DATA TRANSLATION

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DT3120
User's Manual

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Radio and Television Interference

This equipment has been tested and found to comply with CISPR EN55022 Class A and EN50082-1 (CE) requirements and also with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case the user will be required to correct the interference at his own expense.

Changes or modifications to this equipment not expressly approved by Data Translation could void your authority to operate the equipment under Part 15 of the FCC Rules.

Note: This product was FCC-Certified under test conditions that included use of shielded cables and connectors between system components. It is important that you use shielded cables and connectors to reduce the possibility of causing interference to radio, television, and other electronic devices.

Canadian Department of Communications Statement

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

Le présent appareil numérique n'émet pas de bruits radioélectriques dépassant les limites applicables aux appareils numériques de la class A prescrites dans le Règlement sur le brouillage radioélectrique édicté par le Ministère des Communications du Canada.

Table of Contents

About this Manual

This manual describes the features of the DT3120 frame grabber board, and how to use the DT3120 Device Driver with the Frame Grabber SDK™ to write an application program.

Intended Audience

This document is intended for engineers, scientists, technicians, or others responsible for programming and/or using a DT3120 board to perform machine vision and/or image analysis operations. It is assumed that you have some familiarity with imaging principles and that you are familiar with the operating characteristics of your video source.

If you are writing application programs using the device driver and the Frame Grabber SDK, it is also assumed that you are familiar with the Microsoft® Windows® 98, Windows Me (Millennium Edition), Windows 2000, or Windows XP operating system and with the Microsoft C compiler.

What You Should Learn from this Manual

This manual provides detailed information about the features of the DT3120 board and the DT3120 Device Driver to allow you to access the board's capabilities using software. It is organized as follows:

- Chapter 1, "Overview," describes the major features of the boards, as well as the supported software and accessories for the boards.
- Chapter 2, "Principles of Operation," describes all of the features of the boards and how to use them in your application.

- Chapter 3, "Supported Device Driver Capabilities," describes the capabilities supported by the DT3120 Device Driver and the initialized control values.
- Chapter 4, "Programming Flowcharts," describes the processes you must follow to program the DT3120 board using the DT-Open Layers™ Frame Grabber SDK.
- Chapter 5, "Troubleshooting," provides information that you can use to resolve problems with the boards and the device driver, should they occur.
- Appendix A, "Specifications," lists the specifications of the boards.
- Appendix B, "Modifying the Device Driver," describes how to add, modify, and remove boards from the device driver, and how to uninstall the device driver, if necessary.
- An index complete this manual.

Conventions Used in this Manual

The following conventions are used in this manual:

- Notes provide useful information that requires special emphasis, cautions provide information to help you avoid losing data or damaging your equipment, and warnings provide information to help you avoid catastrophic damage to yourself or your equipment.
- Items that you select or type are shown in **bold**.
- `Courier font` is used to represent source code.

Related Information

Refer to the following documents for more information on using the DT3120 board:

- *DT3120 Getting Started Manual* (UM-18113), included on the Imaging OMNI CD™ or GLI/2 Streamline™ CD provided with the DT3120 board, describes how to install the DT3120 software, install a DT3120 board, connect signals to the board, install and configure the DT3120 Device Driver, verify the board's operation with DT-Acquire, and view the DT3120 manuals online.
- *Frame Grabber SDK User's Manual* (UM-13442) and online help, included on the Imaging OMNI CD provided with the DT3120 board, describe the Dynamic Linkable Library (DLL) that you can use to write image acquisition application software.
- *DT-Active Open Layers User's Manual* (UM-17325), available from Data Translation, describes DT-Active Open Layers™, an ActiveX control, which allows you to use Data Translation PCI frame grabber boards within graphical programming environments such as Microsoft Visual Basic® and Visual C++®.
- *GLOBAL LAB Image/2 User's Manual* (UM-17790) and *GLOBAL LAB Image/2 API Manual* (UM-17792), available from Data Translation, describe how to use GLOBAL LAB® Image/2 (GLI/2) and GLI/2 Streamline to create scientific applications using object-oriented image processing tools.
- *DT Vision Foundry User's Manual* (UM-17755) and *DT Vision Foundry API Manual* (UM-17757), available from Data Translation, describe how to use DT Vision Foundry™ to create machine vision applications using object-oriented image processing tools.

Additionally, it may be helpful to read other material to gain a better understanding of image processing concepts, algorithms, and their applications. Data Translation's Technical Support Department recommends the following resources for understanding image processing concepts, processing, and coding:

Baxes, Gregory A. *Digital Image Processing, Principles & Applications.* New York: John Wiley & Sons, 1994. Introduction to image processing and hardware/software basics.

Benson, K. Blair, and Donald G. Fink. *HDTV Advanced TV for the 1990's.* New York: McGraw-Hill, 1990. Details high-definition television concepts.

Castleman, K. R. *Digital Image Processing*. Englewood Cliffs, NJ: Prentice-Hall, 1987. Explains major image processing concepts and mathematical concepts involved in digital image manipulation.

Cunningham, John E. *Cable TV*. 2nd ed. Indianapolis: Howard W. Sams & Company, Inc., 1987. Provides the basics of cable television.

Foley, J. D., and A. Van Dam. *Fundamentals of Interactive Computer Graphics*. Addison-Wesley: Reading, MA, 1984. Provides information on geometric functions.

Friedhoff, Richard M., and William Benzon. *The Second Computer Revolution, Visualization.* New York: Harry N. Abrams, Inc., 1989. Covers the history of image processing technology.

Gonzalez, Rafael C., and Paul Wintz. *Digital Image Processing.* Menlo Park, CA: Addison-Wesley, 1987. Explains major image processing concepts and mathematical concepts involved in digital image manipulation, including FFT processing, filtering operations, geometric functions, histograms, and linear equalization.

Held, Gilbert. *Data Compression Techniques and Applications: Hardware and Software Considerations.* 3rd ed. Somerset, NJ: John Wiley & Sons, Inc., 1991. Covers various techniques currently used for data compression; includes programming examples.

Holzmann, Gerard J. *Beyond Photography - The Digital Darkroom.* Englewood Cliffs, NJ: Prentice-Hall, 1988. Introduces and explains image editing; includes programming examples.

Ingram, Dave. *Video Electronics Technology.* Blue Ridge Summit, PA: Tab Books, Inc., 1984. Explains the basic electronics used in video devices.

Kiver, M. S. *Color Television Fundamentals.* New York: McGraw-Hill, 1977. Covers television and video basics.

Lindley, Craig. *Practical Image Processing in C.* Somerset, NJ: John Wiley & Sons, Inc., 1991. Explains basic image processing techniques using C, provides many programming examples, covers TIFF and PICT file formats, and describes how to map images into VGA memory space.

Luther, Arch C. *Digital Video in the PC Environment.* New York: McGraw-Hill, 1991. Explains Digital Video Interactive (DVI) technology.

National Semiconductor Corporation. *Linear Applications Handbook.* Santa Clara, CA: National Semiconductor Corporation, 1986. Explains broadcasting standards and major circuit components of frame grabber boards.

Pratt, William K. *Digital Image Processing.* Somerset, NJ: John Wiley & Sons, Inc., 1991. Detailed text on image processing, including morphological processing, feature extraction, image segmentation, and shape analysis.

Reid, Christopher E. and Thomas B. Passin. *Signal Processing in C.* Somerset, NJ: John Wiley & Sons, Inc.

Rimmer, Steve. *Bit-Mapped Graphics.* Blue Ridge Summit, PA: Tab Books, Inc., 1990. Details digital image file formats and image manipulation after digitizing.

Rimmer, Steve. *Graphical User Interface Programming.* Blue Ridge Summit, PA: Tab Books, Inc., 1992. Covers various techniques currently used for GUI programming; gives insight into how Microsoft Windows was written/implemented along with the design aspects related to windows programming; includes programming examples.

Rosenfeld, Azriel, and Avinash C. Kak. *Digital Picture Processing.* New York: Academic Press, Inc., 1990. Describes image processing techniques and concepts.

Russ, John C. *Computer-Assisted Microscopy,* The Measurement and Analysis of Images. New York: Plenum Press.

Serra, J. *Image Analysis and Mathematical Morphology.* London: Academic Press, Ltd., 1982. Provides information on morphological processing.

Smith, C. Cecil. *Mastering Television Technology.* Richardson, TX: Newman Smith Publishing Company, Inc., 1988. Describes current video technology and concepts.

Tektronix, Inc. *Television Measurements - NTSC Systems.* Beaverton, OR: Tektronix, Inc., 1989. Covers test equipment and broadcasting standards.

Ulichney, Robert. *Digital Halftoning.* Cambridge, MA: The MIT Press, 1987. Describes image manipulation, creation, and analysis in the digital environment.

Watkinson, John. *The Art of Digital Video.* Stoneham, MA: Focal Press, 1990. Provides an in-depth description of digital video fundamentals.

Where to Get Help

Should you run into problems installing or using a DT3120 board, the Data Translation Technical Support Department is available to provide technical assistance. Refer to Chapter 5 for more information. If you are outside the United States or Canada, call your local distributor, whose number is listed in your Data Translation product handbook.

Overview

Features

The DT3120 is a low-cost, color frame grabber board for the PCI bus. This board is suitable for both color image analysis and machine vision applications.

Each DT3120 board digitizes the image, then either stores the digitized data to the host computer's system memory or transfers the digitized data to the computer's display controller to display images in real-time. The board transfers image data to the host computer using PCI burst transfers.

Key features of the DT3120 board are summarized as follows:

- Operates as PCI bus masters on half-size board.
- Supports the scatter/gather memory capability using the PCI interface chip.
- Supports one monochrome or composite video input, which uses the NTSC/RS-170 or PAL/CCIR video format, or one S-video signal, which uses the Y/C video format.
- Accepts a software or external trigger.
- Acquires single or multiple fields and/or frames synchronously or asynchronously.
- Stores images in either 32-bit RGB, 16-bit RGB, 15-bit RGB, 16-bit YUYV422, or 8-bit monochrome format.
- Supports programmable region-of-interest (ROI).
- Provides real-time, interpolated scaling to any size.
- Provides programmable control of the color settings of the board, including brightness, contrast, saturation, and hue.
- Supports overlays.

Supported Software

The following software is available for use with a DT3120 board:

- **DT3120 Device Driver** –This software, which is operating-system specific, is provided on the Imaging OMNI CD, which is shipped with the board. You *must* install this device driver to use a DT3120 board with any of the supported software packages or utilities. Refer to the *DT3120 Getting Started Manual* (UM-18113) for information on installing the device driver.
- **DT-Acquire** –This software is provided on the Imaging OMNI CD, which is shipped with the board. This utility allows you to verify the operation of your board during startup. Refer to the *DT3120 Getting Started Manual* for information on installing and using this utility.
- **GLI/2 Streamline** –This package is shipped with the board if you purchased the SCI-PAK™ package. This package allows you to create scientific applications using object-oriented image processing tools.
- **32-Bit Frame Grabber SDK** –Use this software package, provided on the Imaging OMNI CD, if you want to develop your own application software for the DT3120 board using the Microsoft C compiler in Windows 98, Windows Me, Windows 2000, or Windows XP.
- **DT-Active Open Layers** –Order this optional software package if you want to use the DT-Active Open Layers ActiveX control to access the capabilities of the DT3120 board using Microsoft Visual Basic or Visual C++.
- **GLOBAL LAB Image/2** –Order this optional software package if you want to develop scientific applications using object-oriented image processing tools.
- **DT Vision Foundry** –Order this optional software package if you want to develop machine vision applications using object-oriented image processing tools.

Refer to the Data Translation catalog for information on additional software packages available for the DT3120 board.

2

Principles of Operation

To aid the discussions in this chapter, refer to the block diagram of the DT3120 board, shown in Figure 1. Bold signal names indicate signals you can access.

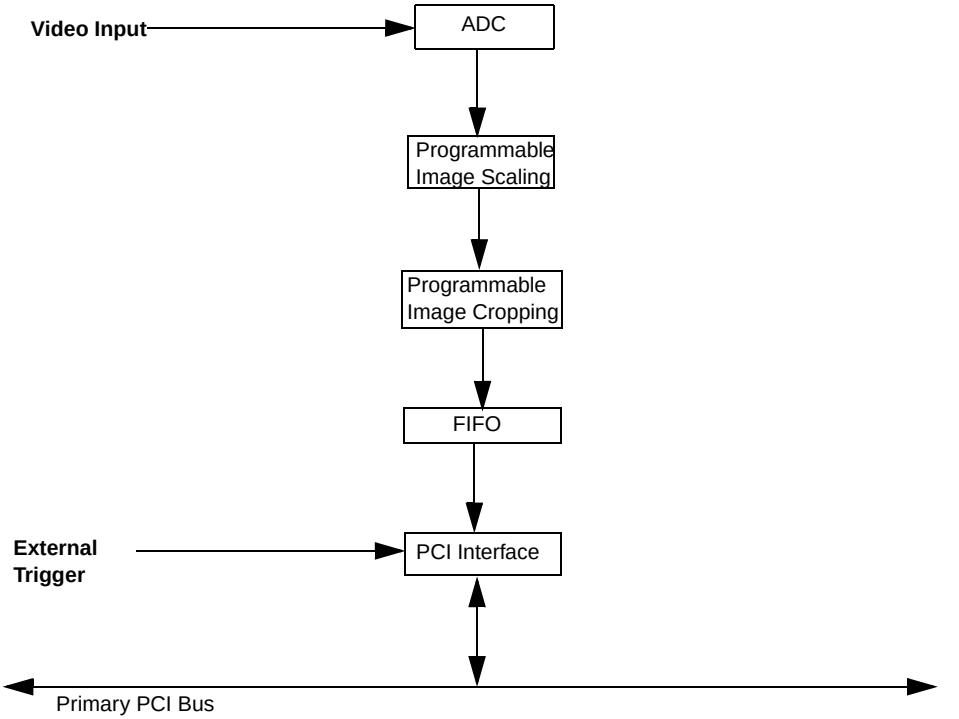


Figure 1: DT3120 Block Diagram

Video Input Signals

This section describes the following aspects of the supported input signals:

- Video signal types,
- Video formats,
- Video input channels,
- Color controls,
- Pixel clock, and
- Triggers.

Video Signal Types

The DT3120 can acquire images from the following signal types:

- **Monochrome** –Data is represented as 8-bit grayscale values.
- **Composite (CVBS**) –The Color Video Broadcast Standard, where both luminance and chrominance information is encoded on a single composite video signal. The signal passes through high- and low-pass filters on the board to separate the chrominance and luminance signals. The decoded signals are represented as 8-bit data.
- **S-Video** –This signal contains both luminance and chrominance information. The filters on the board are bypassed. S-video signals are generally "cleaner," since the high- and low-pass filters can sacrifice signal integrity.

The following video formats are supported for monochrome and composite inputs:

- NTSC –Standard for 60 Hz, color video signal. In this format, the video input is a single analog signal. A video frame is displayed as 640 x 480 lines.
- RS-170 –Standard for 60 Hz, monochrome video signal. In this format, the video input is a single analog signal. A video frame is displayed as 640 x 480 lines.
- PAL –Standard for 50 Hz, color video signal. In this format, the video input is a single analog signal. A video frame is displayed as 768 x 576 lines.
- CCIR –Standard for 50 Hz, monochrome video signal. In this format, the video input is a single analog signal. A video frame is displayed as 768 x 576 lines.

The Y/C format is supported for an S-video input. In this format, the video input is provided as two separate analog signals. The Y signal contains luminance information (the gray-scale portion of the color image). The C signal contains chrominance information (the color portion of the image). For 60 Hz, a video frame is displayed as 640 x 480 lines. For 50 Hz, a video frame is displayed as 768 x 576 lines.

Videos Input Channels

The DT3120 board accepts one composite (CVSB) or one S-video input source at a time. Connect the composite input to connector J2 connector on the DT3120 board or connect the S-video input to connector J 3 on the DT3120 board.

Color Intensity

Using software, you can adjust the following settings of the DT3120 board to affect the intensity of the color:

- **Brightness** –The value associated with a pixel representing its gray value. Values range from 0 to 255 (in increments of 1); the nominal value is 128.
- **Contrast** –The overall range of the monochrome signal of an image. For example, a high contrast image has a large range between black and white values; a low contrast image has a small range between black and white values. Values range from 0 to 511 (in increments of 1); the nominal value is 216.
- **V-Saturation** –The purity of the blue and green primary colors in an image. For example, if a particular pixel has a value of 0 for green, but a value of 511 for blue, then the pixel is said to be saturated in blue. Values range from 0 to 511 (in increments of 1); the nominal value is 180.
- **U-Saturation** –The purity of the green and red primary colors in an image. For example, if a particular pixel has a value of 0 for green, but a value of 511 for red, then the pixel is said to be saturated in red. Values range from 0 to 511 (in increments of 1); the nominal value is 254.
- **Hue** –The intensity or shade of the color. Values range from 0 to 255 (in increments of 1); the nominal value is 128.

Pixel Clock

The DT3120 generates a 12.5 MHz pixel clock signal for 60 Hz image formats and a 15 MHz pixel clock signal for 50 Hz image formats. Pixels are available to the DT3120 frame grabber board in increments of *PixelPeriod*, which is equal to 1 /clock frequency.

Triggers

DT3120 board can accept one of the following trigger sources:

- A software trigger –The board can acquire a frame when a software command is issued.
- An external trigger –By attaching a digital signal to connector J1 on the board, you can synchronize frame acquisitions with external events.

  By default, the external trigger is disabled. Through software, you can enable the external trigger.

You program the trigger source for the acquisition using software.

You can specify whether to start image acquisition when the board detects either a low-to-high edge (rising-edge) transition or a high-to-low edge (falling-edge) transition.

The incoming external trigger is forwarded to the device driver as an interrupt. The interrupt is processed by the device driver to start the acquisition, if desired.

Sync Signals

To digitize the incoming video signal, the DT3120 board requires both horizontal and vertical sync signals. The board determines this information, as well as the odd and even fields, from the video input signal being digitized.

Horizontal sync pulses are asserted low for 4 µs typically. Vertical sync pulses are asserted low for 230 µs typically. The odd field indication changes state on the falling edge of the vertical sync signal.

Video Area

The total video area is a complete set of horizontal and vertical input lines from which you extract the active video area and the frame within the active video area. The total video area includes all parts of the signal, including nonvisual portions such as horizontal and vertical blanking information. (Blanking information is the data not included in the active video area; it contains sync and other information.)

The total video area is as wide as the total pixels per line (the entire area between two consecutive horizontal sync signals) and as tall as the total lines per field (the entire area between two consecutive vertical sync signals).

You can calculate the total pixels per line as follows:

$$\text{Total pixels per line} = \frac{\text{pixel clock frequency (MHz)}}{\text{horizontal frequency (kHz)}}$$

You can calculate the total lines per field as follows:

$$\text{Total lines per field} = \frac{\text{horizontal frequency (kHz)}}{\text{vertical frequency (Hz)}}$$

Active Video Area

The active video area floats in the total video area. The active video area is defined as that part of the incoming signal that contains valid video data (not blanking or sync information). Therefore, the active video area consists of the visible portion of those lines containing visible pixel data. Its top is set by the first active line, its left side is set by the first active pixel, it is as wide as the active pixel count, and it is as tall as the active line count.

For more information about the horizontal and vertical signals that comprise the total video area and the parameters you can set to specify the active video area, refer to the following sections.

Horizontal Video Signal

Each line of video comprising the total video area contains blanking information and active video. Figure 2 shows the components of a single horizontal line of video.

Note that the frame is an area that you establish within the active video area. For information about the frame, refer to page 15.

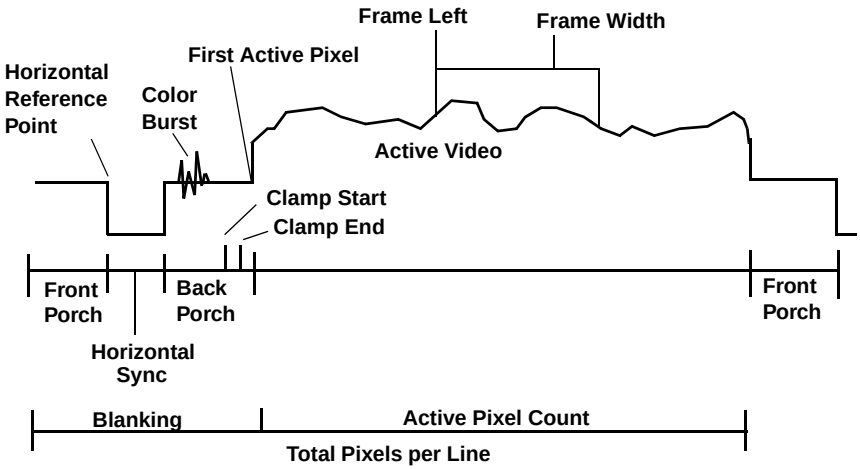


Figure 2: Horizontal Video Signal

A horizontal line of video is identified by the falling edge of the horizontal sync, and a field is composed of a collection of horizontal lines defined by the active line count. Pixel measurements are relative to the horizontal reference point, which is defined as the beginning of the horizontal sync.

The horizontal video signal settings are fixed and cannot be programmed.

Vertical Video Signal

Each field of video also contains blanking information and lines of active video. Figure 3 shows the components of a single vertical field of noninterlaced video.

Note that the frame is an area that you establish within the active video area. For information about the frame, refer to page 15.

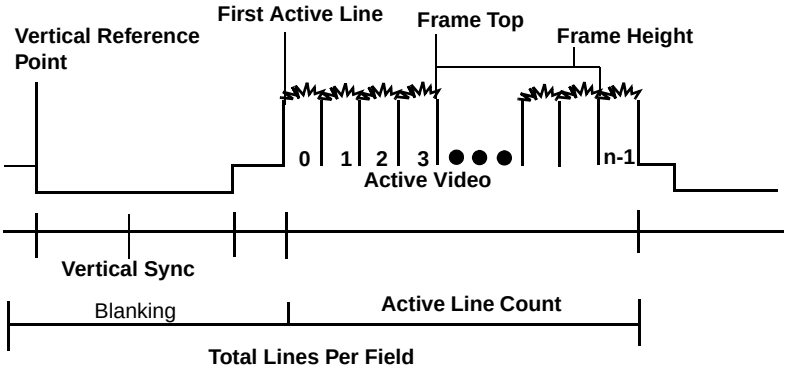


Figure 3: Vertical Video Signal

Line measurements are relative to the vertical reference point, which is defined as the beginning of the vertical sync. Lines themselves are measured in terms of pixels.

The vertical video signal settings are fixed.

Frame (Region of Interest)

The frame is the portion of the active video area that you want to digitize. For this reason, it is sometimes called the region of interest (ROI).

This section describes the following aspects of frames:

- Frame size,
- Frame type,
- Scaling frames, and
- Frame storage modes.

Frame Size

The top of the frame is the first line of video relative to the active video area. The left side of the frame is the first pixel of video relative to the active video area. The width of the frame is the number of pixels per line of video. The height of the frame is the number of lines per field.

Table 1 shows the settings you can program on the DT3120 board to define the frame. Figure 4 illustrates these relationships.

Table 1: Frame Settings for the DT3120 Board

Setting	Description	Range[a]	Nominal Values
Frame Left	The first pixel in the region of interest, relative to the first active pixel, to digitize.	50 Hz: 0 to 763 pixels 60 Hz: 0 to 635 pixels	0
Frame Width	The number of pixels per line of video to digitize.	50 Hz: 1 to 768 pixels 60 Hz: 1 to 640 pixels	50 Hz: 768 60 Hz: 640
Frame Top	The first line of the region of interest, relative to the first active line, to digitize.	50 Hz: 0 to 575 lines 60 Hz: 0 to 479 lines[a]	0
Frame Height	The number of lines per frame of video to digitize.	50 Hz: 1 to 576 lines 60 Hz: 1 to 480 lines	50 Hz: 576 60 Hz: 480

a. Granularity is 1.

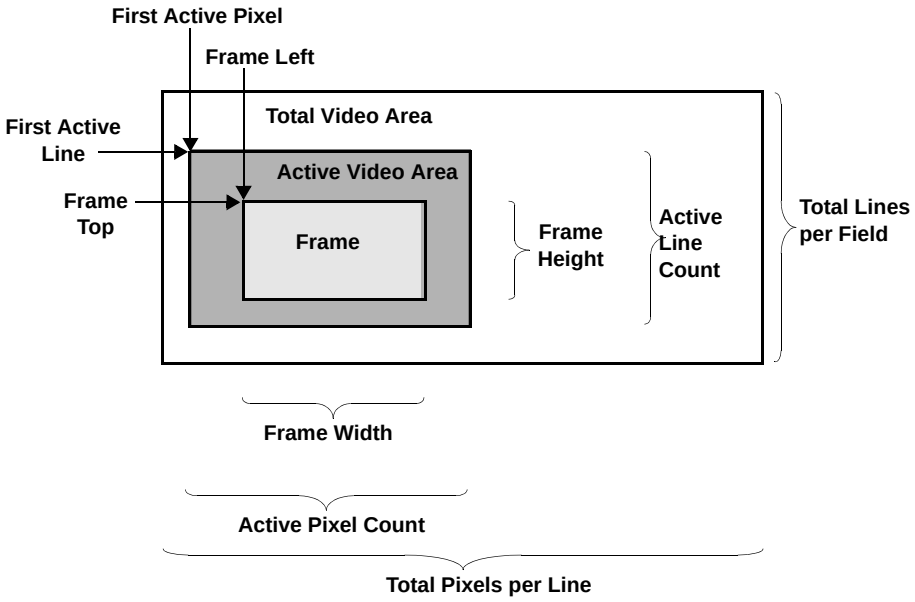


Figure 4: Spatial Relationship of Video Signal

Types of Frames

The DT3120 board can acquire interlaced frames.

The video signal is defined as two consecutive fields, where the start of each field is identified by the falling edge of the vertical sync. These two fields are acquired to create the complete frame. The even field contains lines 0, 2, 4, and so on; the odd field contains lines 1, 3, 5, and so on.

Using software, you can select one of the following types of frame acquisitions:

- Interlaced frames, starting on the next even field (the default),
- Interlaced frames, starting on the next odd field,

- Interlaced frames, starting on the next field (odd or even),
- Even fields only, starting with the next even field,
- An odd field only, starting with the next odd field, or
- Odd or even fields only, starting with the next field of either kind. For example, if the next field is odd, only the odd fields are acquired. If the next field is even, only the even fields are acquired.

Scaling Frames

DT3120 board can perform simultaneous, interpolated, arbitrary scaling in real-time. This feature is useful if you want to reduce the size of an image.

The number of lines per frame in the scaled image can range from 1 to 480 for 60 Hz image formats or from 1 to 576 for 50 Hz image formats (in increments of 1). The number of pixels per line in the scaled image can range from 4 to 640 for 60 Hz image formats or from 4 to 768 for 50 Hz image formats (in increments of 4).

Using software, you provide the scale factor for the horizontal and vertical directions. The scale factor is the ratio of the target values (the total number of pixels or lines in the resulting scaled image) to the source values (the total number of pixels or lines in the image to scale) in each direction.

The minimum scale factor is 1; the maximum scale factor is 100 (nominal is 100).

Frame Storage Mode

You can store the data in one of the following formats:

- Monochrome format (8-bits per pixel), as shown in Figure 5;
- RGB16 (16-bits per pixel), as shown in Figure 6;
- RGB24 (24-bits per pixel), as shown in Figure 7; and
- RGB (32-bits per pixel), as shown in Figure 8; and
- YUYV422 (16-bits per pixel), as shown in Figure 9.

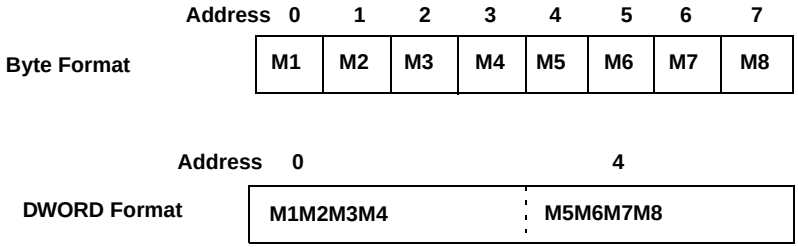


Figure 5: Monochrome Mode (8-Bit Data Format)

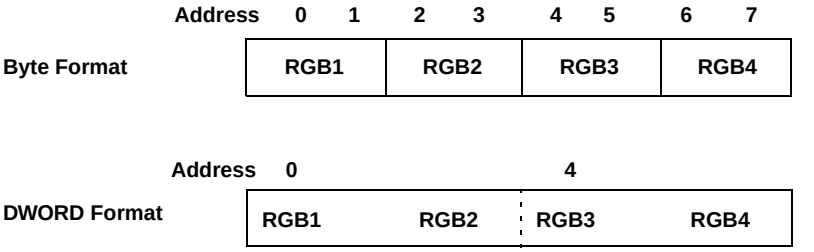


Figure 6: RGB16 (16-Bit) Color Data Format

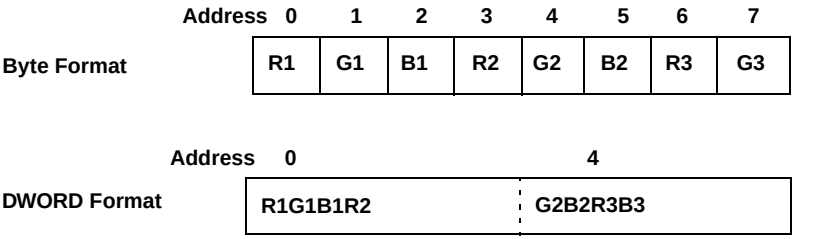


Figure 7: RGB 24-Bit Color Data Format

Figure 8: RGB 32-Bit Color Data Format

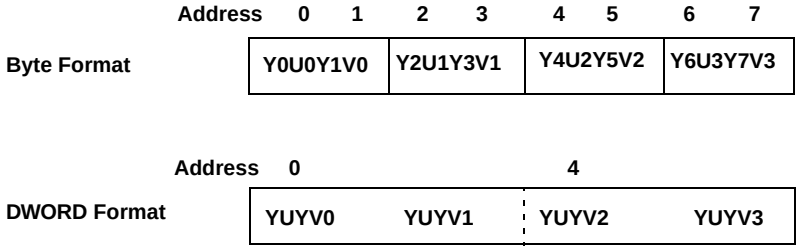


Figure 9: YUYV422 (16-Bit) Data Format

Passthru Operations

In a passthru operation, a DT3120 board continuously captures and displays video data until you stop the operation. Typically, you use passthru to view images (in as close to real time as possible for the configuration and passthru method chosen) for the purpose of focusing or positioning the camera.

In addition to displaying passthru data, you can continuously store the data to user-allocated buffers in host memory, if desired. This operation is called continuous-acquire passthru mode.

This section describes the following aspects of passthru:

- Passthru modes,
- Source origin,
- Passthru scaling, and
- Overlays.

Passthru Modes

The DT3120 board supports bitmap passthru mode and continuous-acquire passthru mode. This section describes these modes.

Bitmap Passthru Mode

The DT3120 board supports asynchronous bitmap passthru mode.

In an asynchronous operation, the operation starts but gives control to you immediately, allowing you to perform other operations while data is displayed.

Bitmap passthru mode requires a frame in device memory into which the image is captured.

Once the image is captured, functions in Windows perform bit copies of the image data to display memory. Functions in Windows handle obstructions to the passthru window by automatically clipping the passthru image to the visible client window region. Therefore, even if the window is obstructed in bitmap mode, the passthru can continue unabated. Once an obstruction has been removed from the passthru window client area, Windows automatically restores the correct underlying image data.

A passthru operation continues until you stop it. You can stop an asynchronous bitmap passthru operation using software.

Continuous-Acquire Passthru Mode

The DT3120 board supports asynchronous, continuous-acquire passthru mode. Since it is asynchronous, the operation starts but gives control to you immediately, allowing you to perform other operations while data is acquired and/or displayed.

Using software, you can set up the continuous-acquire passthru operation so that data is continuously stored and displayed, or continuously stored but not displayed.

If you want to display data in continuous-acquire passthru mode, functions in Windows perform bit copies of the image data to display memory. These functions also handle obstructions to the passthru window by automatically clipping the passthru image to the visible client window region. Therefore, even if the window is obstructed in bitmap mode, the passthru can continue unabated. Once an obstruction has been removed from the passthru window client area, Windows automatically restores the correct underlying image data.

In continuous-acquire passthru mode, data is stored in a circular buffer in device memory.

This mode also has a synchronization mechanism using a WIN32 event object. Using this object, you can synchronize your application with the DT3120 board to process data as it becomes available.

Continuous-acquire passthru operations continues until you stop them using software.

Source Origin

The source origin of an image is the upper left corner of the image. On the DT3120 board, the source origin is always 0,0.

Passthru Scaling

On a DT3120 board, the same scaling mechanism that is used to scale frames is used to scale passthru images.

The number of lines per frame in the scaled image can range from 1 to 480 for 60 Hz image formats or from 1 to 576 for 50 Hz image formats (in increments of 1). The number of pixels per line in the scaled image can range from 4 to 640 for 60 Hz image formats or from 4 to 768 for 50 Hz image formats (in increments of 4).

Using software, you provide the scale factor for the horizontal and vertical directions. The scale factor is the ratio of the target values (the total number of pixels or lines in the resulting scaled image) to the source values (the total number of pixels or lines in the image to scale) in each direction.

The minimum scale factor is 1; the maximum scale factor is 100 (nominal is 100).

Overlays

You can add overlays to the display using software during passthru operations. Overlays allow you to place an image on top of another image that was captured using passthru.

Note: Overlays require Direct Draw Interface (DDI) support.

Acquisition Operations

The DT3120 board can acquire interlaced frames or individual fields either synchronously or asynchronously, and store them in system memory. In a synchronous acquisition, you cannot perform another operation until the synchronous acquisition completes. In an asynchronous acquisition, the operation starts but gives control to you immediately, allowing you to perform other operations while data is acquired.

Using the DT3120, you can acquire a single full frame, a single field (subframe), multiple full frames, or multiple fields. Data is stored to an area in system memory that is allocated by the DT3120 Device Driver (called *device memory*). Table 2 lists the memory size that is used for each image format and image type supported.

Table 2: Memory Used

Video Format	Storage Image Format	Maximum Memory Used (Bytes)
60 Hz	RGB or RGB24	1,228,800
	RGB16 or YUYV422	614,400
	MONO	307,200
50 Hz	RGB or RGB24	1,769,472
	RGB16 or YUYV422	884,736
	MONO	442,368

An interrupt is generated when an even or odd field has been acquired; the PCI bus assigns the interrupt to the board automatically when it is installed.

The speed of the PCI bus allows the DT3120 to transfer an unlimited number of consecutive frames across the bus in real time. You can acquire consecutive images, up to the capacity of available system RAM.

Acting as a PCI bus master, the board sends pixel data over the PCI bus directly using burst transfer rates up to 30 frames/s for 60 Hz image formats and 25 frames/s for 50 Hz image formats, when used with a 16-bit or 32-bit color display adapter board that supports DDI.

Supported Device Driver Capabilities

DT3120 Device Driver Capabilities

Because the Frame Grabber SDK is intended to be used with all DT-Open Layers frame grabbers, the DT3120 may not support all of the Frame Grabber SDK capabilities or may support the Frame Grabber SDK capabilities differently from other boards.

To help you determine which capabilities are supported by the DT3120 board, you can use query functions provided by the Frame Grabber SDK. These functions return either information about a specific capability or the current value of a specific capability.

The tables in this chapter list the capabilities supported by the DT3120 board and the information needed to query the board. The left column of the tables lists the capabilities along with the query key/control used for the listed function. The query's possible returned flags, if any, are indented under the key along with a description. The right column indicates whether the DT3120 board support the capability or flag or the range of values supported by the capability.

To find the information about a capability more readily, use this information:

For capabilities that apply to ...	Refer to the table starting on ...
All frame grabbers	page 32
Input signals	page 34
Sync signals	page 38
Active video area	page 40
Frames	page 42
Passthru	page 46

For capabilities that apply to ...	Refer to the table starting on ...
Overlay	page 47
Memory	page 48
Acquisition	page 49
Digital I/O	page 51

Note: If your code is intended to be compatible with various Data Translation products, use the query functions to determine that the capability is supported by the installed board, prior to execution.

For more information, refer to the description of SDK functions in the Frame Grabber SDK online help.

Table 3: General Device Capabilities for the DT3120 Device Driver

Capability	DT3120 Support
OlImgQueryDeviceCaps	
Board Signature OLC_IMG_DC_OL_SIGNATURE	0x44544F4C
Device ID OLC_IMG_DC_DEVICE_ID	8080h
Board Name OLC_IMG_DC_DEVICE_NAME	“DT3120”
Device Type OLC_IMG_DC_OL_DEVICE_TYPE Monochrome Frame Grabber OLC_IMG_DEV_MONO_FRAME_GRABBER Color Frame Grabber OLC_IMG_DEV_COLOR_FRAME_GRABBER	 Yes Yes
Sections Supported OLC_IMG_DC_SECTIONS Supports Input Operations OLC_FG_SECTION_INPUT Supports Camera Control Operations OLC_FG_SECTION_CAMCTL Supports Management of Device Memory OLC_FG_SECTION_MEMORY Supports Linear Memory Operations OLC_FG_SECTION_LINEAR Supports passthru OLC_FG_SECTION_PASSTHRU Supports DDI OLC_FG_SECTION_DDI	 Yes No Yes No Yes Yes

Table 3: General Device Capabilities for the DT3120 Device Driver (cont.)

Capability	DT3120 Support
DtColorQueryInterface	
SDK Extension Capabilities	
OLT_QUERY_COLOR_INTERFACE	
Supports Signal Type	
COLOR_INTERFACE_SIGNAL_TYPE	True
Supports Storage Mode	
COLOR_INTERFACE_STORAGE_MODE	True
Supports Image Parameter	
COLOR_INTERFACE_IMAGE_PARAMETER	True
Supports Hardware Scaling	
COLOR_INTERFACE_HARDWARE_SCALING	True
Supports Digital I/O	
COLOR_INTERFACE_DIGITAL_IO	False
Supports Draw Acquired Frame	
COLOR_INTERFACE_DRAW_ACQUIRED_FRAME	True
Supports Sync Master Mode	
COLOR_INTERFACE_SYNC_MASTER_MODE	False
Supports Extracting RGB Frames	
COLOR_INTERFACE_EXTRACT_FRAME	False
Supports Drawing Extracted Data	
COLOR_INTERFACE_DRAW_BUFFER	False

Table 4: Input Signal Capabilities for the DT3120 Device Driver

Capability	DT3120 Support
OlFgQueryInputCaps	
Number of Input Sources OLC_FG_INPUT_SOURCE_COUNT	1
Supports Input Filter Selection OLC_FG_IC_DOES_INPUT_FILTER	No
Supports Input Filter Query OLC_FG_IC_DOES_QUERY_INPUT_FILTER	No
Supported Filters OLC_FG_IC_INPUT_FILTER_LIMITS AC Coupled, no Input Filter OLC_FG_FILT_AC_NONE AC Coupled, 50 Hz Input Filter OLC_FG_FILT_AC_50 AC Coupled, 60 Hz Input Filter OLC_FG_FILT_AC_60 DC Coupled, no Input Filter OLC_FG_FILT_DC_NONE	N/A
Supports Programmable A/D OLC_FG_IC_DOES_PROG_A2D	No
Supports Programmable A/D Query OLC_FG_IC_DOES_QUERY_PROG_A2D	No
Voltage Range of Black Level, in µV OLC_FG_IC_BLACK_LEVEL_LIMITS	N/A
Voltage Range of White Level, in µV OLC_FG_IC_WHITE_LEVEL_LIMITS	N/A
Supports Pixel Clock OLC_FG_IC_DOES_PIXEL_CLOCK	No
Supports Pixel Clock Query OLC_FG_IC_DOES_QUERY_PIXEL_CLOCK	Yes

Table 4: Input Signal Capabilities for the DT3120 Device Driver (cont.)

Capability	DT3120 Support
Range of Internal Input Clock Frequency, in Hz OLC_FG_IC_CLOCK_FREQ_LIMITS	Fixed 50 Hz: 15,000,000 60 Hz: 12,500,000
Clock Sources OLC_FG_IC_CLOCK_SOURCE_LIMITS Supports Internal Clock OLC_FG_CLOCK_INTERNAL Supports External Clock OLC_FG_CLOCK_EXTERNAL	 Yes No
Provides Trigger OLC_FG_IC_DOES_TRIGGER	Yes
Trigger Types OLC_FG_TRIGGER_TYPE_LIMITS Supports Externally Triggered Acquisition OLC_FG_TRIG_EXTERNAL_LINE	 Yes
Multiple Trigger Types OLC_FG_IC_MULT_TRIGGER_TYPE_LIMITS Supports Externally Triggered Acquisition OLC_FG_TRIG_EXTERNAL_LINE	 Yes
Multiple Trigger Modes OLC_FG_IC_MULT_TRIGGER_MODE_LIMITS Trigger Starts Multiple Frame Acquisition OLC_FG_MODE_START Trigger Starts Each Frame Acquisition OLC_FG_MODE_EACH	 Yes Yes
Supports Strobing OLC_FG_IC_DOES_STROBE	No

Table 4: Input Signal Capabilities for the DT3120 Device Driver (cont.)

Capability	DT3120 Support
Strobing Modes For Each Input Group OLC_FG_IC_STROBE_TYPE_LIMITS Can Strobe After Each Field OLC_FG_STROBE_FIELD_BASED Can Strobe After Each Frame OLC_FG_STROBE_FRAME_BASED Can Strobe On A Software Command OLC_FG_STROBE_NOW	 No No No No
Strobe Pulse Width Limits OLC_FG_IC_STROBE_PULSE_WIDTH_LIST_LIMITS	 N/A
Strobe Pulse Width List, in μs OLC_FG_IC_STROBE_PULSE_WIDTH_LIST	 N/A
Number of LUTs OLC_FG_IC_ILUT_COUNT	 0
Maximum Index Allowed in each ILUT OLC_FG_IC_MAX_ILUT_INDEX	 N/A
Maximum Value Allowed in each ILUT OLC_FG_IC_MAX_ILUT_VALUE	 N/A
DtColorSignalType	
Signal Type in the SDK Extensions OLT_SIGNAL_TYPE Supports Monochrome Signal Type OLC_MONO_SIGNAL Supports Y/C Signal Type (Luminance/Chrominance) OLC_YC_SIGNAL Support Composite Signal Type OLC_COMPOSITE_SIGNAL Supports RGB Signal OLC_RGB_SIGNAL Supports Dual-Mono SIgnal OLC_DUAL_MONO_SIGNAL Supports Triple-Mono Signal OLC_TRIPLE_MONO_SIGNAL	 Yes Yes Yes No No No

Table 4: Input Signal Capabilities for the DT3120 Device Driver (cont.)

Capability	DT3120 Support
DtColorImageParameters	
Image Parameters in the SDK Extensions OLT_COLOR_PARAMETER Brightness Values OLC_SET_BRIGHTNESS	 min: 0 max: 255 nominal: 128 granularity: 1
Contrast Values OLC_SET_CONTRAST	 min: 0 max: 511 nominal: 216 granularity: 1
V-Saturation Values OLC_SET_V_SAT	 min: 0 max: 511 nominal: 180 granularity: 1
U-Saturation Values OLC_SET_U_SAT	 min: 0 max: 511 nominal: 254 granularity: 1
Hue Values OLC_SET_HUE	 min: 0 max: 255 nominal: 128 granularity: 1

Table 4: Input Signal Capabilities for the DT3120 Device Driver (cont.)

Capability	DT3120 Support
Image Parameters in the SDK Extensions OLT_COLOR_PARAMETER	
Red Level Values	
OLC_SET_RED_LEVEL	N/A
Green Level Values	
OLC_SET_GREEN_LEVEL	N/A
Blue Level Values	
OLC_SET_BLUE_LEVEL	N/A
Red Reference	
OLC_SET_RED_REF	N/A
Red Offset	
OLC_SET_RED_OFFSET	N/A
Green Reference	
OLC_SET_GREEN_REF	N/A
Green Offset	
OLC_SET_GREEN_OFFSET	N/A
Blue Reference	
OLC_SET_BLUE_REF	N/A
Blue Offset	
OLC_SET_BLUE_OFFSET	N/A

Table 5: Sync Signal Capabilities for the DT3120 Device Driver

Capability	DT3120 Support
OlFgQueryInputCaps	
Supports Input Video Selection OLC_FG_IC_DOES_VIDEO_SELECT	Yes
Supports Input Video Selection Query OLC_FG_IC_DOES_QUERY_VIDEO_SELECT	Yes

Table 5: Sync Signal Capabilities for the DT3120 Device Driver (cont.)

Capability	DT3120 Support
Video Types OLC_FG_IC_VIDEO_TYPE_LIMITS Supports Composite Video Source OLC_FG_VID_COMPOSITE Supports Variable Scan Video Source OLC_FG_VID_VARSCAN	 Yes No
Video Sources OLC_FG_IC_CSYNC_SOURCE_LIMITS Composite Sync from Current Input Only OLC_FG_CSYNC_CURRENT_SRC Composite Sync from Any Specified Input OLC_FG_CSYNC_SPECIFIC_SRC Composite Sync from External Sync Line OLC_FG_CSYNC_EXTERNAL_LINE	 Yes No No
Composite Sync Threshold Limits, in mV OLC_FG_IC_CSYNC_THRESH_LIST_LIMITS	 N/A
Composite Sync Threshold List OLC_FG_IC_CSYNC_THRESH_LIST	 N/A
Supports Sync Sentinel OLC_FG_IC_DOES_SYNC_SENTINEL	 No
Supports Sync Sentinel Query OLC_FG_IC_DOES_QUERY_SYNC_SENTINEL	 Yes
Sync Sentinel Types OLC_FG_IC_SYNC_SENTINEL_TYPE_LIMITS Supports Fixed Sync Sentinel OLC_FG_SYNC_SENTINEL_FIXED Supports Variable Sync Sentinel OLC_FG_SYNC_SENTINEL_VARIABLE	 No No
DtColorSyncMasterMode	
Sync Master in SDK Extensions OLT_SYNC_MASTER_PARAMETER Enable Sync Master Mode OLC_SYNC_MASTER_ENABLE	 No

Table 6: Active Video Area Capabilities for the DT3120 Device Driver

Capability	DT3120 Support
OlFgQueryInputCaps	
Supports Defining of Active Video Area OLC_FG_IC_DOES_ACTIVE_VIDEO	Yes
Supports Active Video Area Query OLC_FG_IC_DOES_QUERY_ACTIVE_VIDEO	Yes
Range of Back Porch Start Position OLC_FG_IC_BACK_PORCH_START_LIMITS	min: 0 max: 0 nominal: 0 granularity: 0
Range of Clamp Start Position OLC_FG_IC_CLAMP_START_LIMITS	min: 0 max: 0 nominal: 0 granularity: 0
Range of Clamp End Position OLC_FG_IC_CLAMP_END_LIMITS	min: 0 max: 0 nominal: 0 granularity: 0
Range of Total Pixels Per Line Control OLC_FG_IC_TOTAL_PIX_PER_LINE_LIMITS	min: 50 Hz:1135 60 Hz: 910 max: 50 Hz: 1135 60 Hz: 910 nominal: 50 Hz: 1135 60 Hz: 910 granularity: 0

Table 6: Active Video Area Capabilities for the DT3120 Device Driver (cont.)

Capability	DT3120 Support
Range of First Active Pixel Position OLC_FG_IC_ACTIVE_PIXEL_LIMITS	min: 0 max: 255 nominal: 50 Hz: 190 60 Hz: 140 granularity: 1
Range of Active Pixels Count OLC_FG_IC_ACTIVE_WIDTH_LIMITS	min: 50 Hz: 768 60 Hz: 640 max: 50 Hz: 768 60 Hz: 640 nominal: 50 Hz: 768 60 Hz: 640 granularity: 0
Range of Total Lines per Field Control OLC_FG_IC_TOTAL_LINES_PER_FLD_LIMITS	min: 50 Hz: 312 60 Hz: 262 max: 50 Hz: 312 60 Hz: 262 nominal: 50 Hz: 312 60 Hz: 262 granularity: 0

Table 6: Active Video Area Capabilities for the DT3120 Device Driver (cont.)

Capability	DT3120 Support
Range of First Active Line Position OLC_FG_IC_ACTIVE_LINE_LIMITS	min: 0 max: 255 nominal: 50 Hz: 38 60 Hz: 21 granularity: 1
Range of Active Lines Count OLC_FG_IC_ACTIVE_HEIGHT_LIMITS	min: 50 Hz: 288 60 Hz: 240 max: 50 Hz: 288 60 Hz: 240 nominal: 50 Hz: 288 60 Hz: 240 granularity: 0

Table 7: Frame Capabilities for the DT3120 Device Driver

Capability	DT3120 Support
OlFgQueryInputCaps	
Supports Frame Selection OLC_FG_IC_DOES_FRAME_SELECT	Yes
Supports Frame Selection Query OLC_FG_IC_DOES_QUERY_FRAME_SELECT	Yes

Table 7: Frame Capabilities for the DT3120 Device Driver (cont.)

Capability	DT3120 Support
Range of Frame Top Control OLC_FG_IC_FRAME_TOP_LIMITS	min: 0 max: 50 Hz: 575 60 Hz: 479 nominal: 0 granularity: 1
Range of Frame Left Control OLC_FG_IC_FRAME_LEFT_LIMITS	min: 0 max: 50 Hz: 763 60 Hz: 635 nominal: 0 granularity: 1
Range of Frame Height Control OLC_FG_IC_FRAME_HEIGHT_LIMITS	min: 1 max: 50 Hz: 576 60 Hz: 480 nominal: 50 Hz: 576 60 Hz: 480 granularity: 1
Range of Frame Width Control OLC_FG_IC_FRAME_WIDTH_LIMITS	min: 1 max: 50 Hz: 768 60 Hz: 640 nominal: 50 Hz: 768 60 Hz: 640 granularity: 1

Table 7: Frame Capabilities for the DT3120 Device Driver (cont.)

Capability	DT3120 Support
Range Between Pixels (Scale factor - horizontal) OLC_FG_IC_FRAME_HINC_LIMITS	min: 1 max: 10 nominal: 1 granularity: 1
Range Between Lines (Scale factor - vertical) OLC_FG_IC_FRAME_VINC_LIMITS	min: 1 max: 10 nominal: 1 granularity: 1
Frame Types OLC_FG_IC_FRAME_TYPE_LIMITS Acquire Interlaced Frame Starting on Even Field OLC_FG_FRM_IL_FRAME_EVEN Acquire Interlaced Frame Starting on Odd Field OLC_FG_FRM_IL_FRAME_ODD Acquire Interlaced Frame Starting on Next Field OLC_FG_FRM_IL_FRAME_NEXT Acquire the Even Field OLC_FG_FRM_FIELD_EVEN Acquire the Odd Field OLC_FG_FRM_FIELD_ODD Acquire the Next Field OLC_FG_FRM_FIELD_NEXT Acquire the Next Noninterlaced Frame OLC_FG_FRM_NON_INTERLACED	 Yes Yes Yes Yes Yes Yes No
Maximum Number of Pixels in Frame OLC_FG_IC_MAX_FRAME_SIZE	50 Hz: 442368 60 Hz: 307200
Number of Bytes in a Pixel OLC_FG_IC_PIXEL_DEPTH	RGB = 4 RGB24 = 3 RGB16 = 2 YUYV422 = 2 Mono = 1

Table 7: Frame Capabilities for the DT3120 Device Driver (cont.)

Capability	DT3120 Support
DtColorHardwareScaling	
Hardware Scaling in SDK Extensions OLT_SCALE_PARAM Horizontal scale factor (percentage) hscale Vertical scale factor (percentage) vscale	 min: 1 max: 100 nominal: 100 granularity: 1 min: 1 max: 100 nominal: 100 granularity: 1
DtColorStorageMode	
Storage Mode in the SDK Extensions OLT_IMAGE_MODE Supports Monochrome Mode OLC_IMAGE_MONO Supports YUV Mode OLC_IMAGE_YUV Supports RGB OLC_IMAGE_RGB Supports RGB24 OLC_IMAGE_RGB_24 Supports RGB16 OLC_IMAGE_RGB_16 Supports RGB15 OLC_IMAGE_RGB_15 Supports YUYV422 OLC_IMAGE_YUYV_422	 Yes No Yes Yes Yes No Yes

Table 8: Passthru Capabilities for the DT3120 Device Driver

Capability	DT3120 Support
OlFgQueryPassthruCaps	
Supports Passthru Section OLC_FG_PC_DOES_PASSTHRU	Yes
Passthru Modes OLC_FG_PC_PASSTHRU_MODE_LIMITS Supports Async Direct OLC_FG_PASSTHRU_ASYNC_DIRECT Supports Sync Direct OLC_FG_PASSTHRU_SYNC_DIRECT Supports Async Bitmap OLC_FG_PASSTHRU_ASYNC_BITMAP Supports Sync Bitmap OLC_FG_PASSTHRU_SYNC_BITMAP Supports Continuous-Acquire OLC_FG_PASSTHRU_ASYNC_BITMAP_EXTENDED	 No No Yes No Yes
Source Origin OLC_FG_PC_DOES_SOURCE_ORIGIN Available Range for the X Value of the Source Origin OLC_FG_PC_SRC_ORIGIN_X_LIMITS	 No N/A
Source Origin Available Range for the Y value of the Source Origin OLC_FG_PC_SRC_ORIGIN_Y_LIMITS	 N/A
Passthru Scaling OLC_FG_PC_DOES_SCALING Range of Legal Values for Height OLC_FG_PC_SCALE_HEIGHT_LIMITS Range of Legal Values for Width OLC_FG_PC_SCALE_WIDTH_LIMITS	 No[a] N/A N/A

Table 8: Passthru Capabilities for the DT3120 Device Driver (cont.)

Capability	DT3120 Support
Passthru LUT OLC_FG_PC_DOES_PASSTHRU_LUT Number of Extra Palette Entries OLC_FG_PC_MAX_PALETTE_INDEX Maximum RGB Value for Palette OLC_FG_PC_MAX_PALETTE_VALUE Number of Entries in Passthru LUT OLC_FG_PC_MAX_PLUT_INDEX Maximum RGB Value for Passthru LUT OLC_FG_PC_MAX_PLUT_VALUE	 No N/A N/A N/A N/A
Passthru snapshot OLC_FG_PC_DOES_PASSTHRU_SNAPSHOT	 Yes

a. With the DT3120, use the **DtColorHardwareScaling** function to perform passthru scaling.

Table 9: Overlay Capabilities for the DT3120 Device Driver

Capability	DT3120 Support
OlFgQueryDDICaps	
Passthru with DDI OLC_FG_DDI_FAST_PASSTHRU	 No
Overlay support OLC_FG_DDI_OVERLAYS	 Yes
Translucent overlay capability OLC_FG_DDI_TRANSLUCENT_OVERLAYS	 No
Color overlay capability OLC_FG_DDI_COLOR_OVERLAY	 Yes
Multiple overlay surface capability OLC_FG_DDI_MULTIPLE_SURFACES	 Yes
Color keying (filtering) OLC_FG_DDI_COLOR_KEY_CONTROL	 Yes

Table 9: Overlay Capabilities for the DT3120 Device Driver (cont.)

Capability	DT3120 Support
Add overlay to image OLC_FG_DDI_OVERLAY_ON_FRAME	No
User-managed DDI surface support OLC_FG_DDI_USER_SURFACE_PTR	No
Passthru event synchronization support OLC_FG_DDI_PASSTHRU_SYNC_EVENT	Yes

Table 10: Memory Capabilities for the DT3120 Device Driver

Capability	DT3120 Support
OlFgQueryMemoryCaps	
Memory Types OLC_FG_MC_MEMORY_TYPES Volatile Memory OLC_FG_MEM_VOLATILE Nonvolatile Memory OLC_FG_MEM_NON_VOLATILE	 Yes No
Number of Volatile Buffer Handles OLC_FG_MC_VOL_COUNT	1[a]
Number of Nonvolatile Buffer Handles OLC_FG_MC_NONVOL_COUNT	N/A

a. You can allocate as many frames as the system memory allows using **OlFgAllocateBuiltInFrame**.

Table 11: Acquisition Capabilities for the DT3120 Device Driver

Capability	DT3120 Support
OlFgQueryInputCaps	
Acquisition Types (single frame) OLC_FG_IC_SINGLE_FRAME_OPS *-Single Frame to Host (sync)* Supports Full Frame Acquisition OLC_FG_ACQ_FRAME	No
Supports Subframe Acquisition OLC_FG_ACQ_SUBFRAME	No
Supports Frame-to-Fit Acquisition OLC_FG_ACQ_FRAME_TO_FIT	No
-Single Frame to Device (sync) Supports Full Frame Acquisition OLC_FG_ACQ_FRAME	Yes
Supports Subframe Acquisition OLC_FG_ACQ_SUBFRAME	No
Supports Frame-to-Fit Acquisition OLC_FG_ACQ_FRAME_TO_FIT	No
-Single Frame to Host (async) Supports Full Frame Acquisition OLC_FG_ACQ_FRAME	No
Supports Subframe Acquisition OLC_FG_ACQ_SUBFRAME	No
Supports Frame-to-Fit Acquisition OLC_FG_ACQ_FRAME_TO_FIT	No
-Single Frame to Device (async) Supports Full Frame Acquisition OLC_FG_ACQ_FRAME	Yes
Supports Subframe Acquisition OLC_FG_ACQ_SUBFRAME	No
Supports Frame-to-Fit Acquisition OLC_FG_ACQ_FRAME_TO_FIT	No

Table 11: Acquisition Capabilities for the DT3120 Device Driver (cont.)

Capability	DT3120 Support
Acquisition Types (multiple frame)	
OLC_FG_IC_MULT_FRAME_OPS	
-Multiple Frames to Host (sync)	
Supports Full Frame Acquisition	
OLC_FG_ACQ_FRAME	No
Supports Subframe Acquisition	
OLC_FG_ACQ_SUBFRAME	No
Supports Frame-to-Fit Acquisition	
OLC_FG_ACQ_FRAME_TO_FIT	No
-Multiple Frames to Device (sync)	
Supports Full Frame Acquisition	
OLC_FG_ACQ_FRAME	Yes
Supports Subframe Acquisition	
OLC_FG_ACQ_SUBFRAME	No
Supports Frame-to-Fit Acquisition	
OLC_FG_ACQ_FRAME_TO_FIT	No
-Multiple Frames to Host (async)	
Supports Full Frame Acquisition	
OLC_FG_ACQ_FRAME	No
Supports Subframe Acquisition	
OLC_FG_ACQ_SUBFRAME	No
Supports Frame-to-Fit Acquisition	
OLC_FG_ACQ_FRAME_TO_FIT	No
-Multiple Frames to Device (async)	
Supports Full Frame Acquisition	
OLC_FG_ACQ_FRAME	Yes
Supports Subframe Acquisition	
OLC_FG_ACQ_SUBFRAME	No
Supports Frame-to-Fit Acquisition	
OLC_FG_ACQ_FRAME_TO_FIT	No
Supports Drawing Acquired Frame	
OLC_FG_IC_DOES_DRAW_ACQUIRED_FRAME	Yes
OLC_FG_IC_DOES_DRAW_ACQUIRED_FRAME_EX	Yes

Table 12: Digital I/O Capabilities for the DT3120 Device Driver

Capability	DT3120 Support
OlFgQueryCameraControlCaps	
Number of Digital Output Lines OLC_FG_CC_DIG_OUT_COUNT	0
DtColorDigitalIOControl	
Number of Digital Input/Output Lines	0

Initialized Control Values

Table 13 lists the default control values after opening or initializing the DT3120 Device Driver.

Table 13: Default Control Values

Control Name	Value
OLC_FG_CTL_INPUT_FILTER	N/A
OLC_FG_CTL_BLACK_LEVEL	N/A
OLC_FG_CTL_WHITE_LEVEL	N/A
OLC_FG_CTL_VIDEO_TYPE	OLC_FG_VID_COMPOSITE
OLC_FG_CTL_CSYNC_SOURCE	OLC_FG_CSYNC_CURRENT_SRC
OLC_FG_CTL_CSYNC_THRESH	N/A
OLC_FG_CTL_SYNC_SENTINEL	N/A
OLC_FG_CTL_HSYNC_INSERT_POS	N/A
OLC_FG_CTL_HSYNC_SEARCH_POS	N/A
OLC_FG_CTL_VSYNC_INSERT_POS	N/A
OLC_FG_CTL_VSYNC_SEARCH_POS	N/A
OLC_FG_CTL_BACK_PORCH_START	0
OLC_FG_CTL_CLAMP_START	0
OLC_FG_CTL_CLAMP_END	0
OLC_FG_CTL_TOTAL_PIX_PER_LINE	50 Hz: 1135 60 Hz: 910
OLC_FG_CTL_FIRST_ACTIVE_PIXEL	50 Hz: 190 60 Hz:140
OLC_FG_CTL_ACTIVE_PIXEL_COUNT	50 Hz: 768 60 Hz: 640
OLC_FG_CTL_TOTAL_LINES_PER_FLD	50 Hz: 312 60 Hz: 262

Table 13: Default Control Values (cont.)

Control Name	Value
OLC_FG_CTL_FIRST_ACTIVE_LINE	50 Hz: 38 60 Hz: 21
OLC_FG_CTL_ACTIVE_LINE_COUNT	50 Hz: 288 60 Hz: 240
OLC_FG_CTL_FRAME_TOP	0
OLC_FG_CTL_FRAME_LEFT	0
OLC_FG_CTL_FRAME_WIDTH	50 Hz: 768 60 Hz: 640
OLC_FG_CTL_FRAME_HEIGHT	50 Hz: 576 60 Hz: 480
OLC_FG_CTL_HOR_FRAME_INC	1
OLC_FG_CTL_VER_FRAME_INC	1
OLC_FG_CTL_CLOCK_FREQ	50 Hz: 15,000,000 60 Hz: 12,500,000
OLC_FG_CTL_CLOCK_SOURCE	OLC_FG_CLOCK_INTERNAL
OLC_FG_CTL_FRAME_TYPE	OLC_FG_FRM_IL_FRAME_EVEN
OLC_FG_IC_STROBE_PULSE_WIDTH_ LIST_LIMITS	 N/A
OLC_FG_CTL_ILUT	N/A
DtColorSignalType	OLC_COMPOSITE_SIGNAL
DtColorStorageMode	OLC_IMAGE_RGB
DtColorImageParameters Brightness Contrast V Saturation U Saturation Hue Red Level Green Level Blue Level	 128 216 180 254 128 N/A N/A N/A

Table 13: Default Control Values (cont.)

Control Name	Value
DtColorHardwareScaling Horizontal scale factor Vertical scale factor	 100 100
DtColorDigitalIOControl Digital I/O Configuration	 0
DtColorSyncMasterMode Enable/Disable	 0 (disabled)

4

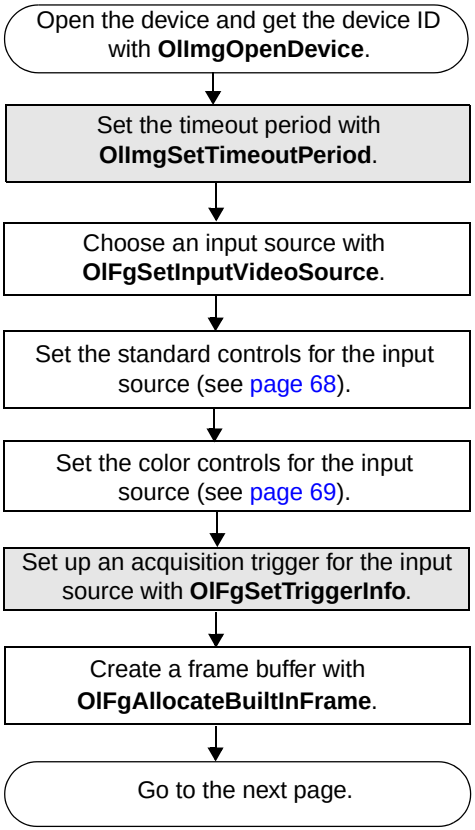
Programming Flowcharts

The following flowcharts show the steps required to perform imaging operations using DT-Open Layers. For illustration purposes, the functions in the Frame Grabber SDK are shown; however, the concepts apply to all DT-Open Layers software for imaging.

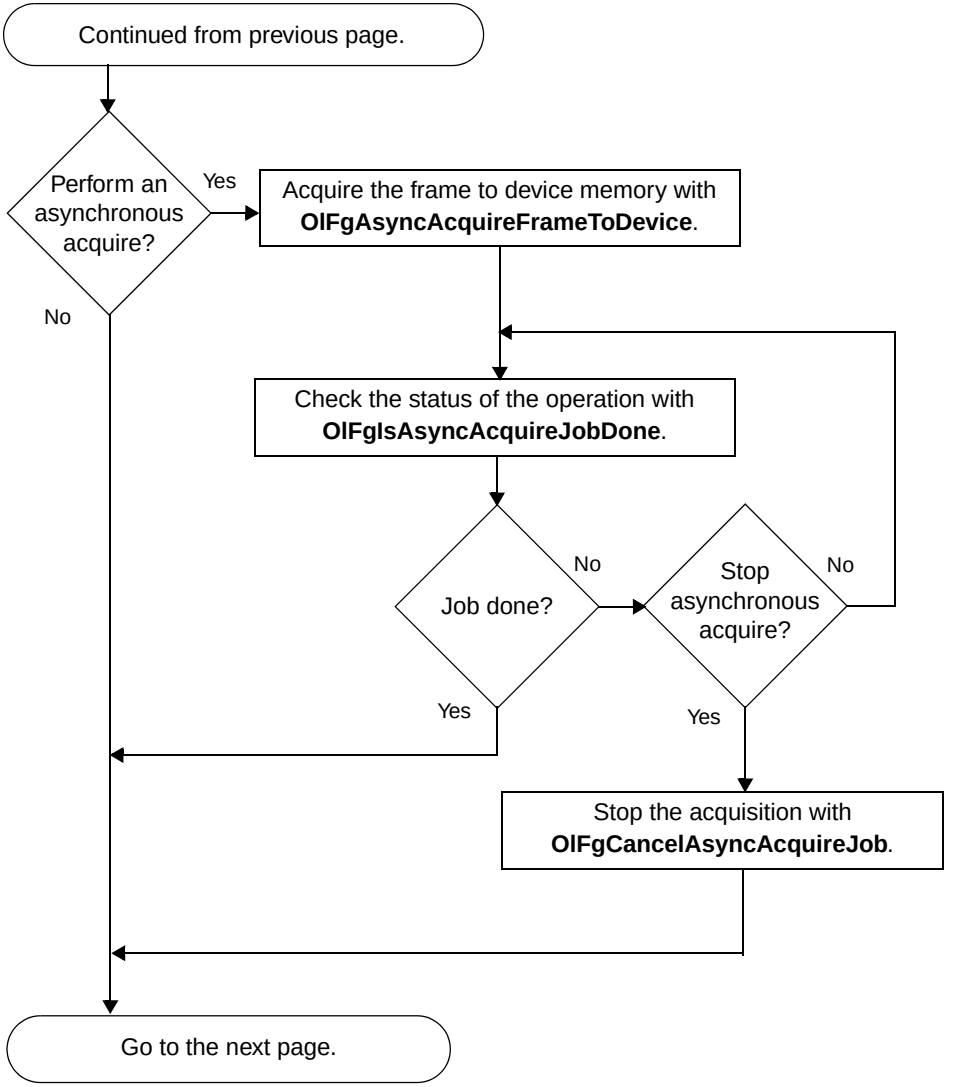
Note that many steps represent several substeps; if you are unfamiliar with the detailed operations involved with any one step, refer to the indicated page for detailed information. Optional steps appear in shaded boxes.

Note: Although the flowcharts do not show error/status checking, it is recommended that you check for error/status messages after calling each function.

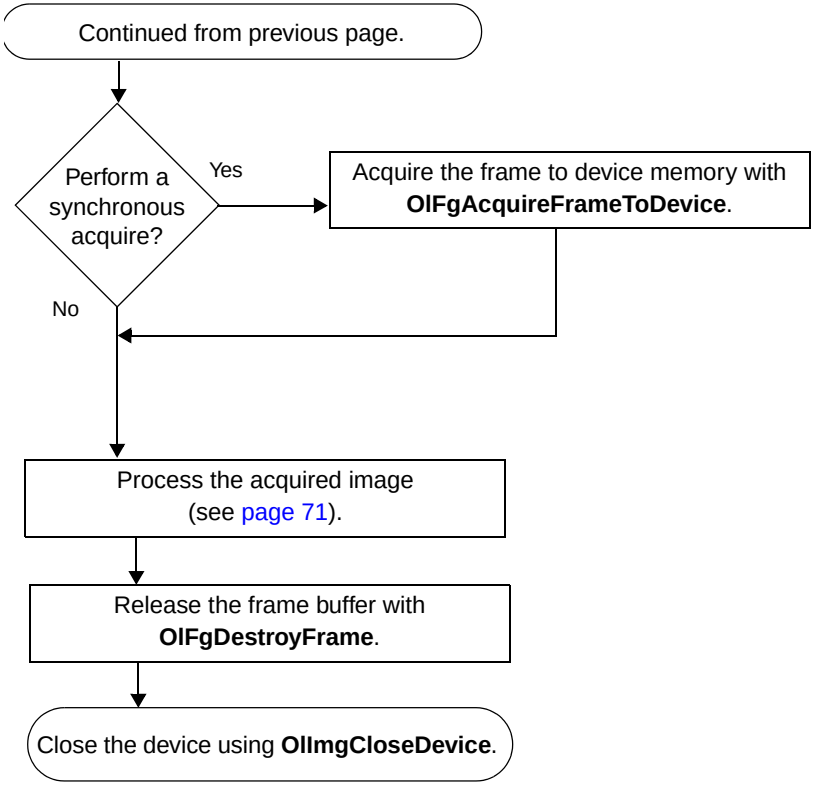
Single-Frame Acquisition



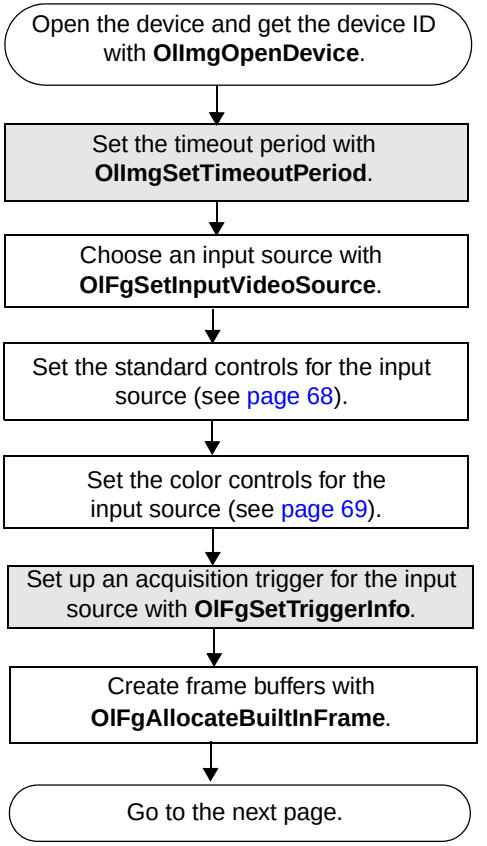
Single-Frame Acquisition (cont.)



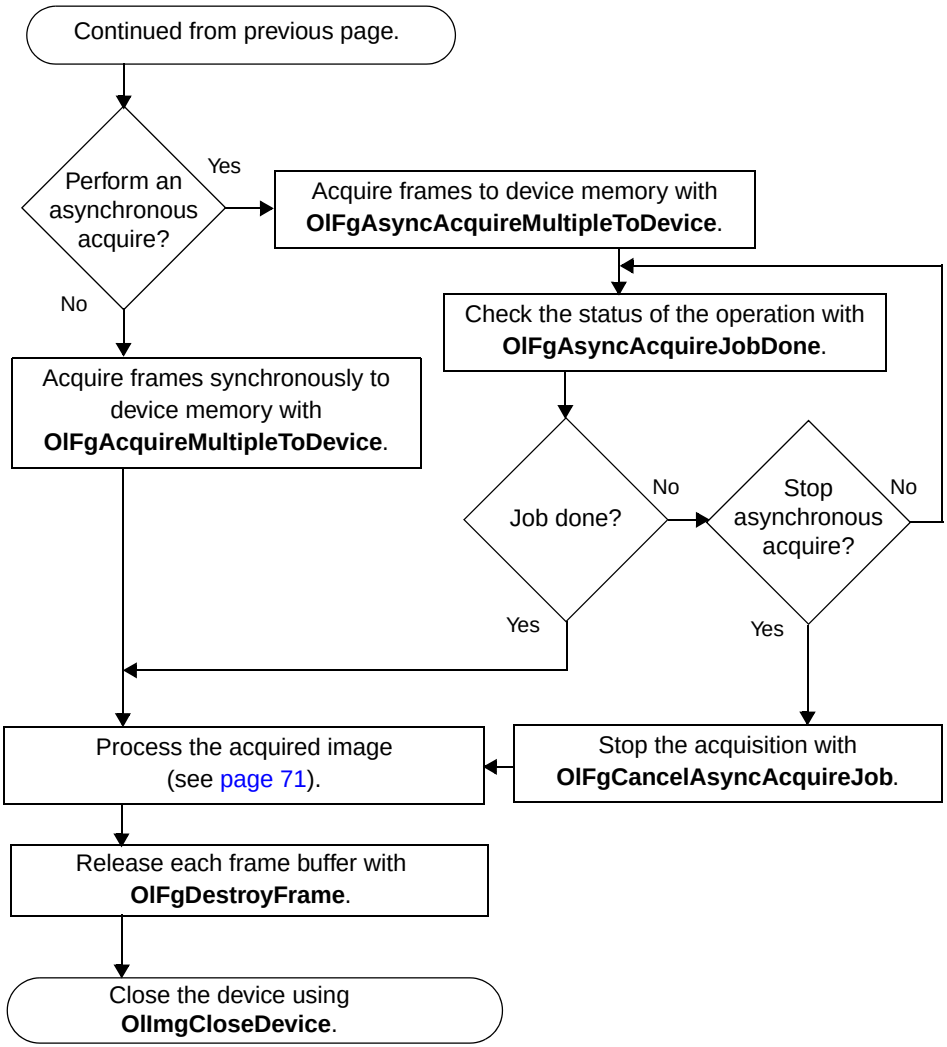
Single-Frame Acquisition (cont.)



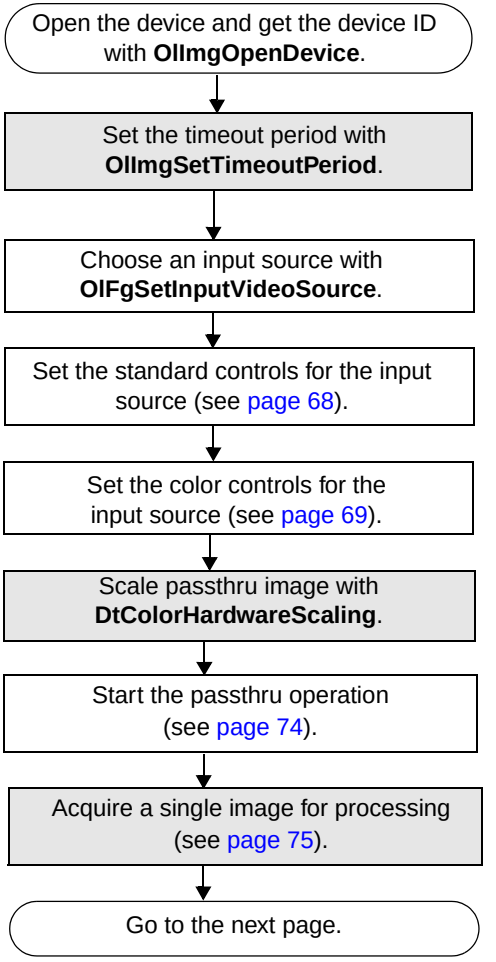
Multiple-Frame Acquisition



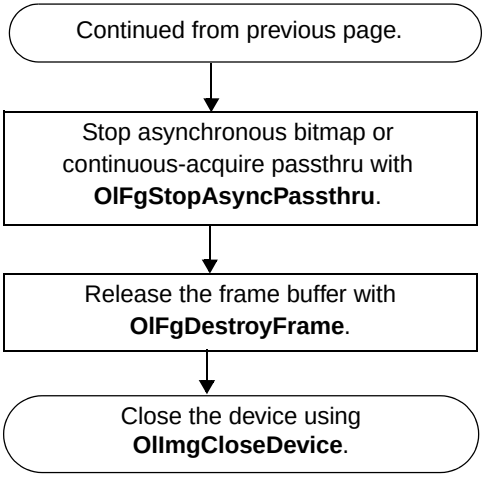
Multiple-Frame Acquisition (cont.)



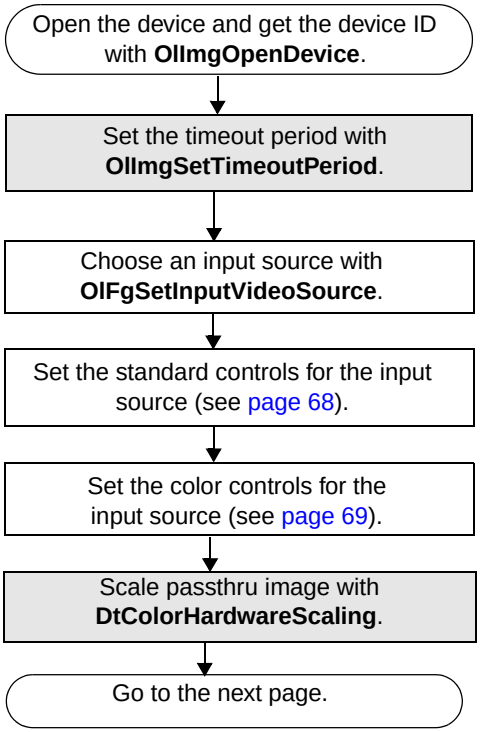
Passthru without Overlays



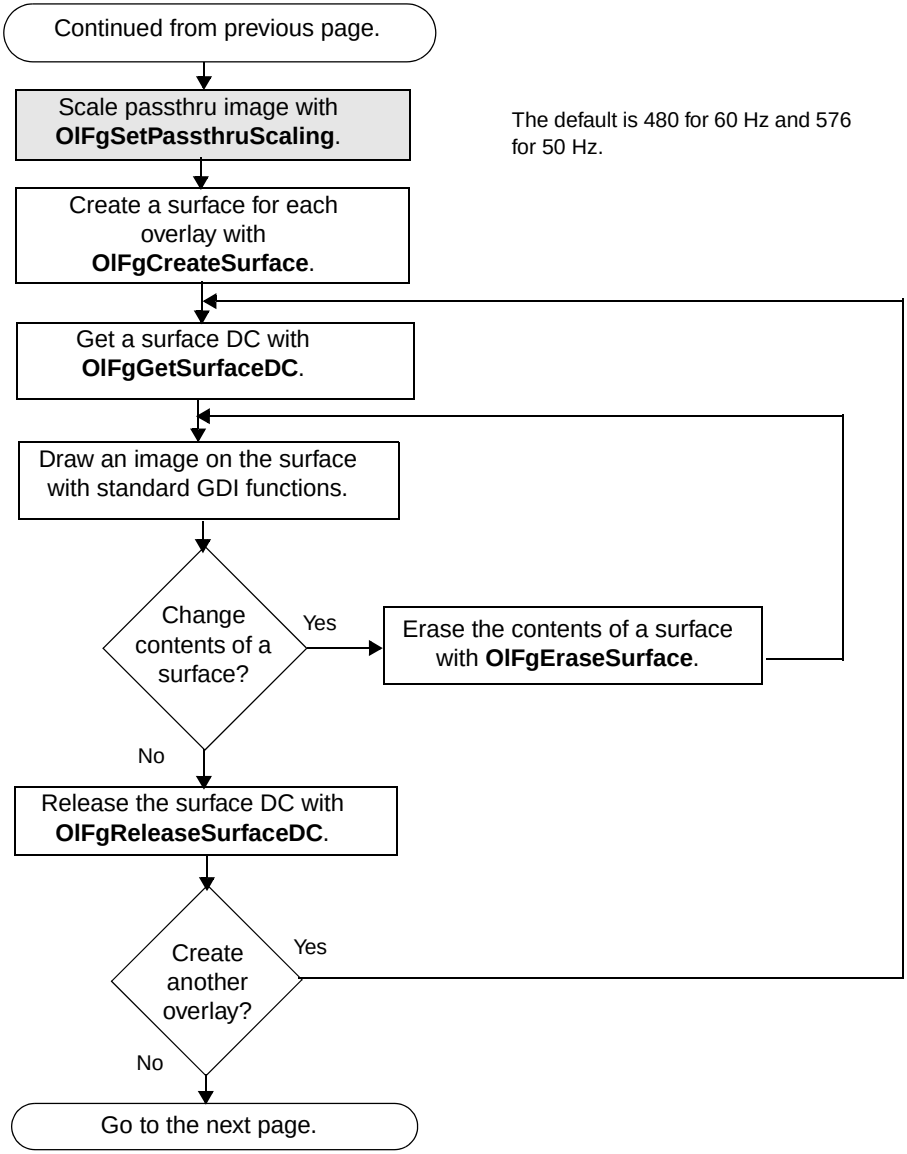
Passthru without Overlays (cont.)



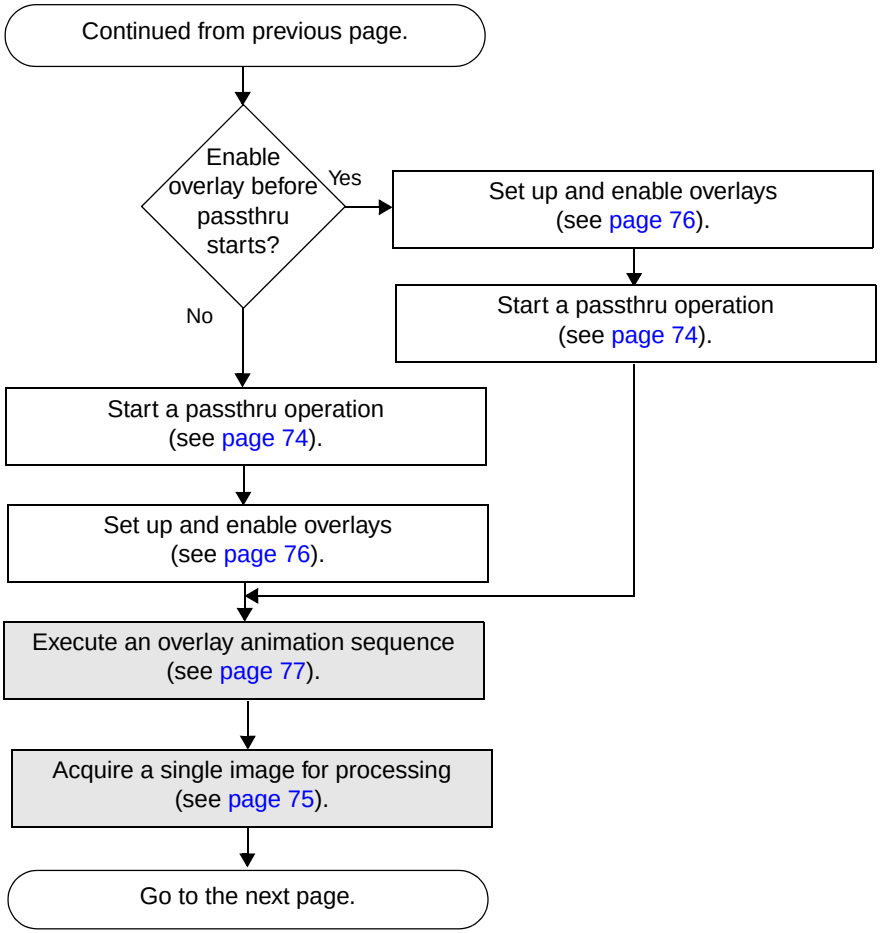
Passthru with Overlays



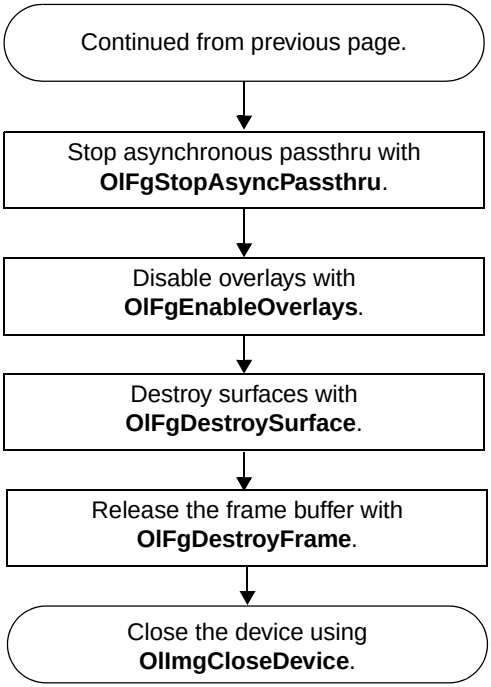
Passthru with Overlays (cont.)



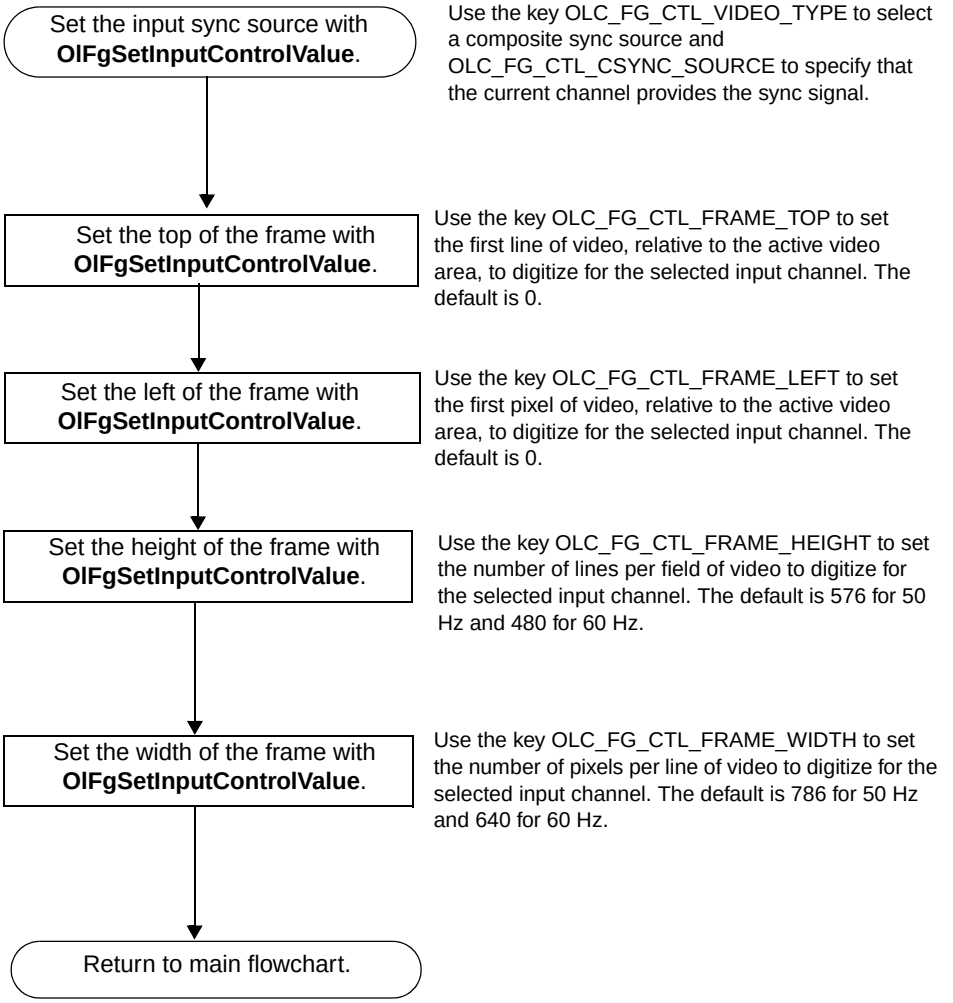
Passthru with Overlays (cont.)



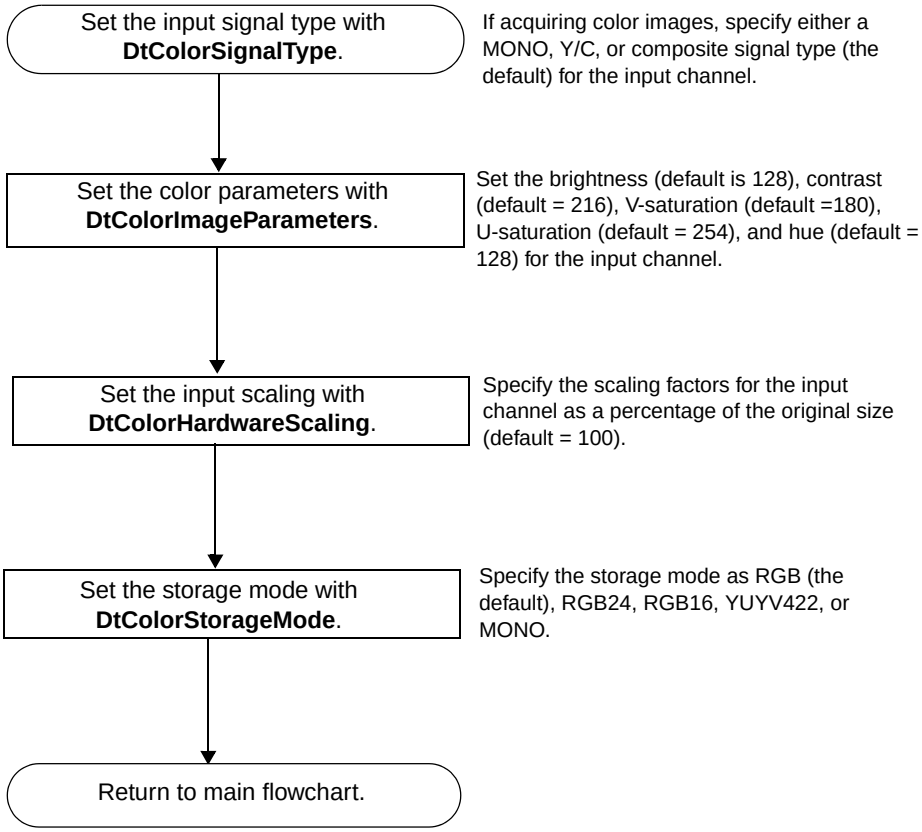
Passthru with Overlays (cont.)



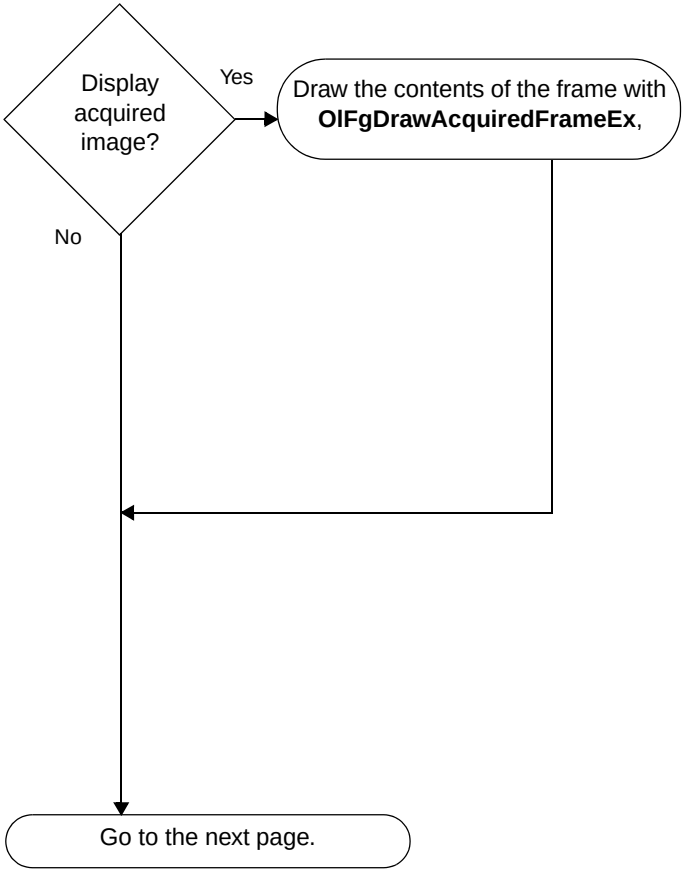
Set the Standard Controls for the Input Channel



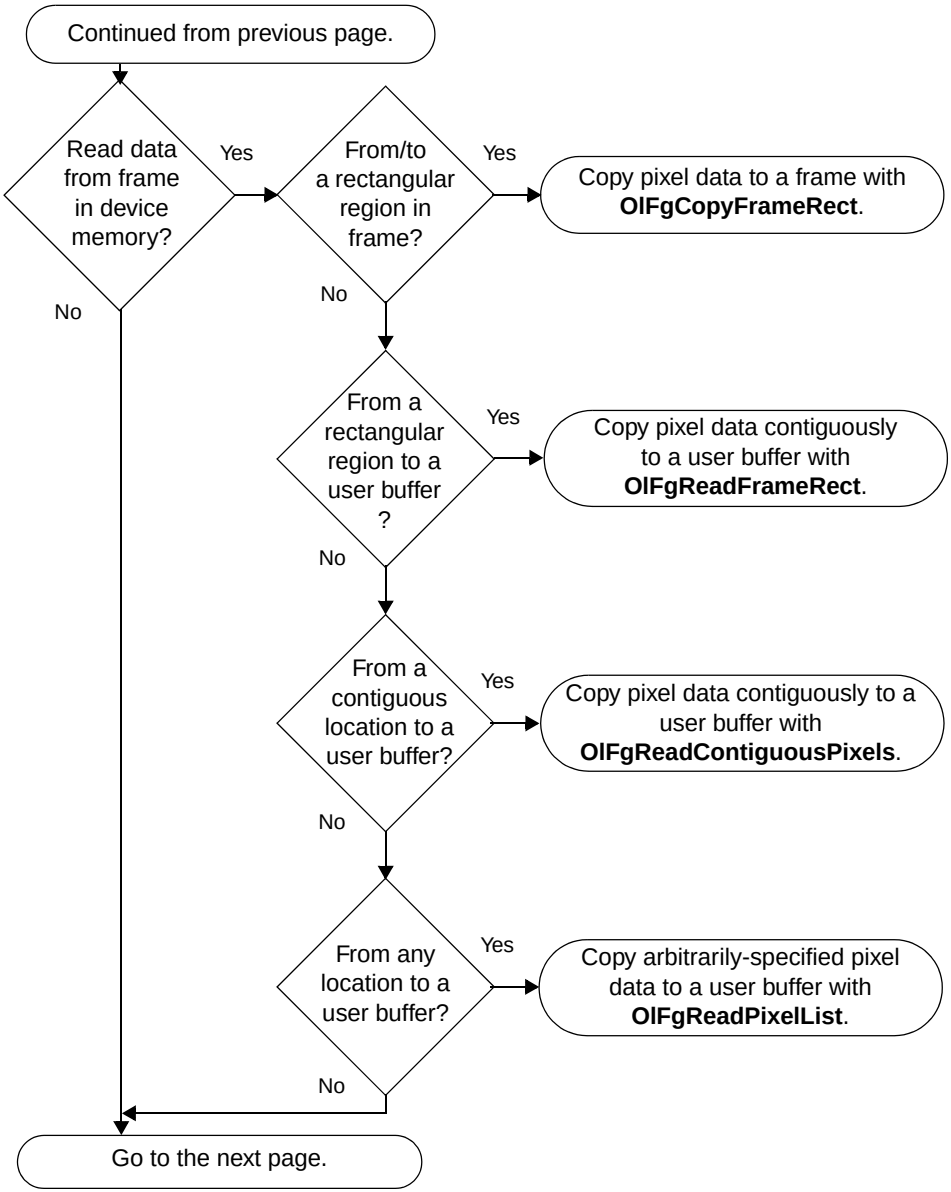
Set the Color Controls for the Input Channel



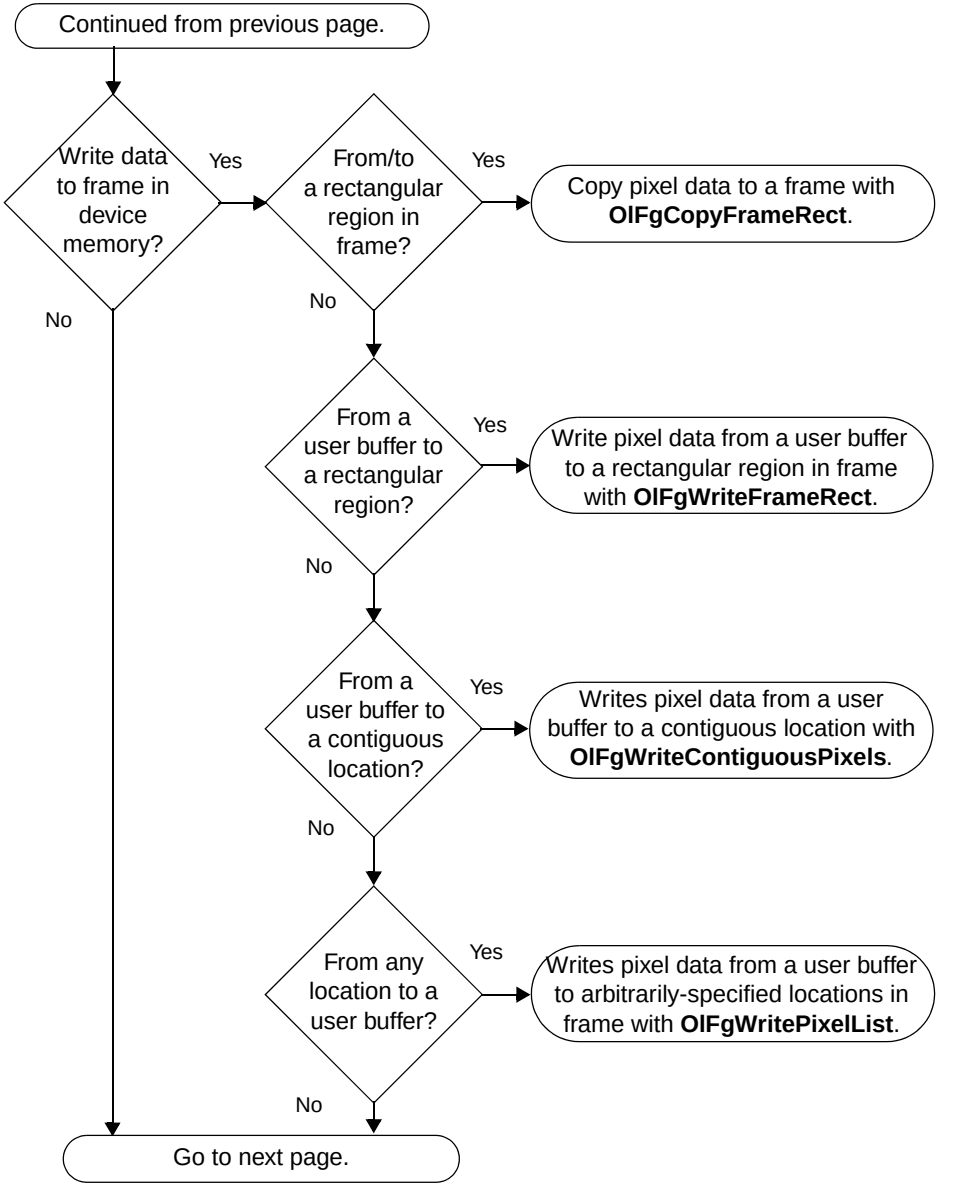
Process the Acquired Image



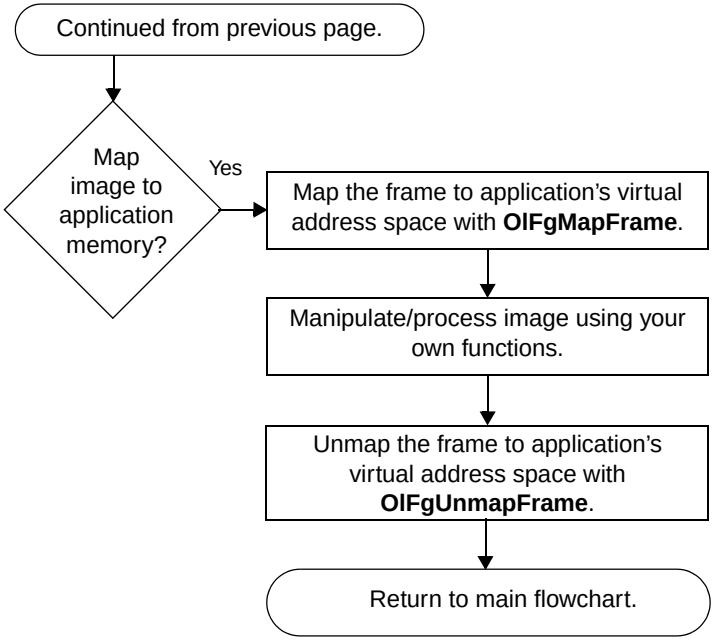
Process the Acquired Image



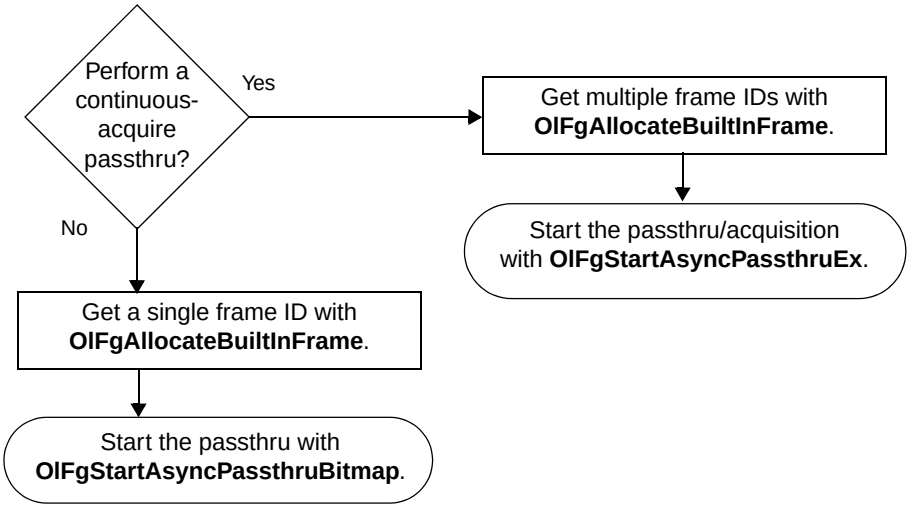
Process the Acquired Image (cont.)



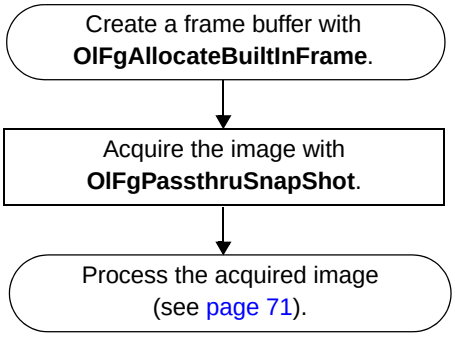
Process the Acquired Image (cont.)



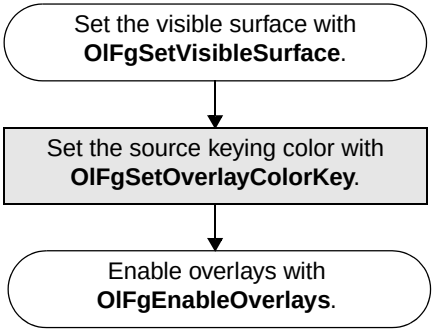
Start the Passthru Operation



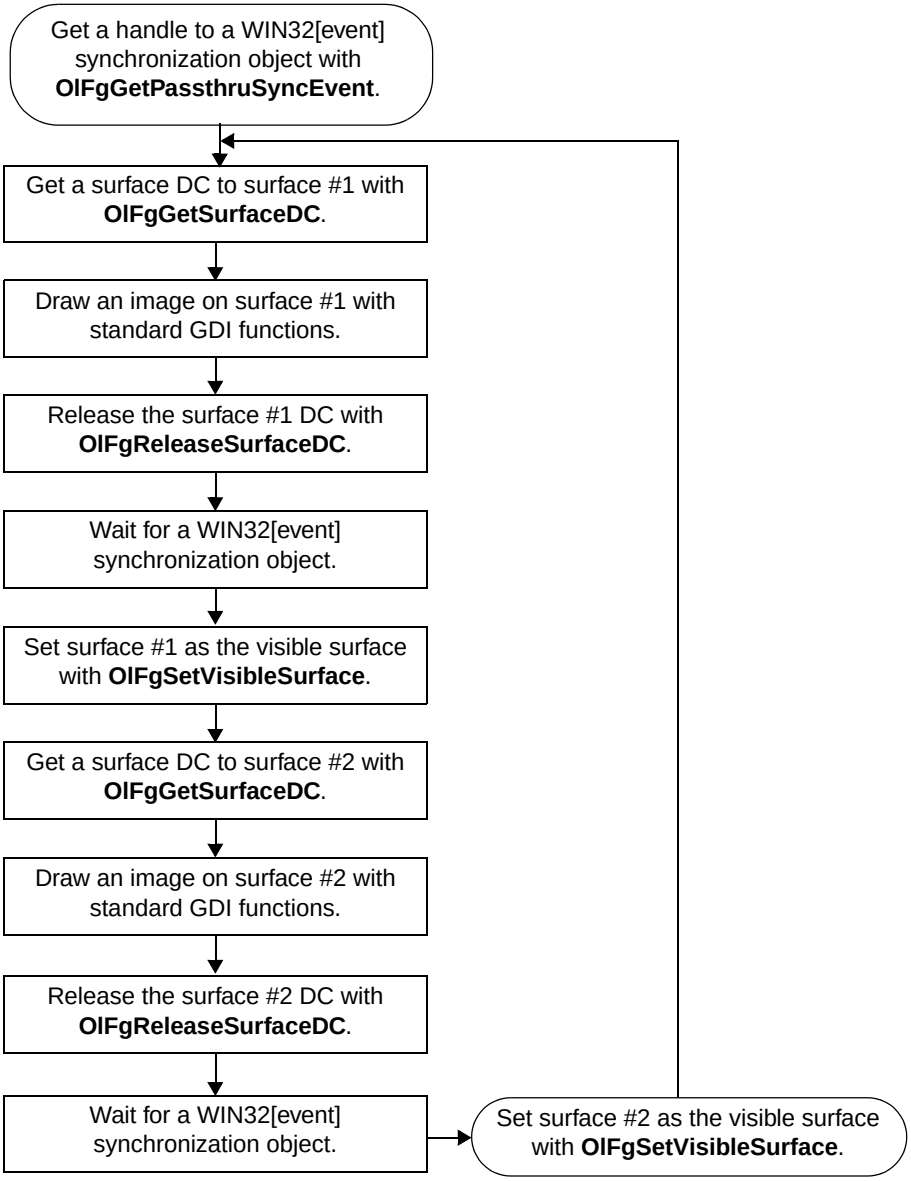
Take a Snapshot



Set up and Enable Overlays



Execute an Overlay Animation Sequence



Troubleshooting

General Checklist

Should you experience problems using the DT3120 board, please follow these steps:

1. Read all the appropriate sections of this manual. Make sure that you have added any "Read This First" information to your manual and that you have used this information.
2. Check your CD-ROM for a README file and ensure that you have used the latest installation and configuration information available.
3. Check that your system meets the requirements stated in the *DT3120 Getting Started Manual*.
4. Check that you have installed your hardware properly using the instructions in the *DT3120 Getting Started Manual*.
5. Check that you have installed and configured the device driver properly using the instructions in the *DT3120 Getting Started Manual*.

If you still experience problems, try using the information in Table 14 to isolate and solve the problem. If you cannot identify the problem, refer to page 84.

Table 14: Troubleshooting Problems

Symptom	Possible Cause	Possible Solution
Board does not respond.	The board is incorrectly aligned in a PCI expansion slot.	Check that the slot in which your DT3120 board is located is a PCI slot and that the board is correctly seated in the slot; see the instructions in the *DT3120 Getting Started Manual.*
	The interrupt level is unacceptable.	An interrupt conflict exists in your system. If you think you may have an interrupt conflict between a PCI device and a device that is plugged into the ISA bus, change the interrupt setting (usually by changing a jumper) on the ISA device. If you think you may have an interrupt conflict on a PCI device that was not designed to share interrupts, select a different interrupt for each PCI slot in the PCI BIOS. To do this, enter the system BIOS program; this is usually done by pressing the DEL key when rebooting your system. Once in the system BIOS, enter the PCI/PnP BIOS setup, and select a unique interrupt for each PCI slot. The PCI BIOS assigns the interrupt; the device on the PCI bus does not have control over the interrupt assignment. Some network devices do not share interrupts. If you still have an interrupt conflict, remove the network device, install the DT3120 board, and reboot the system. Then reinsert the network device.
Board does not respond (cont.).	The board is damaged.	Contact Data Translation for technical support; refer to page 84.

Table 14: Troubleshooting Problems (cont.)

Symptom	Possible Cause	Possible Solution
Intermittent operation.	Loose connections or vibrations exist.	Check your wiring and tighten any loose connections or cushion vibration sources; see the instructions in the *DT3120 Getting Started Manual.*
	Electrical noise exists.	Check your connections; see the instructions in the *DT3120 Getting Started Manual.*
	The board is overheating.	Check environmental and ambient temperature; consult the board's specifications on page 91 of this manual and the documentation provided by your computer manufacturer for more information.
Data appears to be invalid.	Wiring is not connected properly.	Check your wiring and fix any open connections; see the instructions in the *DT3120 Getting Started Manual.*
Computer does not boot.	Board is not seated properly.	Check that the slot in which your DT3120 board is located is a PCI slot, that the board is correctly seated in the slot, and that the board is secured in the slot with a screw; see the instructions in the *DT3120 Getting Started Manual.*
	The power supply of the computer is too small to handle all the system resources.	Check the power requirements of your system resources and, if needed, get a larger power supply; consult the board's specifications on page 91 of this manual.

Table 14: Troubleshooting Problems (cont.)

Symptom	Possible Cause	Possible Solution
System lockup.	Board is not seated properly.	Check that the slot in which your DT3120 board is located is a PCI slot, that the board is correctly seated in the slot, and that the board is secured in the slot with a screw; see the instructions in the *DT3120 Getting Started Manual.*
	Interrupt level is unacceptable.	If you think you may have an interrupt conflict between a PCI device and a device that is plugged into the ISA bus, change the interrupt setting (usually by changing a jumper) on the ISA device. If you think you may have an interrupt conflict on a PCI device that was not designed to share interrupts, select a different interrupt for each PCI slot in the PCI BIOS. To do this, enter the system BIOS program; this is usually done by pressing the DEL key when rebooting your system. Once in the system BIOS, enter the PCI/PnP BIOS setup, and select a unique interrupt for each PCI slot. The PCI BIOS assigns the interrupt; the device on the PCI bus does not have control over the interrupt assignment. Some network devices do not share interrupts. If you still have an interrupt conflict, remove the network device, install the DT3120 board, and reboot the system. Then, reinsert the network device.

Service and Support

If you have difficulty using the DT3120 board, Data Translation's Technical Support Department is available to provide prompt technical assistance. Support upgrades, technical information, and software are also available.

All customers can always obtain the support needed. The first 90 days are complimentary, as part of the product's original warranty, to help you get your system running. Customers who call outside of this time frame can either purchase a support contract or pay a nominal fee (charged on a per-incident basis).

For "priority support," purchase a support contract. Support contracts guarantee prompt response and are very affordable; contact your local sales office for details.

Refer to the Data Translation Support Policy located at the end of this manual for a list of services included and excluded in our standard support offering.

Telephone Technical Support

Telephone support is normally reserved for original warranty and support-contract customers. Support requests from non-contract or out-of-warranty customers are processed after requests from original warranty and support-contract customers.

For the most efficient service, please complete the form on page 86 and be at your computer when you call for technical support. This information helps to identify specific system and configuration-related problems and to replicate the problem in house, if necessary.

You can reach the Technical Support Department by calling (508) 481-3700 x1401.

If you are located outside the USA, call your local distributor. The name and telephone number of you nearest distributor are provided in your Data Translation catalog.

If you are leaving a message to request a support call, please include the following information:

- Your name (please include proper spelling),
- Your company or organization (please include proper spelling),
- A phone number,
- An email address where you can be reached,
- The hardware/software product you need help on,
- A summary of the issue or question you have,
- Your contract number, if applicable, and
- Your product serial number or purchase date.

Omitting any of the above information may delay our ability to resolve your issue.

Information Required for Technical Support

Name:_____Phone_____
Contract Number: _____
Address: _____
_____

Data Translation hardware product(s): _____
serial number:_____
configuration: _____
Data Translation device driver - SPO number: _____ _____
_____ version: _____
Data Translation software - SPO number:_____ _____
serial number: _____ version:_____
PC make/model: _____
operating system: _____ version:_____
Windows version: _____
processor: _____ speed:_____
RAM:_____ hard disk space:_____
network/number of users: _____ disk cache:_____
graphics adapter: _____ data bus:_____

I have the following boards and applications installed in my system:_____
_____
_____
I am encountering the following problem(s): _____
_____
_____
_____
and have received the following error messages/codes: _____
_____
_____
I have run the board diagnostics with the following results: _____
_____
You can reproduce the problem by performing these steps:
1. _____
_____
2. _____
_____
3. _____
_____

E-Mail and Fax Support

You can also get technical support by e-mailing or faxing the Technical Support Department:

- **E-mail**: You can reach Technical Support at the following address: tsupport@datx.com

  Ensure that you provide the following minimum information:

  – Your name,

  – Your company or organization,

  – A phone number,

  – An email address where you can be reached,

  – The hardware/software product you need help on,

  – A summary of the issue you are experiencing,

  – Your contract number, if applicable, and

  – Your product serial number or purchase date.

  Omitting any of the above information may delay our ability to resolve your issue.

- **Fax**: Please photocopy and complete the form on page 86, then fax Technical Support at the following number: (508) 481-8620.

Support requests from non-contract and out-of-warranty customers are processed with the same priority as telephone support requests.

World-Wide Web

For the latest tips, software fixes, and other product information, you can always access our World-Wide Web site free of charge at the following address: http://www.datatranslation.com

If Your Board Needs Factory Service

If your board must be returned to Data Translation, perform the following steps:

1. Record the board's serial number, then contact the Customer Service Department at (508) 481-3700 (if you are in the USA) and obtain a Return Material Authorization (RMA).

   If you are located outside the USA, call your local distributor for authorization and shipping instructions. The name and telephone number of your nearest distributor are listed in your Data Translation catalog.
   All return shipments to Data Translation must be marked with the correct RMA number to ensure proper processing.

2. Using the original packing materials, if available, package the board as follows:

   – Wrap the board in an electrically conductive plastic material. Handle with ground protection. A static discharge can destroy components on the board.

   – Place in a secure shipping container.

3. Return the board to the following address, making sure the RMA number is visible on the outside of the box.

   Customer Service Dept.
   Data Translation, Inc.
   100 Locke Drive
   Marlboro, MA 01752-1192

Specifications

Table 15 lists the electrical specifications for the video input signals of the DT3120 boards.

Table 15: Video Input Electrical Specifications

Feature	Specification
Input Signal Range	0.5 V to 2.0 V
Input Impedance	75 Ω ± 10%

Table 16 lists the electrical specifications for the external trigger signals of the DT3120 board.

Table 16: External Trigger Electrical Specifications

Feature	Minimum Specification	Maximum Specification
Input Low Level (V_{IL})	0 VDC	0.4 VDC[a]
Input High Level (V_{IH})	3.5 VDC	5.0 VDC
Input rate	-	10 Hz

a. Exceeding the voltage limits noted may cause damage to the device to which the input is connected.

Table 17 lists the power, physical, and environmental specifications of the DT3120 board.

Table 17: Power, Physical, and Environmental Specifications

Feature	Specification
Operating temperature	0° C to 50° C (32° F to 122° F)
Storage temperature	–25° C to 70° C (–13° F to 158° F)
Humidity	0 to 90%, noncondensing
Dimensions	6.875 inches x 4.2 inches
Weight	5.3 ounces (150 grams)

Modifying the Device Driver

Windows 98 and Windows Me Procedures

This section describes the following procedures in Windows 98 and Windows Me:

- Adding a board to the device driver configuration (on this page);
- Modifying the board settings in the device driver configuration (on page 95); and
- Uninstalling the device driver, if necessary (on page 96).

Adding a Board to the Device Driver Configuration

To add a new board to the DT3120 Device Driver configuration, perform the following steps:

1. Turn your computer off and insert the new DT3120 board into your computer following the instructions in the *DT3120 Getting Starting Manual.*
2. Turn your computer on and start Windows 98 or Windows Me.
   The Add New Hardware Wizard dialog box appears.
3. Click **Next**.
4. For Windows 98:
   Click **Search for the best driver for your device (Recommended)**, make sure all optional search locations are unchecked, then click **Next**.

   For Windows Me:
   Click **Automatic search for a better driver (Recommended)**.
5. Click **Next**.
   The files are copied.
6. Click **Finish**.
7. Open the Control Panel.
8. Double-click the **DT Imaging Control** icon.

9. Select the DT3120 board to configure.
10. Select the **Video Format** as either 50 Hz or 60 Hz.
11. When you are finished, click **Done**.
    If you made any changes, the Save Changes dialog box appears.
12. If you want to save your changes, click **Yes**.

Modifying a Board in the Device Driver Configuration

To modify a board in the device driver configuration, perform the following steps:

1. Open the Control Panel.
2. Double-click the **DT Imaging Control** icon.
3. Select the DT3120 board to configure.
4. Select the **Video Format** as either 50 Hz or 60 Hz.
5. When you are finished, click **Done**.
   If you made any changes, the Save Changes dialog box appears.
6. If you want to save your changes, click **Yes**.

Uninstalling the Device Driver

Generally, you will always require the DT3120 Device Driver. However, if you are no longer using the DT3120 with the supported software, you can uninstall the DT3120 Device Driver from the system by performing the following steps:

1. Open the Control Panel, and double-click **System**.
2. Click the **Device Manager** tab.
3. Double-click **DT Image Device**.
4. Click **DT3120 Secondary Device**, then click **Remove**.
   The Confirm Device Removal dialog appears.
5. Click **OK** to confirm the removal.
6. Click **DT3120 Frame Grabber**, then click **Remove**.
   The Confirm Device Removal dialog appears.
7. Click **OK** to confirm the removal.
8. Repeat steps 6 and 7 until all DT3120 frame grabber boards have been removed.
9. Close the System dialog box.
10. From the Control Panel, click **Add/Remove Programs**.
11. Click **DT3120 Drivers for Windows 98 and Me**, then click **Add/Remove**.
12. Click **Yes** to remove read-only files.
13. Click **Finish**.
14. Close the Control Panel.
15. Turn your computer off and remove any DT3120 boards.

Note: If you want to reinstall the device driver after removing it, refer to the *DT3120 Getting Started Manual* for instructions.

Windows 2000 Procedures

This section describes the following procedures in Windows 2000:

- Adding a board to the device driver configuration (on this page);
- Modifying the board settings in the device driver configuration (on page 98); and
- Uninstalling the device driver, if necessary (on page 98).

Adding a Board to the Device Driver Configuration

To add a new board to the DT3120 Device Driver configuration, perform the following steps:

1. Turn your computer off and insert the new DT3120 board into your computer following the instructions in the *DT3120 Getting Starting Manual.*
2. Turn your computer on and start Windows 2000.
   The Add New Hardware Wizard dialog box appears.
3. Click **Next**.
4. Click **Search for a suitable driver for my device (recommended)**, make sure all optional search locations are unchecked, then click **Next**.
5. Click **Next**.
   The files are copied.
6. Click **Finish**.
7. Open the Control Panel.
8. Double-click the **DT Imaging Control** icon.
9. Select the DT3120 board to configure.
10. Select the **Video Format** as either 50 Hz or 60 Hz.

11. When you are finished, click **Done**.
    If you made any changes, the Save Changes dialog box appears.
12. If you want to save your changes, click **Yes**.

Modifying a Board in the Device Driver Configuration

To modify a board in the device driver configuration, perform the following steps:

1. Open the Control Panel.
2. Double-click the **DT Imaging Control** icon.
3. Select the DT3120 board to configure.
4. Select the **Video Format** as either 50 Hz or 60 Hz.
5. When you are finished, click **Done**.
   If you made any changes, the Save Changes dialog box appears.
6. If you want to save your changes, click **Yes**.

Uninstalling the Device Driver

Generally, you will always require the DT3120 Device Driver. However, if you are no longer using the DT3120 board with the supported software, you can uninstall the DT3120 Device Driver from the system by performing the following steps:

1. Open the Control Panel.
2. Double-click **System**.
3. Click **Hardware**, then click **Device Manager**.
4. Double-click **DT Image Device**.
5. Click the **DT3120 Frame Grabber**, click **Action,** then click **Uninstall**.

6. Click **DT3120 Secondary Device**, click **Action,** then click **Uninstall**.
7. Close the System dialog box.
8. From the Control Panel, click **Add/Remove Programs**.
9. Click **DT3120 Drivers for Windows 2000**, then click **Change/Remove**.
10. If prompted, click **Yes** to remove read-only files.
11. Click **OK**.
12. Close the Control Panel.
13. Turn your computer off and remove any DT3120 boards.

Note: If you want to reinstall the device driver after removing it, refer to the *DT3120 Getting Started Manual* for instructions.

Windows XP Procedures

This section describes the following procedures in Windows XP:

- Adding a board to the device driver configuration (on this page);
- Modifying the board settings in the device driver configuration (on page 101); and
- Uninstalling the device driver, if necessary (on page 101).

Adding a Board to the Device Driver Configuration

To add a new board to the DT3120 Device Driver configuration, perform the following steps:

1. Turn your computer off and insert the new DT3120 board into your computer following the instructions in the *DT3120 Getting Starting Manual.*
2. Turn your computer on and start Windows XP.
   The Add New Hardware Wizard dialog box appears.
3. Click **Next**.
4. Click **Search for a suitable driver for my device (recommended)**, make sure all optional search locations are unchecked, then click **Next**.
5. Click **Next**.
   The files are copied.
6. Click **Finish**.
7. Open the Control Panel.
8. Double-click the **DT Imaging Control** icon.
9. Select the DT3120 board to configure.
10. Select the **Video Format** as either 50 Hz or 60 Hz.

11. When you are finished, click **Done**.
    If you made any changes, the Save Changes dialog box appears.
12. If you want to save your changes, click **Yes**.

Modifying a Board in the Device Driver Configuration

To modify a board in the device driver configuration, perform the following steps:

1. Open the Control Panel.
2. Double-click the **DT Imaging Control** icon.
3. Select the DT3120 board to configure.
4. Select the **Video Format** as either 50 Hz or 60 Hz.
5. When you are finished, click **Done**.
   If you made any changes, the Save Changes dialog box appears.
6. If you want to save your changes, click **Yes**.

Uninstalling the Device Driver

Generally, you will always require the DT3120 Device Driver. However, if you are no longer using the DT3120 board with the supported software, you can uninstall the DT3120 Device Driver from the system by performing the following steps:

1. Open the Control Panel.
2. Double-click **System**.
3. Click **Hardware**, then click **Device Manager**.
4. Double-click **DT Image Device**.
5. Click the **DT3120 Frame Grabber**, click **Action,** then click **Uninstall**.
6. Click **OK**.

7. Click **DT3120 Secondary Device**, click **Action,** then click **Uninstall**.
8. Click **OK**.
9. Close the System dialog box.
10. From the Control Panel, click **Add/Remove Programs**.
11. Click **DT3120 Drivers**, then click **Change/Remove**.
12. Click **Finish**.
13. Click **Close**.
14. Turn your computer off and remove any DT3120 boards.

Note: If you want to reinstall the device driver after removing it, refer to the *DT3120 Getting Started Manual* for instructions.

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