAL/SECAM composite and S-Video ports are furnished for live video input. A camcorder, VCR, or laserdisc may be used. Additionally, an RF input is provided for connecting a TV antenna or cable to the on-board TV tuner. Cable and video hookups are shown in Figure 2.

- Connect the live video sources to the correct inputs. NTSC/PAL comes in either composite or S-Video format. The RCA jack is for the composite signal, while the 4-pin DIN connector supports the S-Video format.
- Connect the TV antenna or cable to the TV tuner input through the F connector.
- Connect an audio cable to the audio out jack. This cable will connect the TV tuner stereo audio out to the sound card audio input.

**Figure 2. Cable Hookups**







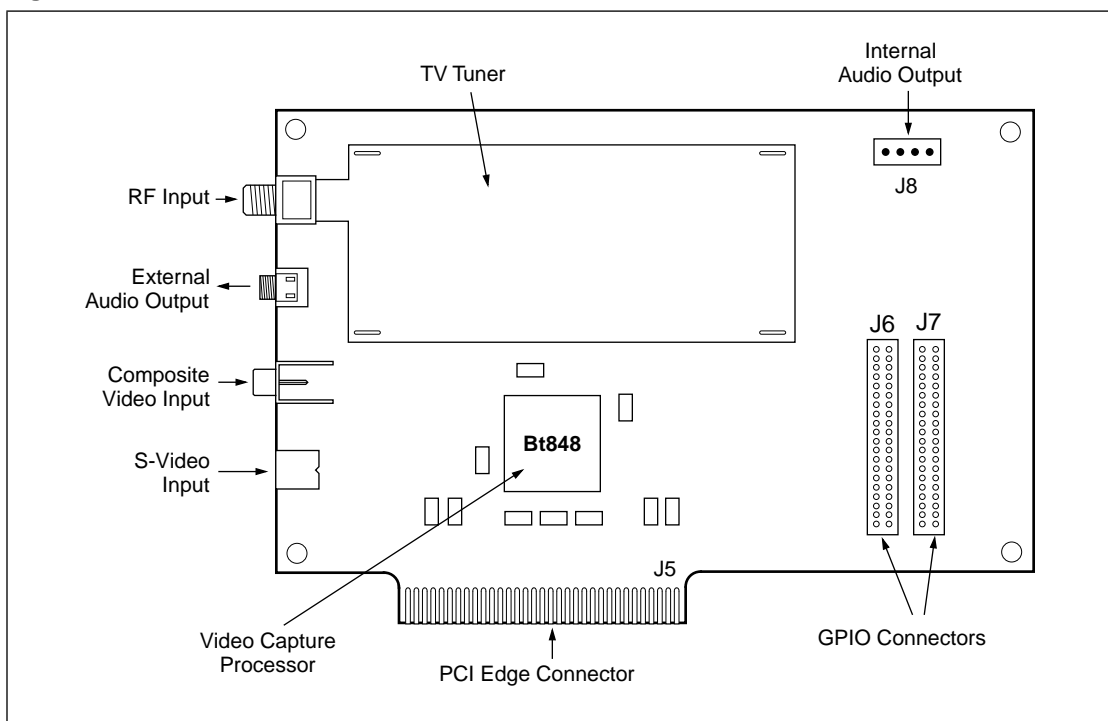
### Bt848EVK Board Input and Output Connections

Table 1 summarizes the Bt848EVK board input and output connections. Figure 3 depicts the major features of the Bt848EVK board, including all interfaces.

**Table 1. Functional Interface Descriptions**

Interface	Function	Description
J5	PCI Local Bus	Edge Card Connector
J1	NTSC/PAL/SECAM Composite Video Input	RCA Jack
P1	NTSC/PAL/SECAM Super Video Input	4-pin DIN Connector
P4	TV Tuner Input	F Connector
J2	Audio Output	Mini Phone Jack

**Figure 3. Bt848EVK Board Features**



### Installation of Application and Driver Software

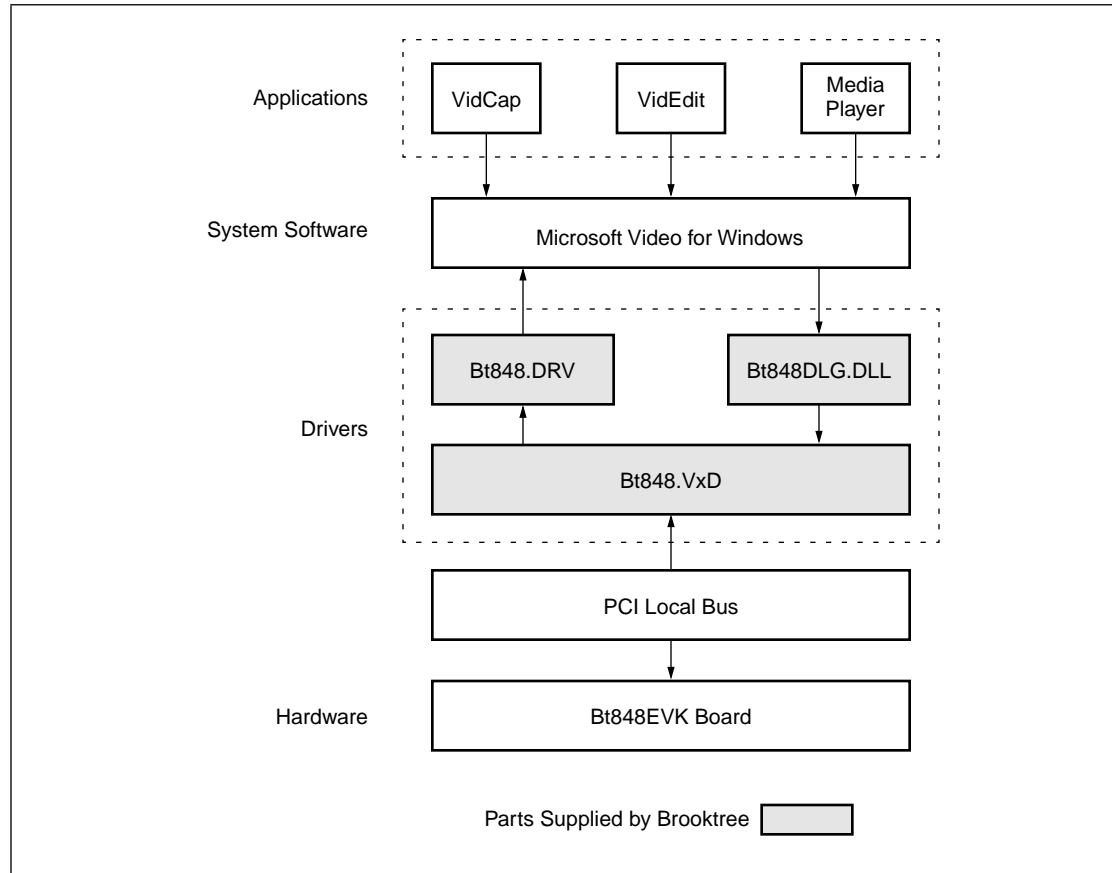
- Refer to Installation Instructions provided in the kit.



## Software Configuration

The basic software/hardware relationships are illustrated in Figure 4. The items depicted in gray are supplied with your Bt848EVK kit.

**Figure 4. Software/Hardware Relationships**





## Using Microsoft's Video for Windows with Bt848EVK

### Capturing and Editing Video Images

Capturing to disk and editing live video images requires Microsoft's Video for Windows version 1.1e or later. With full video and audio editing and storage capability, this program is an excellent vehicle for creating multimedia presentations. It is assumed that the user has Video for Windows installed and is familiar with the basic operation of the program. This section briefly describes the relevant operating features. If you are new to this application, refer to your system documentation.

Video for Windows consists of three main modules:

- VidCap (for video capture)
- VidEdit (for editing captured sequences)
- Media Player (for quick playback of stored and edited sequences)

VidCap provides two modes for capturing video: real time capture, which processes video and audio data from an uninterrupted source or as events occur naturally; and step frame mode, which captures the video source one frame at a time. If the data being captured is from a recorded source (e.g., a VCR or videodisc), each frame of video and audio is paused and processed individually. In the case of real-time capture, it is possible that the time required to process a single frame may exceed the time for the source to reach the next frame, making clear the advantage of using step-frame processing.

The captured frames are not compressed in VidCap. Instead, VidEdit is used to compress, edit and interleave the captured sequences. However, it is suggested that the video sequences be saved in an uncompressed state so that the user can experiment with different compression settings. VidEdit also permits the user to add, delete, and move multimedia data in the audio/video sequence. This allows the images to be fine-tuned for presentations or included in other software packages. In addition, multiple copies of VidEdit can be run simultaneously, providing convenient editing and refinement for portions of sequences.

Once video sequences have been edited, Media Player is used to conveniently play recorded sequences, or to add them to spreadsheets, presentations, word processors, or other electronic documents. Digitally recorded sound files are easily included with Media Player. The video/audio sequence can be set up to run as a stand-alone application or as an embedded object to add sounds or video to other applications.

### Video Capture Device Setup

Several dialog boxes are available in VidCap which allow the user to configure the video source and display parameters. These dialog boxes include:

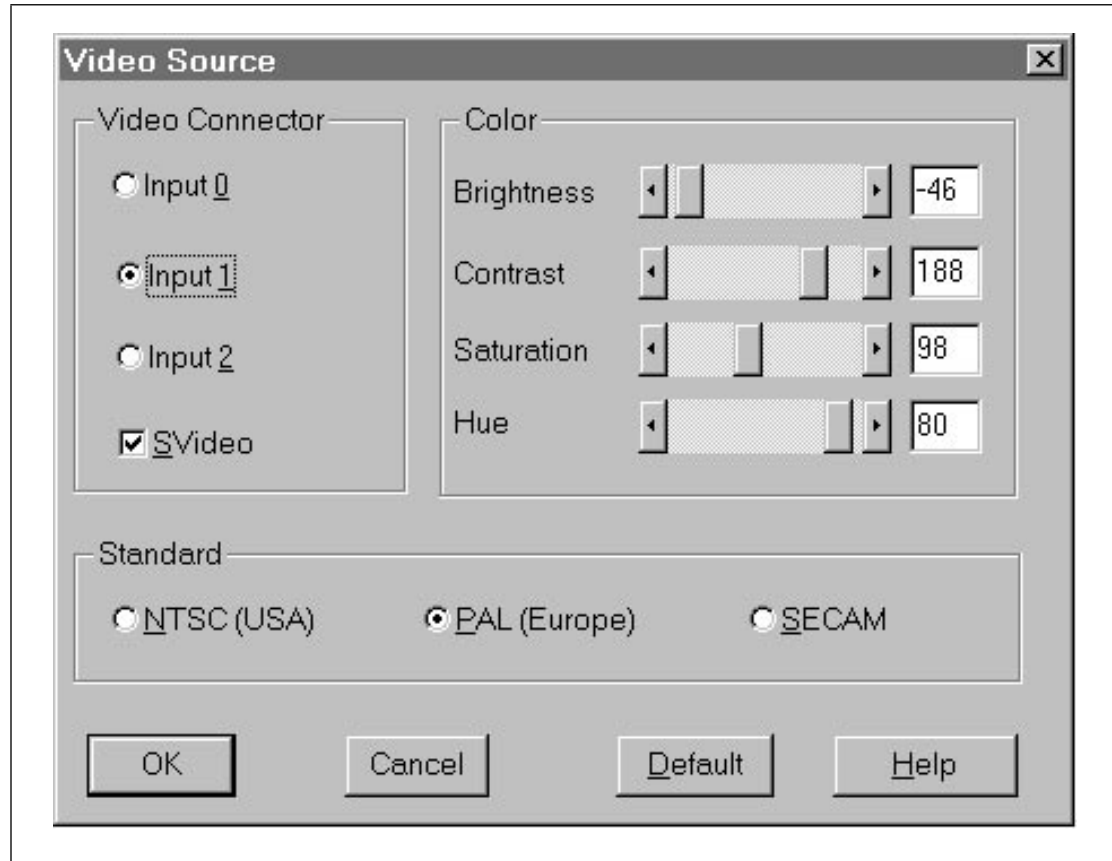
- Video Source
- Video Format



## The Video Source Dialog Box

The Video Source dialog box shown in Figure 5 allows the user to specify NTSC, PAL, or SECAM as the video format. The video source connector should be selected depending on whether the input is a TV signal (Video Input 1), camera/VCR/laserdisc signal (Video Input 2), or S-Video VCR (S-VHS or Video Input 3). There are four controls for the video color: Brightness, Contrast, Hue, and Saturation.

**Figure 5. Video Source Dialog Box**

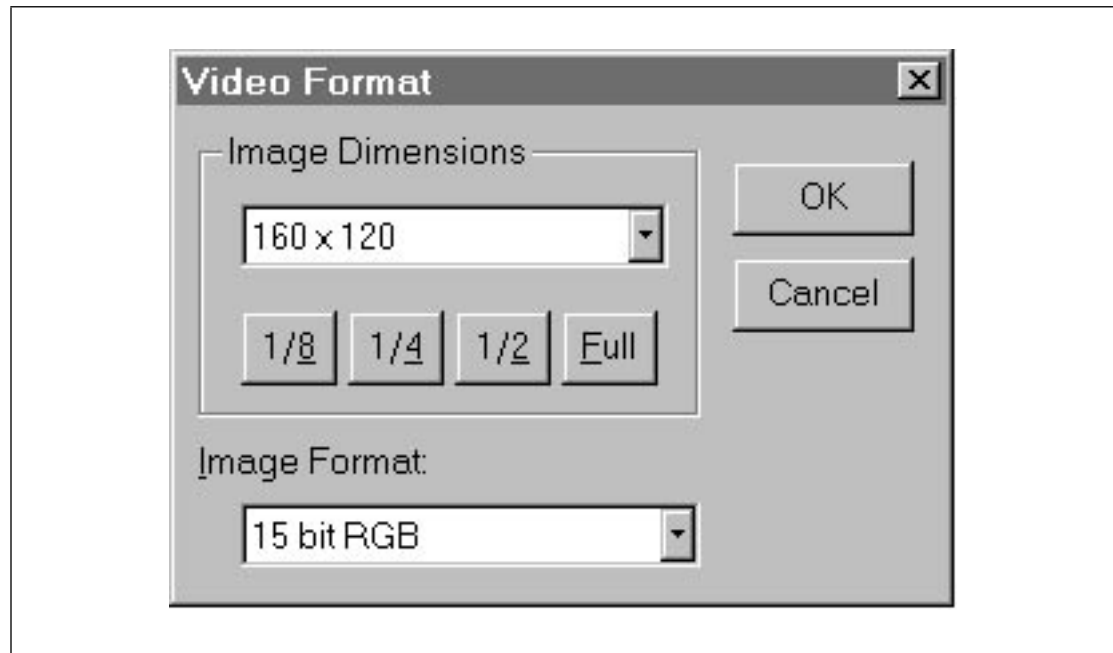




### The Video Format Dialog Box

The video format dialog box shown in Figure 6 allows the user to adjust the size of the source video display. A basic screen size is selected, after which the user can adjust the scaling by 1/8, 1/4, 1/2, or full size. If, for instance, the playback in VidEdit appears jerky and discontinuous, then the source resolution may have to be diminished. The smaller source window size reduces the amount of data which has to be transmitted.

Figure 6. Video Format Dialog Box



# Bt848EVK

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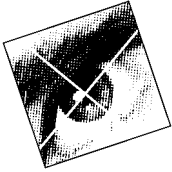
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# Bt848EVK Hardware Reference Guide

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## **Introduction**

The Bt848EVK board is a graphics-independent solution that enables video capture and display using the PCI bus. The design is based on the Bt848 video capture processor and is fully compliant with PCI specification revision 2.1. It accepts analog video inputs from the TV and composite and S-Video sources, and provides a high quality digital video stream to the system. Live video streams can be played in a display window, or can be captured and transferred across the PCI local bus to the system memory. The Bt848EVK board also provides capability for the TV audio to be played via the system sound card.

## **Bt848EVK Features**

The features of the Bt848EVK product are as follows:

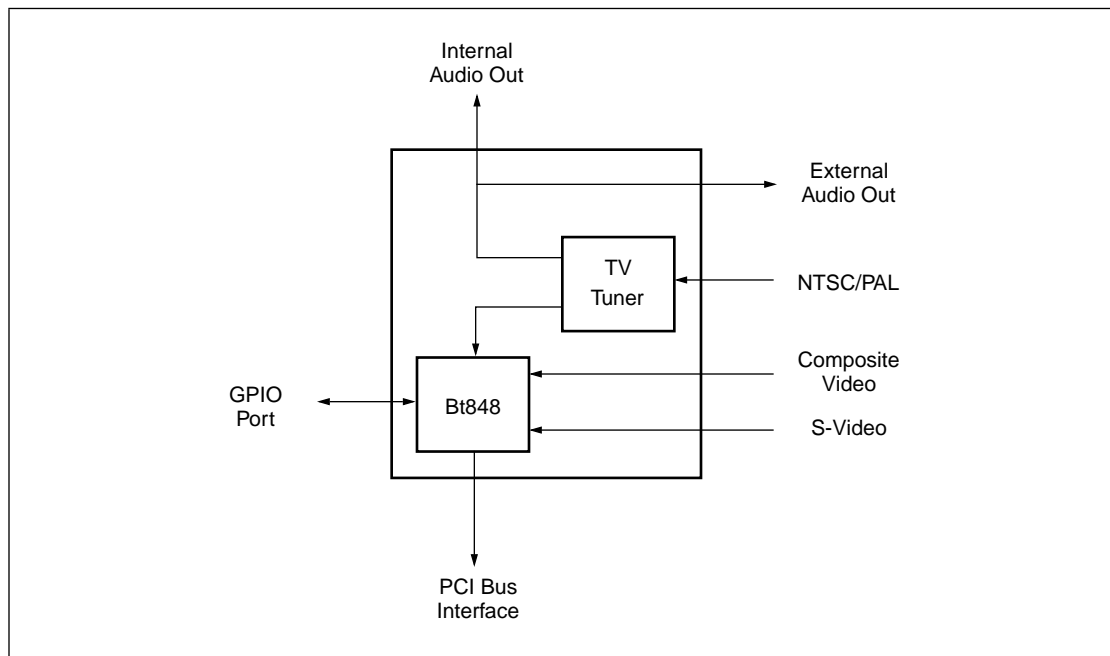
- Provides PCI bus mastering capability and eliminates the need for a local frame buffer.
- NTSC, PAL, and SECAM input video sources are supported.
- One composite NTSC, PAL, or SECAM video input is provided (RCA connector).
- One S-Video Y/C video input is provided (4-pin micro DIN connector).
- One TV tuner input is provided. The Bt848EVK board provides options for TV tuners made by several different manufacturers.
- An auxiliary port is provided for GPIO data and video decoder data.
- Image sizes of up to 768 x 576 for PAL/SECAM and 720 x 480 for NTSC are supported. The image size is scalable down to icon size using vertical and horizontal interpolation filtering.
- Multiple YCrCb and RGB pixel formats are available for the video output.
- Complex clipping of the video source is enabled using the clip list information from the Direct Draw Interface™ (DDI).
- Different destinations for odd and even fields are possible, allowing simultaneous capture and display of the video data. Different color space and scaling factors can be selected for odd and even fields.
- VBI data capture is enabled for closed captioning, teletext, and InterCast data decoding.
- I<sup>2</sup>C bus master capability is provided for programming other components on the board, such as the TV tuner.



## Physical Description

The Bt848EVK is a four-layer PCI card. Figure 1 shows a functional block diagram of the Bt848EVK. The front panel of the board is connected to chassis ground. The front panel connector contains four connectors that are described in the Front Panel Connector section. There are two internal connectors, they are described in the Internal Connectors section.

**Figure 1. Bt848EVK Board Block Diagram**





## PCI Connection

The PCI connection provides the PCI signals shown in Table 1.

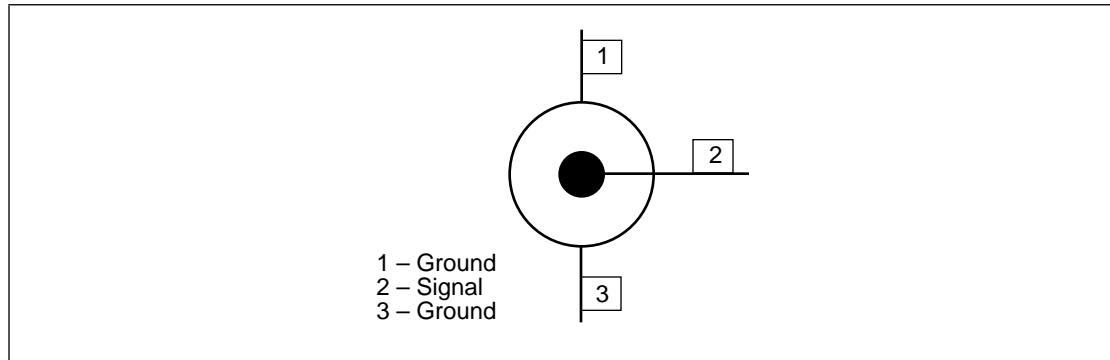
**Table 1. PCI Signal Map**

PCI Signal Name	J5 Pin Number	PCI Signal Name	J5 Pin Number
CLK	J5-B16	AD[10]	J5-B48
$\overline{\text{RST}}$	J5-A15	AD[9]	J5-A49
$\overline{\text{GNT}}$	J5-A17	AD[8]	J5-B52
IDSEL	J5-A26	AD[7]	J5-B53
AD[31]	J5-B20	AD[6]	J5-A54
AD[30]	J5-A20	AD[5]	J5-B55
AD[29]	J5-B21	AD[4]	J5-A55
AD[28]	J5-A22	AD[3]	J5-B56
AD[27]	J5-B23	AD[2]	J5-A57
AD[26]	J5-A23	AD[1]	J5-B58
AD[25]	J5-B24	AD[0]	J5-A58
AD[24]	J5-A25	$\overline{\text{CBE}}[0]$	J5-A52
AD[23]	J5-B27	$\overline{\text{CBE}}[1]$	J5-B44
AD[22]	J5-A28	$\overline{\text{CBE}}[2]$	J5-B33
AD[21]	J5-B29	$\overline{\text{CBE}}[3]$	J5-B26
AD[20]	J5-A29	PAR	J5-A43
AD[19]	J5-B30	$\overline{\text{FRAME}}$	J5-A34
AD[18]	J5-A31	$\overline{\text{IRDY}}$	J5-B35
AD[17]	J5-B32	$\overline{\text{TRDY}}$	J5-A36
AD[16]	J5-A32	$\overline{\text{DEVSEL}}$	J5-B37
AD[15]	J5-A44	$\overline{\text{STOP}}$	J5-A38
AD[14]	J5-B45	PERR	J5-B40
AD[13]	J5-A46	REQ	J5-B18
AD[12]	J5-B47	$\overline{\text{INTA}}$	J5-A6
AD[11]	J5-A47	$\overline{\text{SERR}}$	J5-B42

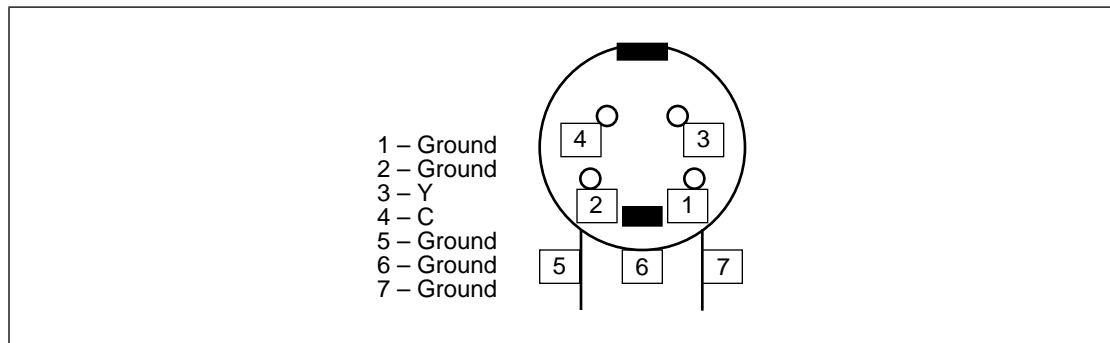


### Front Panel Connectors

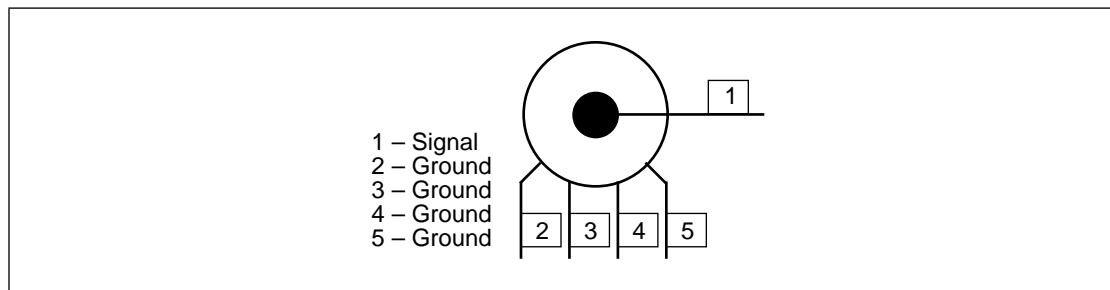
**Figure 2. Composite Video - RCA jack**



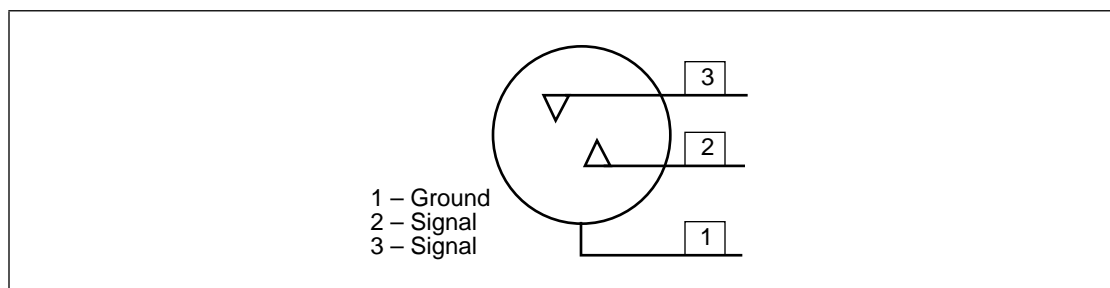
**Figure 3. S Video - 4 pin Mini DIN**



**Figure 4. NTSC/PAL RF - F connector (part of the TV tuner)**



**Figure 5. Audio Out - Mini Stereo Phone Jack**





## Internal Connectors

### GPIO

Two dual row 40 pin connectors. In a normal configuration of the Bt848EVK board, these connectors are not installed.

**Table 2. GPIO Connector Map**

General I/O	Video Decoder Mode	J 6/7 Connector Pin #
GPIO[23]	HRESET	J7-20
GPIO[22]	VRESET	J7-18
GPIO[21]	HACTIVE	J7-22
GPIO[20]	DVALID	J7-28
GPIO[19]	CBFLAG	J7-26
GPIO[18]	FIELD	J7-24
GPIO[17]	VACTIVE	J7-30
GPIO[16]	VBISEL	J6-22
GPIO[15]	Y[7]	J7-2
GPIO[14]	Y[6]	J7-4
GPIO[13]	Y[5]	J7-6
GPIO[12]	Y[4]	J7-8
GPIO[11]	Y[3]	J7-10
GPIO[10]	Y[2]	J7-12
GPIO[9]	Y[1]	J7-14
GPIO[8]	Y[0]	J7-16
GPIO[7]	CrCb[7]	J6-2
GPIO[6]	CrCb[6]	J6-4
GPIO[5]	CrCb[5]	J6-6
GPIO[4]	CrCb[4]	J6-8
GPIO[3]	CrCb[3]	J6-10
GPIO[2]	CrCb[2]	J6-12
GPIO[1]	CrCb[1]	J6-14
GPIO[0]	CrCb[0]	J6-16
GPWE		J6-18
GPINTR		J6-20



## Internal Audio Out

Single in-line 4-pin connector

- 1 Ground
- 2 Audio
- 3 Ground
- 4 Audio

## Electrical Description

There are four logical blocks in the Bt848EVK board. The logical blocks are the Front End Tuner, Bt848 Video Capture Processor, I/O and Power.

### Front End Tuner Block

#### Physical Connections

The Bt848EVK accommodates any one of three tuner manufacturers. In addition, there are two types of tuners NTSC or PAL. There is one footprint located near the front panel of the Bt848EVK that accommodates any of the five TV tuners listed in Table 3. The TV tuner provides an F connector that protrudes enough through the front panel to accommodate connection to mating connectors.

**Table 3. TV Tuner Part Numbers Supported by the Bt848EVK Board**

NTSC M/N	PAL B/G
Phillips F11236	Phillips F11216
Temic 4032FY5	Temic 4002FH5
Alps TSBH1-001A	Alps TSBE1

#### Electrical Connections

There are five logical connections to the TV tuner and two or three power connections, depending on the TV tuner manufacturer. The power connections are described in the Power Block section.

#### Video Output

The video output of the tuner is connected through an RC network to the MUX0 input of the Bt848.

#### Audio Output

The baseband audio of the tuner is decoded. The stereo signal is available at the external audio jack and an internal 4-pin connector. The tuner stereo/audio output should be connected to the system sound card.

#### I<sup>2</sup>C Bus Interface

The data and clock pins of the TV tuner are directly connected to the Bt848.



## Bt848 Block

The Bt848 is a single-chip device for video capture over the PCI bus. In addition to video decoding and scaling capability similar to those of the Bt829 video decoder, Bt848 provides an on-chip FIFO, a DMA controller, PCI bus mastering capability, a general purpose I/O port, and I<sup>2</sup>C bus mastering capability.

### Power

The power systems for the Bt848 are described in the Power Block section.

### Video Input

There are three sources of video information to the video decoder section of Bt848. The TV tuner is connected to MUX0, Composite Video is connected to MUX1, and the S-Video input is connected to the MUX2.

### Video Output

The video data is output by the Bt848 DMA controller over the PCI bus.

### Clock

The Bt848EVK accommodates NTSC or PAL/SECAM video formats. The Bt848 requires the appropriate crystals and associated clock circuit as specified in the Bt848 datasheet.

## I/O Block

### I<sup>2</sup>C Bus

The TV tuner is controlled by Bt848 via the I<sup>2</sup>C bus. The clock and data pins are routed to the appropriate pins on the tuner. Pull ups of 10 K $\Omega$  are provided to the +5 V plane. The protocol of the bus and the possible commands may be found in the appropriate specifications for these devices.

### GPIO Bus

The GPIO port is connected to two 40-pin connectors. The GPIO port can be used to input/output general purpose data or video decoder data. Table 2 shows the mapping of the GPIO pins in both general I/O and video decoder modes.





## **Power Block**

There is one power plane (+5 V) and one ground plane in the Bt848EVK. There also exists a DC to DC converter that takes the  $\pm 12$  VDC from the PCI bus and creates +33 VDC, as needed by some TV tuner models.

### **Digital Power**

Power supply for Bt848 digital circuitry. All VDD pins are connected together as close to the Bt848 as possible.

### **Analog Power**

Power supply for Bt848 analog circuitry. All VAA pins and VPOS are connected together as close to the Bt848 as possible.

### **PCI Power**

Power supply for PCI bus signals. All VDDP pins are connected together.

### **TV Tuner Power**

The  $\pm 12$  VDC from the PCI bus is connected to the DC to DC converter that creates +30 VDC to +33 VDC at 2.0 mA maximum. This output must not exceed 10 mV peak to peak ripple (up to 500 KHz spectrum). The output of the DC to DC converter is passed to the tuning supply pin of the TV tuner through a 22 K $\Omega$  resistor. The circuitry in this section is not necessary if a TV tuner with an internal DC to DC converter is used.

### **GPIO Power**

Power supply for GPIO port signals. All VDDG pins are connected together.

### **Grounding**

There is one continuous ground plane for all digital circuits, analog circuits, PCI ground, and chassis ground. Chassis ground connects all input connector cases and the front panel.

## ***Mechanical Description***

The Bt848EVK board's physical dimensions are 6.875 inches in length and 4.2 inches in width.

## ***Power Consumption***

Less than 7.5 Watts.

# Bt848

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## *Software Specification*

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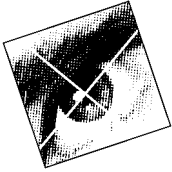
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# Bt848 Software Specification

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## Overview

### Intended Audience

The Bt848 Software Driver Guide is intended for an audience with an understanding of software driver programming. It is assumed that the reader is familiar with and has access to the appropriate documentation for: Microsoft® Windows95™, Video for Windows™, and Direct Draw Interface™.

### Driver Software Specification

The Bt848 driver software provides high-level control of the device functions. It provides an interface to Microsoft Video for Windows (VfW) for video capture and video-in-a-window support, and uses the Microsoft Direct Draw Interface (DDI), to write video data directly to the graphics frame buffer.

The Bt848 driver software features:

- Windows 95 compatibility
- High level control of Bt848 video decoder functions
- Video Capture support
- Video-in-a-window support
- Vertical Blanking Interval (VBI) data support
- Closed-caption support
- Teletext support
- I<sup>2</sup>C function support
- GPIO function support
- Intelligent error recovery
- Microsoft Setup installation script
- Customer modifiable dialog boxes in Dialog Dynamic Link Library (DLL)

### Target Platform

The Bt848 driver software is intended for Pentium™ 90 MHz PCI systems with the Microsoft Windows95 operating system. The graphics sub-system must have a linear frame buffer and a DDI provider for video in a window support.



## Driver Software Suite

Bt848 driver software files include:

- Device driver binaries
- Dialog DLL source code (including resources)
- Microsoft Setup script source

The included executable files are listed in Table 1. The Bt848 software will also be available on the Brooktree BBS. Contact Brooktree Applications Group (1-800-2BT-APPS) for further assistance.

**Table 1. Bt848 Driver Software Executable Files**

Name	Description
BT848.DRV	Video for Windows capture driver
Bt848DLG.DLL	Configuration dialogs DLL for the capture driver
BT848.VxD	Bt848 VxD

The Bt848 driver supports only one application at a time. In case additional applications try to open the driver, an error message will be displayed.

## Video Capture/Preview Driver

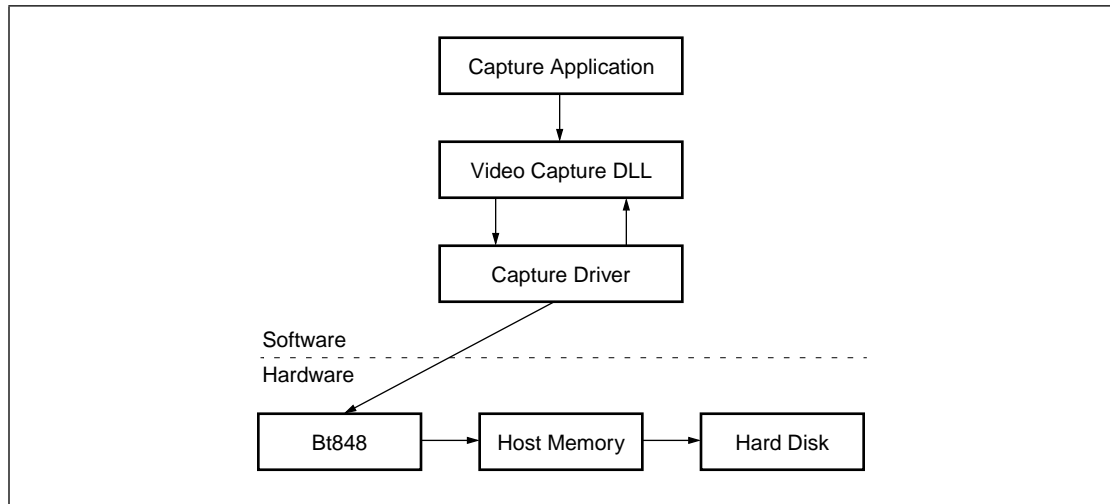
Bt848 video capture conforms to the Microsoft Video for Windows standard. Microsoft's Video for Windows interface completely defines the protocols and interface for video capture and video-in-a-window support. The performance of video in a window will depend on the graphics sub-system present.

The Bt848 driver supports AVI capture/preview by transferring the decoded video frame to the host memory and making it available for the CPU to transfer to the hard disk for capture or to the display for preview purposes. This is illustrated in Figure 1. Table 2 is a list of supported frame rates and color formats.

There is virtually no CPU utilization during transfer of the decoded data for AVI capture. Capture frame rates depend primarily on hard disk performance.



**Figure 1. AVI Capture Block Diagram**



**Table 2. Video Capture Formats and Frame Rates**

Color Format	Resolution	Frames per Second	Comments
RGB32	160 x 120	15	
RGB24	160 x 120	15	
RGB16 (565)	320 x 240	15	
RGB15 (555)	320 x 240	15	
Y8 (Gray Scale)	320 x 240	30	
8-bit Dithered RGB	320 x 240	30	
YUY2 YCrCb 4:2:2	320 x 240	24	UYVY by byte swapping
BtYUV YCrCb 4:1:1	320 x 240	30	3 words pack 8 pixels
YCrCb 4:2:2 Planar	320 x 240	24	
YUV12	320 x 240	24	Vertically sub-sampled 4:2:2
YCrCb 4:1:1 Planar	320 x 240	15	
YUV9	320 x 240	30	Vertically sub-sampled 4:1:1
All Color Formats	160 x 120	30	

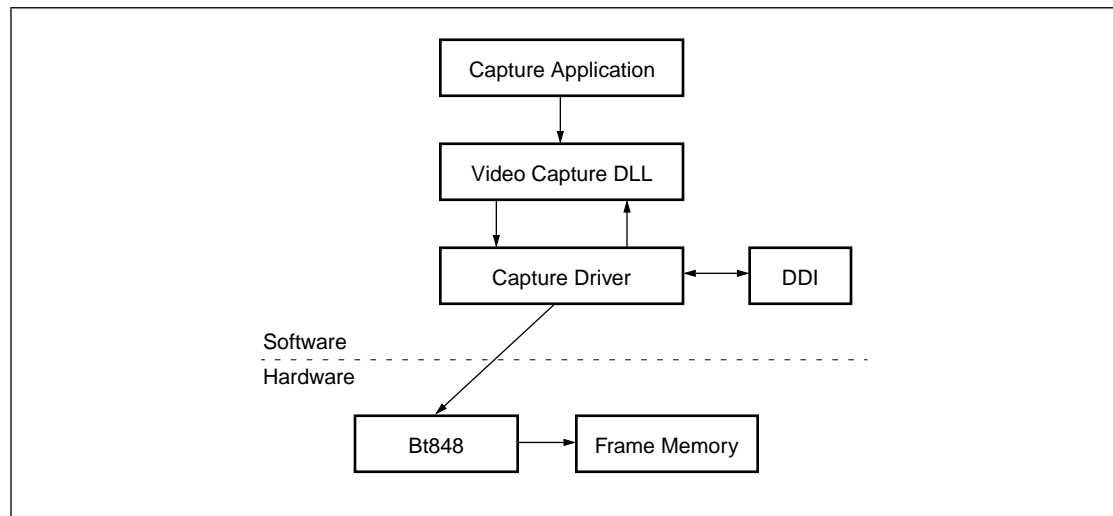




## Previewing a Live Video Window

The Direct Draw Interface is used by the Bt848 capture driver to perform the task of displaying a live video window (see the DDI section). Bt848 can support frame rates up to 30 frames per second for preview applications, however, the actual frame rate will depend on the graphics card's DDI provider. This is illustrated in Figure 2. Table 3 is a list of supported message groups.

**Figure 2. Live Video in a Window Block Diagram**



The following color formats are supported for preview:

- RGB32
- RGB24
- RGB15 with error diffusion
- RGB16 with error diffusion
- Y8 (Gray Scale)

**Table 3. Video for Windows Message Groups**

Description	Message(s)	Supported by Bt848 Capture Driver
Configure the channels of a video capture driver.	DVM_DIALOG	Yes
Set and obtain video capture formats.	DVM_FORMAT	Yes
Set and obtain video source and destination rectangles.	DVM_DST_RECT	Yes
	DVM_SRC_RECT	Yes
	DVM_UPDATE	Yes
Determine channel capabilities.	DVM_GET_CHANNEL_CAPS	Yes
Set and obtain a video capture palette.	DVM_PALLETE	No *
	DVM_PALETTE_RGB555	No *
Obtain the device driver version.	DVM_GETVIDEOAPIVER	Yes
Transfer data from the frame buffer.	DVM_FRAME	Yes
Allocate and free capture buffers on the capture device.	DVM_STREAM_ALLOCBUFFER	Yes
	DVM_STREAM_FREEBUFFER	Yes
Prepare and unprepare buffers for streaming video capture.	DVM_STREAM_PREPAREHEADER	Yes
	DVM_STREAM_ADDBUFFER	Yes
	DVM_STREAM_UNPREPAREHEADER	Yes
Initialize and terminate streaming video capture.	DVM_STREAM_INT	Yes
	DVM_STREAM_FINI	Yes
Start and stop video streaming capture.	DVM_STREAM_START	Yes
	DVM_STREAM_STOP	Yes
Reset, get error information, or get the current stream position.	DVM_STREAM_RESET	Yes
	DVM_STREAM_GETERROR	Yes
	DVM_GETERRORTEXT	Yes
	DVM_STREAM_GETPOSITION	Yes
Send messages to the video capture callback function.	MM_DRVM_CLOSE	Yes
	MM_DRVM_DATA	Yes
	MM_DRVM_ERROR	Yes
	MM_DRVM_OPEN	Yes

Note: These functions are implemented through the color space conversion block of the Bt848 device.



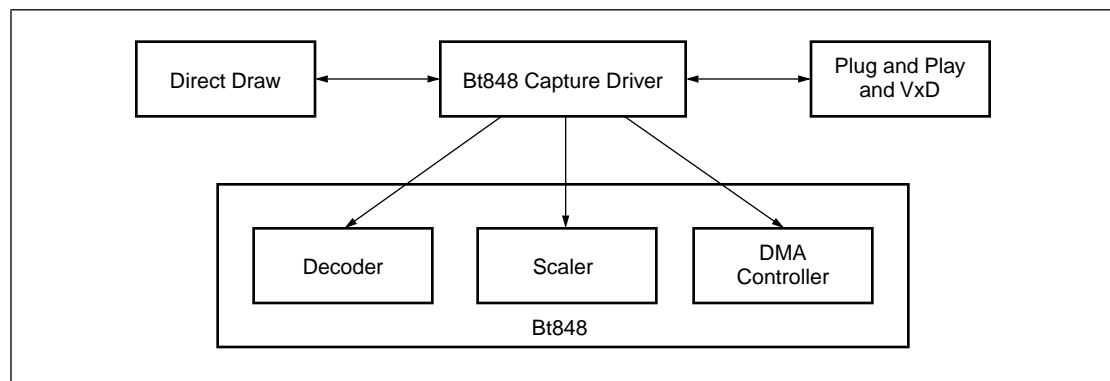
## Hardware Interfaces

There are three major hardware interfaces between the Bt848 device and its driver software:

- Video Decoder
- Video Scaler
- DMA Controller

The video decoder and scaler have independent control of the odd and even fields. The DMA controller receives separate commands for each field. Other major interfaces to the driver software are the Plug and Play™ interface and the Direct Draw Interface. Figure 3 shows the relationships between the different interfaces.

**Figure 3. Bt848 Capture Driver Interfaces**



The video decoder block of the Bt848 is programmed during the capture/preview initialization process. After that point, there are infrequent changes, such as setting a desired color format, brightness, hue, etc. The video scaler on the other hand will be programmed quite frequently to support video in a window functionality. The scaler parameters will be changed every time the user has changed the dimensions or the position of the preview window.

The Bt848 DMA controller executes the RISC instructions generated by the driver software. The RISC instruction sequence may be changed due to several reasons, for example when there has been a change in the graphics overlaid on the video window. Another example is when there have been changes in the destination addresses for both capture (every field) and preview (when the window has been moved or resized). Changes to the RISC instruction sequence involve adding or removing commands for an entire field. The RISC program cannot be changed on a per line basis.



## **DDI Interface**

Direct Draw Interface (DDI) is an extension to Microsoft Windows which allows direct access to video and graphics hardware in order to accelerate such tasks as displaying decompressed video under Video for Windows. It is ideally suited to provide direct access to the graphics frame buffer.

The central concept of the DDI interface is the “surface.” In general, a surface is an image plane or buffer containing part of the display which is shown to the user. Each surface may have different image or color-space formats; for example, one surface may contain 8 bpp RGB pixels while another contains YUV 4:1:1 information. The Bt848 manages the necessary conversions before display. Several surfaces are combined into the final monitor image using either direct writing to the frame buffer (primary surface) or by off-screen surface methods.

The Bt848 capture driver uses DDI to perform the task of displaying live video in a window. The Bt848 driver has the option of moving the video image to the graphics frame buffer, or to the host memory for later display.

## **Windows95 Plug and Play**

As a PCI device, the Bt848’s configuration information is dynamically created at system start-up by Windows95. The operating system can make dynamic changes to the installed hardware. This is all accomplished through the Plug and Play Configuration Manager.

Bt848 driver is able to respond to the Windows95 Plug and Play Configuration Manager’s messages and to dynamically reconfigure the installed hardware as necessary. Under Windows95, a set of API exist in the VxD that provide the interface for interacting with the Configuration Manager.

## **RISC Program**

The Bt848 driver software generates a RISC program to fill requests from Video for Windows. All RISC operations are internal to the driver and are triggered indirectly by VfW messages. The RISC program software can generate all necessary command sequences to support video capture in all formats, and preview in the RGB modes. The software also performs the necessary linear to physical address translations.

Bt848 driver supports complex clipping of graphics data. Based on a clip list from the DDI, the driver generates the RISC program in such a way to block the video information in areas where graphics are to be displayed instead. The PCI bus is not utilized when the video data is being occluded.

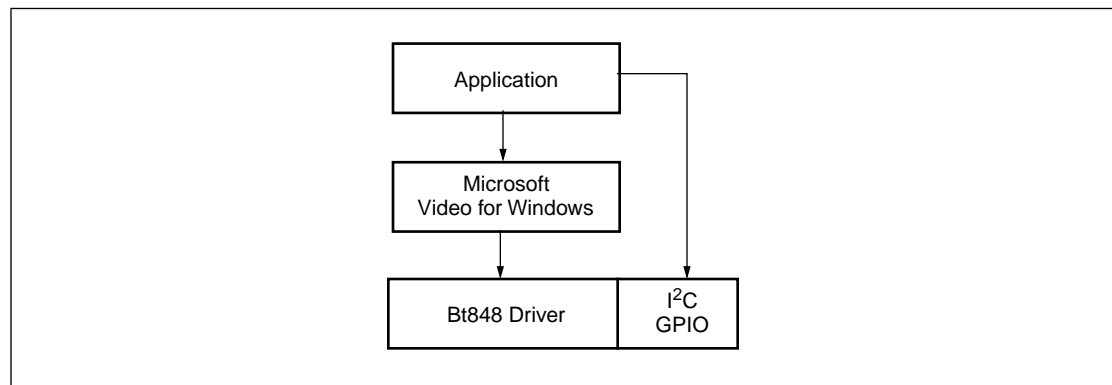
The RISC program instructions reside in system memory. The VxD allocates a portion of contiguous memory during initialization and uses it for the RISC commands. The amount of memory required by the RISC instructions ranges from 3 to 12 K bytes.



## I<sup>2</sup>C and GPIO Function Support

The Bt848 device driver conforms to the Video for Windows specification, which does not provide an interface for proprietary ports such as the I<sup>2</sup>C and the General Purpose I/O (GPIO) port. Therefore, applications attempting to access these proprietary ports must bypass the VfW interface. This is illustrated in Figure 4.

**Figure 4. Bypassing VfW to Access the I<sup>2</sup>C and GPIO Ports**



The I<sup>2</sup>C and GPIO ports are accessed by an application through memory pointers. The two memory pointers to the I<sup>2</sup>C and GPIO ports are located in the Bt848 memory mapped register space. The Bt848 capture driver provides specific messages that an application uses to retrieve the I<sup>2</sup>C and GPIO memory pointers. After the Bt848 capture driver has been opened, the application uses the VfW messaging system to send the specific messages. The Bt848 capture then recognizes the messages, and retrieves the memory pointers.

## Modifiable Dialog Boxes

The Dialog Dynamic Link Library (DLL) contains dialogs and other resources required for using the Bt848 software package. These resources include dialogs for basic video controls (brightness, contrast, hue, saturation), video source selection, video standard (NTSC, PAL, SECAM), image size, capture format, etc. The dialogs may be used as provided or may be modified by the user as suited for each application. The source code is provided for the Dialog Dynamic Link Library. See the Bt848 Users Guide for a description of the dialog boxes as they are provided in the Dynamic Link Library.



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