DATA TRANSLATION

UM-16345-G

MACH Series
DT3154
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 DT3154 frame grabber board and how to use the DT3154 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 the DT3154 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 DT3154 board and the DT3154 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 board, as well as the supported software and accessories for the board.
- Chapter 2, "Principles of Operation," describes all of the board's features and how to use them in your application.
- Chapter 3, "Supported Device Driver Capabilities," describes the capabilities supported by the DT3154 Device Driver and the initialized control values.

- Chapter 4, "Programming Flowcharts," describes the processes you must follow to program the DT3154 board using the DT-Open Layers™ Frame Grabber SDK and Color SDK Extensions.
- Chapter 5, "Troubleshooting," provides information that you can use to resolve problems with the board and the device driver, should they occur.
- Appendix A, "Specifications," lists the specifications of the board.
- Appendix B, "Connector Pin Assignments," shows the pin assignments for the connectors on the board.
- Appendix C, "Modifying the Device Driver," describes how to add, modify, and remove a board from the device driver configuration, and 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 DT3154 board:

- *DT3154 Getting Started Manual* (UM-16347), included on the Imaging OMNI CD™ provided with the DT3154 board, describes how to install the DT3154 software, install the DT3154 board, connect signals to the board, install and configure the DT3154 Device Driver, and verify the board's operation with DT-Acquire.
- *Frame Grabber SDK Manual* (UM-13442), included on the Imaging OMNI CD provided with the DT3154 board, describes the Dynamic Linkable Library (DLL) that you can use to write image acquisition application programs.
- *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 and GLOBAL LAB Image/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.
- *PCI Specification:* PCI Local Bus Specification, PCI Special Interest Group, Hillsboro, OR., Revision 2.0, (503) 696-2000.
- Bt254 Monolithic CMOS Triple 8-bit Image Digitizer, Brooktree Corporation, (619) 452-7580.

- SAA7116 Digital Video to PCI Interface, Philips Semiconductors, (800) 234-7381.

Additionally, it may be helpful to read other material in order 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.

Brooktree Corporation. *Brooktree Applications Handbook - Graphics and Imaging Products.* San Diego: Brooktree Corporation, 1991. Product data book and application examples.

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 the DT3154 board, our Technical Support Department is available to provide technical assistance. Refer to Chapter 5 for more information. If you are outside the U.S. or Canada, call your local distributor, whose number is listed in your Data Translation product handbook, or contact the Data Translation web site (www.datatranslation.com).

Overview

Features

The DT3154 is an RGB (red, green, and blue) frame grabber board for the PCI bus. It is suitable for both image analysis and machine vision applications.

The DT3154 board digitizes the video signal and either stores the image to the host computer's system memory or transfers the 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 DT3154 board are summarized as follows:

- Operates as a PCI bus master;
- Supports real-time image transfer to system memory;
- Supports RGB NTSC and RGB PAL video formats;
- Digitizes a 24-bit RGB input from one of two video input channels (each consisting of separate red, green, and blue signals);
- Can digitize two 8-bit monochrome signals of an input channel simultaneously to provide progressive scan capability;
- Can digitize three 8-bit monochrome signals of an input channel simultaneously;
- Supports single and multiple frame acquisitions for both color and monochrome images;
- Supports programmable region-of-interest (ROI);
- Provides real-time, interpolated scaling to any size;
- Provides a 256 x 8-bit input look-up-table (ILUT) for each signal (red, green, and blue) corresponding to each input channel;
- Synchronizes to one of seven sources: the red, green, or blue signal corresponding to either input channel or to an external sync input;

- Provides a sync output for driving camera timing;
- Provides fixed Sync Sentinel with an enable/disable option for VCR compatibility;
- Provides programmable control of the A/D offset and reference settings of the board;
- Accepts an external trigger with selectable polarity; and
- Provides two general-purpose, TTL-level digital inputs and three general-purpose, TTL-level digital outputs.

Supported Software

The following software is available for use with the DT3154 board:

- **DT3154 Device Driver** –This software is provided on the Imaging OMNI CD, which is shipped with the board. You *must* install this device driver to use a DT3154 board with any of the supported software packages or utilities. Refer to the *DT3154 Getting Started Manual* 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 *DT3154 Getting Started Manual* for information on installing and using this utility.
- **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 DT3154 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 an ActiveX control to access the capabilities of the DT3154 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 Data Translation's imaging product catalog for information on additional software packages available for the DT3154 board.

Accessories

You can connect the DT3154 to the video input source using either an EP306 cable (available from Data Translation) or a user-designed cable.

The EP306 is a 5-foot cable with a 15-pin, D-shell connector on one end and 14 BNC connectors on the other end. It accommodates all the signals from the J1 connector on the DT3154 board. Refer to Appendix B for connector pin assignments.

2

Principles of Operation

This chapter describes the features of the DT3154 board from a functional point-of-view. To aid the discussions in this chapter, refer to the block diagram of the DT3154, shown in Figure 1.

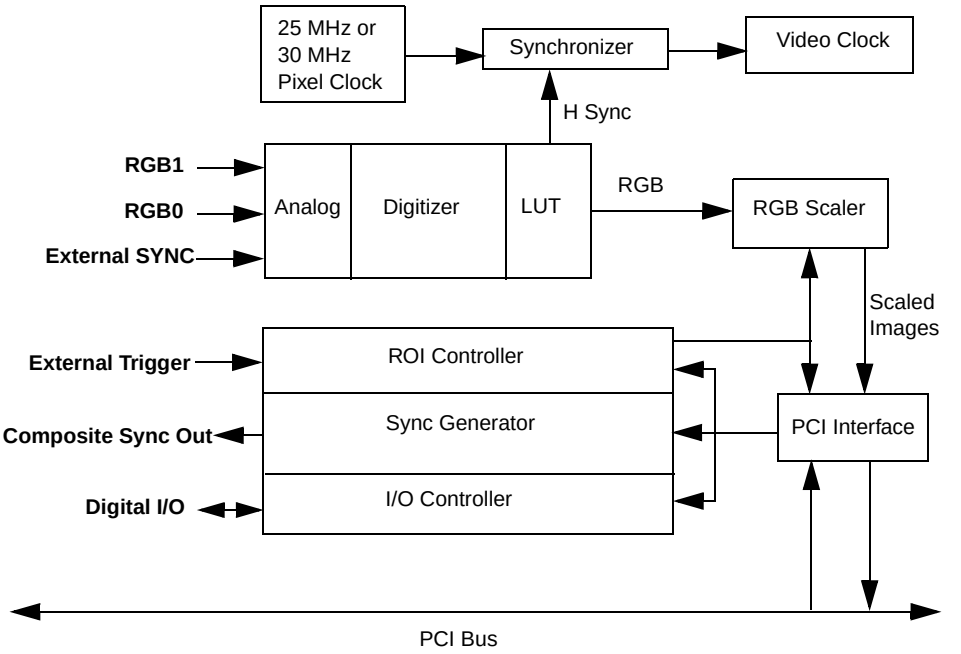


Figure 1: DT3154 Block Diagram

Video Input Signals

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

- Video signal types,
- Video input channels,
- Color intensity,
- Pixel clock,
- External trigger, and
- Input look-up table.

Video Signal Types

The DT3154 can acquire images from the following signal types:

- **RGB** –Red, green, and blue signals (RVID, GVID, and BVID) are captured simultaneously; image manipulations are performed independently.
- **Triple Monochrome** –Three monochrome signals (RVID, GVID, and BVID) are captured simultaneously.
- **Dual Monochrome** –Two monochrome signals (RVID and GVID) are captured simultaneously. Data from the BVID signal is ignored.

Note: For triple-monochrome and dual-monochrome mode, the data must be post-processed before it can be displayed. Refer to page 24 for more information on how data is stored for these modes.

The video signal must conform to one of the following video formats:

- NTSC –Standard for 60 Hz RGB video signals. A video frame is displayed as 640 x 480 lines.
- PAL –Standard for 50 Hz RGB video signals. A video frame is displayed as 768 x 576 lines.

Videos Input Channels

The DT3154 supports two RGB video input channels (0 and 1). As listed in Table 1, each input channel consists of three separate signals: red, green, and blue.

Table 1: Input Channels

Input Channel	Signals	Signal Description[a]
0	RVID0	Red signal of channel 0.
	GVID0	Green signal of channel 0.
	BVID0	Blue signal of channel 0.
1	RVID1	Red signal of channel 1.
	GVID1	Green signal of channel 1.
	BVID1	Blue signal of channel 1.

a. If you wish, you can attach monochrome signals instead of RGB signals to channel 0 and/or 1; in this case, ignore the color designations.

Color Intensity

For RGB images, adjusting the offset and reference voltages for the signal affects the intensity of the color. For ease of use, both of these voltages are measured at the camera's output.

Note: For monochrome images, adjusting the offset affects the black level (the voltage below which all voltages are digitized to black); adjusting the reference affects the white level (the voltage above which all voltages are digitized to white).

The following subsections describe how to adjust the offset and reference settings of the video signal.

Offset

For the DT3154, offset is defined as the programmable voltage that is added to the minimum full-scale value of your video input signal to zero it. For example, if the negative full-scale voltage of your video input signal is −53.86 mV, use an offset of +53.86 mV to raise the minimum voltage to 0 V.

The DT3154 supports a minimum offset of 0 V and a maximum offset of 305.55 mV, in increments of 4.85 mV. By default, the offset is −53.86 mV.

Reference

Reference is defined as the maximum full-scale value of your video signal.

The DT3154 supports a minimum reference value of 338.00 mV and a maximum reference value of 1.19 V, in increments of 13.68 mV. By default, the reference is 707.41 mV.

Once it has been adjusted for offset, the DT3154 board digitizes each signal (red, green, and blue) between 0 V and the reference voltage.

Pixel Clock

The DT3154 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.

To generate the pixel clock signal, the DT3154 uses a 25 MHz clock for 60 Hz image formats and 30 MHz clock for 50 Hz image formats. This clock is subsequently synchronized to each horizontal sync (including those inserted if using Sync Sentinel) and divided by two to produce the desired digitization rate. (Refer to page 15 for more information on Sync Sentinel.)

Using the Digital Clock Sync Circuitry, which has no more than ±4 ns jitter, the DT3154 board synchronizes the pixel clock to the first frame of an asynchronous external video source.

External Trigger

The DT3154 frame grabber provides pin 1 (EXT_TRIGGER) on connector J1 for connecting an external trigger input. Using an external trigger, you can synchronize frame acquisitions with an external event.

You can enable and invert the external trigger using software. When the external trigger is enabled, image acquisition starts when a low-to-high edge (rising-edge) transition occurs or if the external trigger is inverted, when a high-to-low (falling-edge) transition occurs on pin 1 of connector J1.

Input Look-Up Tables (ILUTs)

An input look-up table (ILUT) allows you to change the value of an incoming pixel value. The DT3154 board has six, 256 x 8-bit ILUTs: one for the RVID, GVID, and BVID signals corresponding to input channels 0 and 1. Using the board's ILUTs, you can perform real-time image processing. When it gets an input pixel value, the ILUT retrieves the output value for that particular pixel and passes the output value to the frame. Pixel values range from 0 to 255.

Using software, you can specify the relationship between the pixel input value and the ILUT output value by loading an ILUT with different processing setups. For example, you can pass an image unaltered (the default setting, known as *identity*), or you can perform pixel point operations, such as image multiplication and division, intensity correction, and reverse-video, before passing the image on.

As an example, assume that the ILUT is loaded with the identity pattern. An input value of 0 (black in monochrome mode), has an output value of 0 (black in monochrome mode). An input value of 1 has an output value of 1. An input value of 2 has an output value of 2, and so on, up to and input value of 255 (which has an output value of 255 or white in monochrome mode).

As another example, if you load an ILUT with an inverse or negative pattern, an input of 0 has an output value of 255, an input value of 1 has an output value of 254, and so on, up to an input value of 255 (which has an output value of 0).

Note: On the DT3154 board, you can load an ILUT without regard to whether you are capturing RGB, triple-monochrome, or dual-monochrome images.

Sync Signals

This section describes the following aspects of sync signals:

- Sync source,
- Sync threshold,
- Sync Sentinel, and
- Sync-locking.

Sync Source

To digitize the incoming video signal, the DT3154 frame grabber requires both horizontal and vertical sync signals. The DT3154 board determines this sync information from a video input signal.

Generally, the connected camera generates the 60 Hz or 50 Hz sync signals. The board accepts a sync signal from one of the following sources: the RVID, GVID, or BVID signal corresponding to input channel 0 or 1, or the external sync input (pin 2 of connector J1). By default, the GVID signal corresponding to channel 0 is the sync signal.

The sync signal is stripped from the incoming video signal and fed into Digital Sync Circuitry, which is responsible for clocking data through the board.

Sync Threshold

The voltage level of the incoming analog sync signal is compared with a voltage you set (called the sync threshold) to determine when the horizontal and vertical sync signals are asserted. The sync period is defined as the portion of the sync signal that falls below the sync threshold. The sync is then used to generate the horizontal and vertical timing for the input section of the DT3154 board.

On the DT3154, you can program the sync threshold for each input channel (0 and 1). Possible threshold settings are 50 mV and 125 mV (nominal is 125 mV).

Note: The sync threshold value applies to all signals corresponding to the selected input channel.

Sync Sentinel

The fixed Sync Sentinel circuitry provides sync continuity for the DT3154 board. The Sync Sentinel is especially useful for noisy input sources, such as VCRs, where the DT3154 frame grabber may interpret a noise spike in the video signal as a horizontal or vertical sync, or the board may miss some syncs that are below the sync threshold.

By default, Sync Sentinel is enabled. You can enable or disable the Sync Sentinel using software.

When enabled, the Sync Sentinel on the DT3154 provides a window in which a sync can be detected. In the horizontal dimension, the window starts when 95% of the total number of pixels per line have been digitized, and stops when 101.5% of the number of pixels per line have been digitized. In the vertical dimension, the window starts when 90% of the total number of lines per field have been digitized, and stops when 101.5% of the number of lines per field have been digitized.

If a sync (either horizontal or vertical) has not been detected within the window (where one is expected), the Sync Sentinel inserts the appropriate sync. Once the sync is detected, the Sync Sentinel masks any further sync detection until the next window occurs.

If you are switching among multiple channels or if the sync signals occur at random intervals, you can disable the Sync Sentinel. This allows the DT3154 frame grabber to wait unit a sync signal actually occurs before starting the acquisition.

Sync-Locking

The DT3154 board generates a composite sync signal (COMP_SYNC) and outputs it on pin 14 of connector J1. This signal complies with the NTSC (60 Hz) or PAL (50 Hz) format and can be used to drive one or more cameras, if desired.

The video signal from the camera is then digitized as usual, using the composite sync generated by the board as the sync basis. This process is called *sync-locking*. Sync-locking allows you to synchronize signals when switching among channels or, in the case of the triple- or dual-monochrome modes, allows you to synchronize two or three cameras to acquire a packed monochrome image on up to three channels with one acquisition.

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, 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.

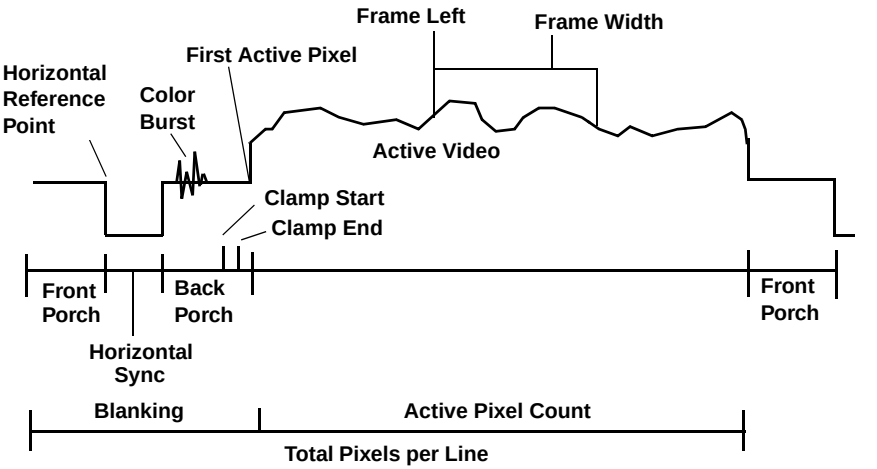


Figure 2: Horizontal Video Signal

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.

Pixels are available to the frame grabber board at increments of PixelPeriod (1 / pixel clock frequency). You can think of pixels as an increment of time also. Pixel measurements are relative to the horizontal reference point, which is defined as the beginning of the horizontal sync. For information on the pixel clock frequency, see page 12.

Except for the frame left and frame width parameters, all the settings of the horizontal video signal are fixed on the DT3154 and are not programmable. Refer to page 20 for information on setting the frame parameters.

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.

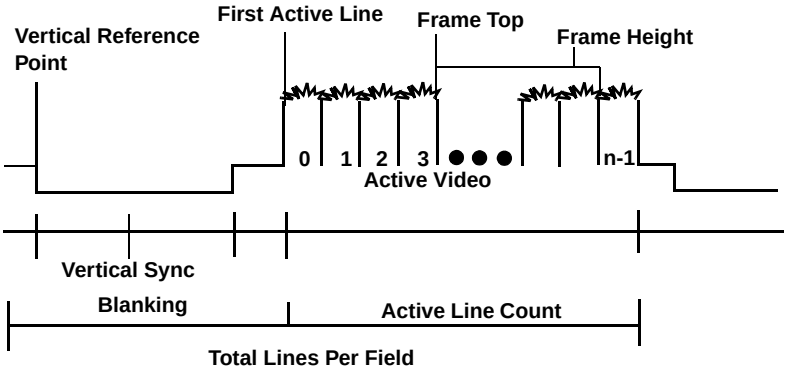


Figure 3: Vertical Video Signal

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.

Except for the frame top and frame height parameters, all the settings of the vertical video signal are fixed on the DT3154 and are not programmable. Refer to page 20 for information on setting the frame parameters.

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 the frame:

- 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 2 shows the settings you can program on the DT3154 to define the frame. Figure 4 illustrates these relationships.

Table 2: Frame Settings for the DT3154

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 764 pixels 60 Hz: 0 to 636 pixels	0
Frame Width	The number of pixels per line of video to digitize.	50 Hz: 4 to 768 pixels 60 Hz: 4 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 572 lines 60 Hz: 0 to 476 lines	0
Frame Height	The number of lines per frame of video to digitize.	50 Hz: 4 to 576 lines 60 Hz: 4 to 480 lines	50 Hz: 576 60 Hz: 480

a. Granularity is 4.

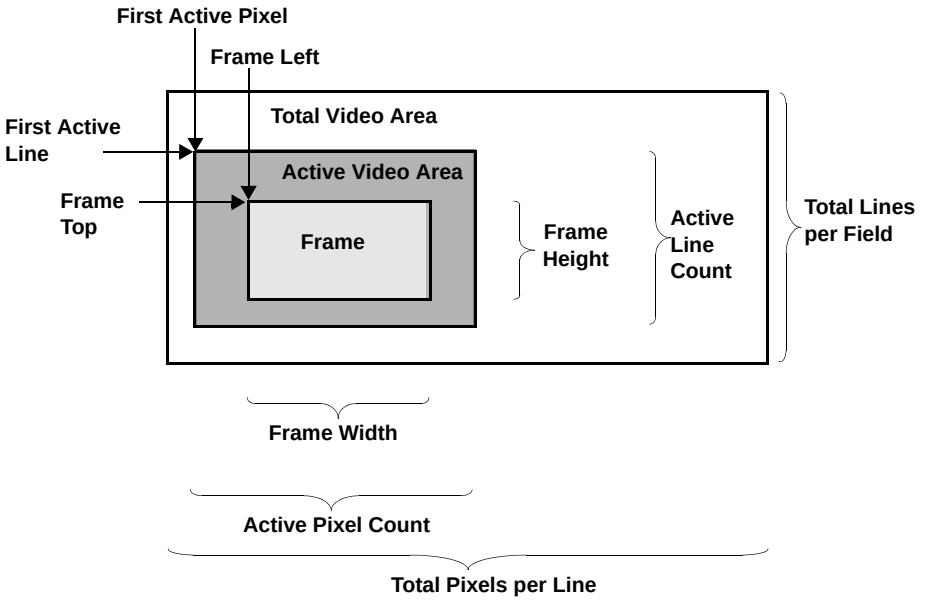


Figure 4: Spatial Relationship of Video Signal

Types of Frames

Using software, you can specify that you want to acquire one of the following types of frames:

- 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), or
- Noninterlaced frames.

For an interlaced frame, 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.

For a noninterlaced frame, the video signal is defined as a single field where the start of the field is identified by the falling edge of the vertical sync.

Scaling Frames

The DT3154 can perform simultaneous, RGB 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 4 to 480 for 60 Hz image formats or from 4 to 576 for 50 Hz image formats. 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.

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) multiplied by 100 (to represent the ratio as a percentage).

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

Note: Using software, you can also set the scale factor from 1 to 16; however, this method does not provide as much control as the method described above.

Frame Storage Mode

When the DT3154 board is used as an RGB frame grabber, the data is stored and/or displayed as 24-bits RGB, but formatted as 32 bits, where the high byte is unused, followed by red data, then green data, then blue data. Figure 5 shows how two pixels are stored in RGB format using bytes and DWORD representations.

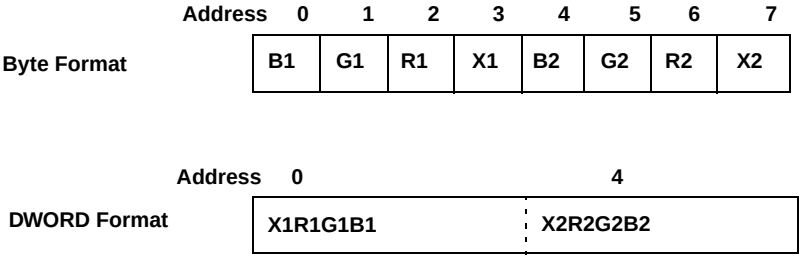


Figure 5: RGB 24-Bit Color Data Format

When the DT3154 board is configured for triple-monochrome mode, data is stored in an interleaved manner, where each 32-bit location contains one byte from each signal and one unused byte. Data is formatted as XABC, where *X* (the high byte) is unused, *A* data is from RVID, *B* data is from GVID, and *C* data is from BVID. Using software, you can separate the data for display or processing. Figure 6 shows how two pixels are stored in triple-monochrome mode using bytes and DWORD representations.

Figure 6: Triple-Monochrome Mode 8-Bit Data Format

When the DT3154 is configured for dual-monochrome mode, two images are captured and stored in the 32-bit location to accomplish progressive scanning. Data is formatted as ABAB, where *A* data is from RVID, and *B* data is from GVID. Using software, you can separate the data for display or processing. Figure 7 shows how four pixels are stored in dual-monochrome mode using bytes and DWORD representations.

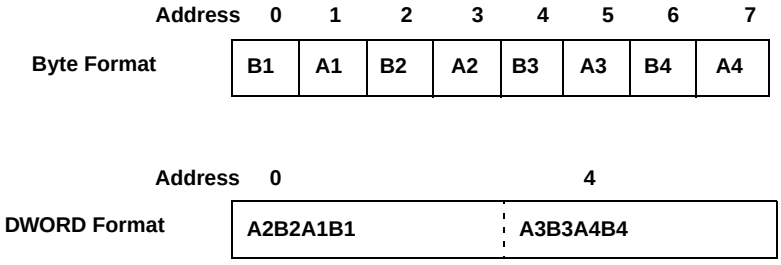


Figure 7: Dual-Monochrome Mode 8-Bit Data Format

Passthru Operations

For RGB images only, the DT3154 board can perform passthru operations. In a passthru operation, the board continuously captures image data, converts the data to a bitmap, and transfers the data to the display memory of the video board. Image data in display memory is continuously overwritten.

Note: Passthru is not supported for triple-monochrome and dual-monochrome signals because the data must first be unpacked before it can be displayed.

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.

This section describes the following aspects of passthru:

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

Passthru Modes

The DT3154 board supports both synchronous and asynchronous bitmap passthru mode. In a synchronous passthru operation, you cannot perform another operation until the synchronous passthru operation is stopped. In an asynchronous passthru 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 buffer in device memory into which the image is first captured. Once it is captured, Windows functions perform bit copies of the image data to display memory. Windows functions 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, 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 bitmap passthru operation continues until you stop it. You can stop an asynchronous bitmap passthru operation using software. To stop a synchronous bitmap passthru operation, click the mouse or press a key.

Note: No image is saved to nonvolatile system memory when a passthru operation is stopped. To save an image, you must perform an acquisition (see page 29).

Source Origin

The source origin of an image is the upper left corner of the image. Using software, you can change the source origin of an image to pan and scroll the image during a passthru operation.

The new source origin is a pixel position somewhere in the image. Values for the x-axis range from 0 to 636 for 60 Hz image formats or from 0 to 764 for 50 Hz image formats. Values for the y-axis range from 0 to 476 for 60 Hz image formats or from 0 to 572 for 50 Hz image formats. When set, the source origin becomes the upper left corner of the window. The passthru image shifts to the new position.

Passthru Scaling

Using software, the DT3154 board can scale the passthru image to the coordinates that most closely match the requested size. Unlike hardware scaling (see page 23), where the hardware scales the image before the image is transferred to system memory, passthru scaling is done in software after the image is transferred to system memory.

Values for the width range from 4 to 640 pixels for 60 Hz image formats or from 4 to 768 for 50 Hz image formats. Values for the height range from 2 to 480 lines for 60 Hz image formats or 2 to 576 for 50 Hz image formats.

Overlays

For the DT3154 board, you can use software to add overlays to the display when capturing RGB signals. Overlays are a means by which you can place an image on top of another image that was captured using passthru.

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

Acquisition Operations

The DT3154 board can capture frames either synchronously or asynchronously and store them in system memory; this operation is called *acquisition*. 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 DT3154, you can acquire a single full frame or multiple full frames. Single frames are stored in an area in system memory that was either allocated to the DT3154 Device Driver during system startup (called *device memory*) or provided by you (called *host memory*). Multiple frames are stored only in device memory.

Acquiring RGB images generally requires device memory, while acquiring triple-monochrome and dual-monochrome images requires host memory.

Each user buffer must be large enough to hold the acquired frame. The amount of data that is acquired into host memory can change depending on the input format (50 Hz or 60 Hz) used and the type of image (RGB, triple-monochrome, or dual-monochrome) captured. The required host memory size must be equal to or greater than frame height multiplied by frame width multiplied by pixel depth for each input format and image type. Table 3 lists the minimum host memory size required for each image format and image type supported.

Table 3: Required Host Memory

Image Format	Image Type	Minimum Memory Required (Bytes)
60 Hz (NTSC)	RGB or Triple-Monochrome Mode	1,228,800
	Dual-Monochrome Mode	614,400
50 Hz (PAL)	RGB or Triple-Monochrome Mode	1,769,472
	Dual-Monochrome Mode	884,736

WARNING!

If you are acquiring to host memory and change either the image format or the image type, you must ensure that the user buffer is large enough to hold the acquired data. Failure to do so results in invalid frame messages when you acquire the image.

An interrupt is generated when a frame 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 DT3154 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.

Digital I/O Signals

The DT3154 board provides two digital input lines (pins 12 and 13) and three digital output lines (pins 9, 10, and 11) on connector J1. These digital lines are simple register-driven, TTL-level inputs and outputs that you can use for any purpose, such as controlling or actuating external devices. A bit value of 0 identifies a low TTL level; a bit value of 1 identifies a high TTL level.

Use software to write the digital output values or read the digital input values.

Supported Device Driver Capabilities

DT3154 Device Driver Capabilities

Because the Frame Grabber SDK is intended to be used with all DT-Open Layers frame grabbers, the DT3154 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 DT3154 board, you can use query keys provided by the Frame Grabber SDK functions. These functions either return information about a specific capability or return the current value of a specific capability.

The tables in this chapter list the capabilities supported by the DT3154 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 DT3154 board supports 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 36
Input signals	page 38
Sync signals	page 42
Active video area	page 44
Frames	page 45
Passthru	page 48

For capabilities that apply to ...	Refer to the table starting on ...
Overlay	page 50
Memory	page 51
Acquisition	page 52
Digital I/O	page 54

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 descriptions of the functions in the *Frame Grabber SDK User's Manual* and online help.

Table 4: General Device Capabilities for the DT3154 Device Driver

Capability	DT3154 Support
OlImgQueryDeviceCaps	
Device Signature OLC_IMG_DC_OL_SIGNATURE	Ox44544F4C
Device ID OLC_IMG_DC_DEVICE_ID	2D
Device Name OLC_IMG_DC_DEVICE_NAME	“DT3154”
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	 No Yes
Sections Supported OLC_IMG_DC_SECTIONS Supports Input Operations OLC_FG_SECTION_INPUT Supports Linear Memory Operations OLC_FG_SECTION_LINEAR Supports Camera Control Operations OLC_FG_SECTION_CAMCTL Supports Management of Device Memory OLC_FG_SECTION_MEMORY Supports passthru OLC_FG_SECTION_PASSTHRU Supports DDI OLC_FG_SECTION_DDI	 Yes No No Yes Yes[a] Yes

Table 4: General Device Capabilities for the DT3154 Device Driver (cont.)

Capability	DT3154 Support
DtColorQueryInterface	
Color SDK Capabilities OLT_QUERY_COLOR_INTERFACE Supports Signal Type COLOR_INTERFACE_SIGNAL_TYPE Supports Storage Mode COLOR_INTERFACE_STORAGE_MODE Supports Image Parameter COLOR_INTERFACE_IMAGE_PARAMETER Supports Hardware Scaling COLOR_INTERFACE_HARDWARE_SCALING Supports Digital I/O COLOR_INTERFACE_DIGITAL_IO Supports Draw Acquired Frame COLOR_INTERFACE_DRAW_ACQUIRED_FRAME Supports Sync Master Mode COLOR_INTERFACE_SYNC_MASTER_MODE Supports Frame Extraction COLOR_INTERFACE_EXTRACT_FRAME Supports Drawing Buffers COLOR_INTERFACE_DRAW_BUFFER	 True True[b] True True True True False[c] True True

a. Passthru is supported in RGB mode only.
b. On the DT3154 board, you can query this value only.
c. The DT3154 provides a composite sync output on pin 14 of connector J1.

Table 5: Input Signal Capabilities for the DT3154 Device Driver

Capability	DT3154 Support
OlFgQueryInputCaps	
Number of Input Sources OLC_FG_INPUT_SOURCE_COUNT	2 (channels 0 and 1)[a]
Supports Input Filter Selection OLC_FG_IC_DOES_INPUT_FILTER	No
Supports Input Filter Query OLC_FG_IC_DOES_QUERY_INPUT_FILTER	Yes
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	 Yes No No No
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[b]
Voltage Range of White Level, in µV OLC_FG_IC_WHITE_LEVEL_LIMITS	N/A[b]
Supports Programmable Pixel Clock OLC_FG_IC_DOES_PIXEL_CLOCK	No
Supports Pixel Clock Query OLC_FG_IC_DOES_QUERY_PIXEL_CLOCK	Yes

Table 5: Input Signal Capabilities for the DT3154 Device Driver (cont.)

Capability	DT3154 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
Number of LUTs OLC_FG_ILUT_COUNT	6[c]
Maximum Index Number Allowed in each ILUT OLC_FG_IC_MAX_ILUT_INDEX	255[d]
Maximum Value Allowed in each ILUT OLC_FG_IC_MAX_ILUT_VALUE	255

Table 5: Input Signal Capabilities for the DT3154 Device Driver (cont.)

Capability	DT3154 Support
DtColorSignalType	
Signal Type in the Color SDK Extensions OLT_SIGNAL_TYPE	
Supports Monochrome Signal Type OLC_MONO_SIGNAL	No
Supports YC Signal Type (Luminance/Chrominance) OLC_YC_SIGNAL	No
Support Composite Signal Type OLC_COMPOSITE_SIGNAL	No
Supports RGB Signal OLC_RGB_SIGNAL	Yes
Supports Triple-Monochrome Signal OLC_TRIPLE_MONO_SIGNAL	Yes
Supports Dual-Mono Signal OLC_DUAL_MONO_SIGNAL	Yes
DtColorImageParameters	
Image Parameters in the Color SDK Extensions OLT_COLOR_PARAMETER	
Brightness Values OLC_SET_BRIGHTNESS	N/A
Contrast Values OLC_SET_CONTRAST	N/A
V Saturation Values OLC_SET_V_SAT	N/A
U Saturation Values OLC_SET_U_SAT	N/A
Hue Values OLC_SET_HUE	N/A
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

Table 5: Input Signal Capabilities for the DT3154 Device Driver (cont.)

Capability	DT3154 Support
Image Parameters in the Color SDK Extensions (cont.) OLT_COLOR_PARAMETER	
Red Offset Values (μV) OLC_SET_RED_OFF	min: 0 max: 305,550 nominal: 53,350 granularity: 4,850
Red Reference Values (μV) OLC_SET_RED_REF	min: 338,000 max: 1,199,966 nominal: 707,414 granularity: 13,682
Green Offset Values (μV) OLC_SET_GREEN_OFF	min: 0 max: 305,550 nominal: 53,350 granularity: 4,850
Green Reference Values (μV) OLC_SET_GREEN_REF	min: 338,000 max: 1,199,966 nominal: 707,414 granularity: 13,682
Blue Offset Values (μV) OLC_SET_BLUE_OFF	min: 0 max: 305,550 nominal: 53,350 granularity: 4,850
Blue Reference Values (μV) OLC_SET_BLUE_REF	min: 338,000 max: 1,199,966 nominal: 707,414 granularity: 13,682

a. Channel 0 consists of signals RVID0, GVID0, and BVID0. Channel 1 consists of signals RVID1, GVID1, and BVID1.

b. To specify black and white levels, use the **DtColorImageParameters** function.

c. An ILUT is associated with each of the following signals RVID0, GVID0, BVID0, RVID1, GVID1, and BVID1.
d. The maximum number of entries allowed in the LUT is 255, since the index number is zero-based.

Table 6: Sync Signal Capabilities for the DT3154 Device Driver

Capability	DT3154 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
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	 No 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	 No Yes[a] Yes
Composite Sync Threshold Limits, in mV OLC_FG_IC_CSYNC_THRESH_LIST_LIMITS	 min: 50 max: 125 nominal: 125 granularity: 75
Composite Sync Threshold List OLC_FG_IC_CSYNC_THRESH_LIST	 50, 125
Supports Sync Sentinel OLC_FG_IC_DOES_SYNC_SENTINEL	 Yes

Table 6: Sync Signal Capabilities for the DT3154 Device Driver (cont.)

Capability	DT3154 Support
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	 Yes No
DtColorSyncMasterMode	
Sync Master in Color SDK Extensions OLT_SYNC_MASTER_PARAMETER Enable Sync Master Mode OLC_SYNC_MASTER_ENABLE	 No[b]

a. If a specific source is selected, use the defines in the file DtColorSDK.h to specify the source (refer to the *Frame Grabber SDK User's Manual* and online help for information on this file). Alternatively, use the low word of the new data value to specify the sync source. A value of 0 corresponds to RVID0, 1 corresponds to GVID0, 2 corresponds to BVID0, 3 corresponds to RVID1, 4 corresponds to GVID1, and 5 corresponds to BVID1.

b. The DT3154 provides a composite sync output on pin 14 of connector J1.

Table 7: Active Video Area Capabilities for the DT3154 Device Driver

Capability	DT3154 Support
OlFgQueryInputCaps	
Supports Defining of Active Video Area OLC_FG_IC_DOES_ACTIVE_VIDEO	No
Supports Active Video Area Query OLC_FG_IC_DOES_QUERY_ACTIVE_VIDEO	No
Range of Back Porch Start Position OLC_FG_IC_BACK_PORCH_START_LIMITS	N/A
Range of Clamp Start Position OLC_FG_IC_CLAMP_START_LIMITS	N/A
Range of Clamp End Position OLC_FG_IC_CLAMP_END_LIMITS	N/A
Range of Total Pixels Per Line Control OLC_FG_IC_TOTAL_PIX_PER_LINE_LIMITS	N/A
Range of First Active Pixel Position OLC_FG_IC_ACTIVE_PIXEL_LIMITS	N/A
Range of Active Pixels Count OLC_FG_IC_ACTIVE_WIDTH_LIMITS	N/A
Range of Total Lines per Field Control OLC_FG_IC_TOTAL_LINES_PER_FLD_LIMITS	N/A
Range of First Active Line Position OLC_FG_IC_ACTIVE_LINE_LIMITS	N/A
Range of Active Lines Count OLC_FG_IC_ACTIVE_HEIGHT_LIMITS	N/A

Table 8: Frame Capabilities for the DT3154 Device Driver

Capability	DT3154 Support
OlFgQueryInputCaps	
Supports Frame Selection OLC_FG_IC_DOES_FRAME_SELECT	Yes
Supports Frame Selection Query OLC_FG_IC_DOES_QUERY_FRAME_SELECT	Yes
Range of Frame Top Control OLC_FG_IC_FRAME_TOP_LIMITS	min: 0 max: 50 Hz: 572 60 Hz: 476 nominal: 0 granularity: 1
Range of Frame Left Control OLC_FG_IC_FRAME_LEFT_LIMITS	min: 0 max: 50 Hz: 764 60 Hz: 636 nominal: 0 granularity: 4
Range of Frame Height Control OLC_FG_IC_FRAME_HEIGHT_LIMITS	min: 4 max: 50 Hz: 576 60 Hz: 480 nominal: 50 Hz: 576 60 Hz: 480 granularity: 1

Table 8: Frame Capabilities for the DT3154 Device Driver (cont.)

Capability	DT3154 Support
Range of Frame Width Control OLC_FG_IC_FRAME_WIDTH_LIMITS	min: 4 max: 50 Hz: 768 60 Hz: 640 nominal: 50 Hz: 768 60 Hz: 640 granularity: 4
Range Between Pixels (Scale factor - horizontal) OLC_FG_IC_FRAME_HINC_LIMITS	min: 1[a] max: 16 nominal: 1 granularity: 1
Range Between Lines (Scale factor - vertical) OLC_FG_IC_FRAME_VINC_LIMITS	min: 1[e] max: 16 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 No No No Yes

Table 8: Frame Capabilities for the DT3154 Device Driver (cont.)

Capability	DT3154 Support
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 Triple-Mono = 4 Dual-Mono = 2
DtColorHardwareScaling	
Hardware Scaling in Color 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 Color SDK Extensions OLT_IMAGE_MODE Supports Monochrome Mode OLC_IMAGE_MONO Supports YUV Mode OLC_IMAGE_YUV Supports RGB OLC_IMAGE_RGB Supports RGB16 OLC_IMAGE_RGB_16	 No No Yes Yes

a. For better control, it is recommended that you scale the image using the Color SDK function **DtColorHardwareScaling**.

Table 9: Passthru Capabilities for the DT3154 Device Driver

Capability	DT3154 Support
OlFgQueryPassthruCaps	
Supports Passthru Section OLC_FG_PC_DOES_PASSTHRU	 Yes
Passthru Modes OLC_FG_PC_PASSTHRU_MODE_LIMITS Supports Sync Bitmap OLC_FG_PASSTHRU_SYNC_BITMAP Supports Async Bitmap OLC_FG_PASSTHRU_ASYNC_BITMAP Supports Sync Direct OLC_FG_PASSTHRU_SYNC_DIRECT Supports Async Direct OLC_FG_PASSTHRU_ASYNC_DIRECT	 Yes Yes No No
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 Available Range for the Y value of the Source Origin OLC_FG_PC_SRC_ORIGIN_Y_LIMITS	 Yes min: 0 max: 50 Hz: 764 60 Hz: 636 nominal: 0 granularity: 4 min: 0 max: 50 Hz: 572 60 Hz: 476 nominal: 0 granularity: 4

Table 9: Passthru Capabilities for the DT3154 Device Driver (cont.)

Capability	DT3154 Support
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	 Yes min: 2 max: 50 Hz: 576 60 Hz: 480 nominal: 50 Hz: 576 60 Hz: 480 granularity: 2 (interlaced), or 1 (noninterlaced) min: 4 max: 50 Hz: 768 60 Hz: 640 nominal: 50 Hz: 768 60 Hz: 640 granularity: 4
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 Maximum Index Number Allowed 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

Table 10: Overlay Capabilities for the DT3154 Device Driver

Capability	DT3154 Support
OlFgQueryDDICaps	
Passthru with DDI OLC_FG_DDI_FAST_PASSTHRU	RGB = Yes Dual-Mono = No Triple-Mono = No
Overlay support OLC_FG_DDI_OVERLAYS	RGB = Yes Dual-Mono = No Triple-Mono = No
Translucent overlay capability OLC_FG_DDI_TRANSLUCENT_OVERLAYS	RGB = Yes Dual-Mono = No Triple-Mono = No
Color overlay capability OLC_FG_DDI_COLOR_OVERLAY	RGB = Yes Dual-Mono = No Triple-Mono = No
Multiple overlay surface capability OLC_FG_DDI_MULTIPLE_SURFACES	RGB = Yes Dual-Mono = No Triple-Mono = No
Color keying (filtering) OLC_FG_DDI_COLOR_KEY_CONTROL	RGB = Yes Dual-Mono = No Triple-Mono = No
Add overlay to image OLC_FG_DDI_OVERLAY_ON_FRAME	RGB = Yes Dual-Mono = No Triple-Mono = No

Table 10: Overlay Capabilities for the DT3154 Device Driver (cont.)

Capability	DT3154 Support
User-managed DDI surface support OLC_FG_DDI_USER_SURFACE_PTR	RGB = No Dual-Mono = No Triple-Mono = No
Passthru event synchronization support OLC_FG_DDI_PASSTHRU_SYNC_EVENT	RGB = Yes Dual-Mono = No Triple-Mono = No

Table 11: Memory Capabilities for the DT3154 Device Driver

Capability	DT3154 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	Device memory size divided by maximum number of pixels in frame
Number of Nonvolatile Buffer Handles OLC_FG_MC_NONVOL_COUNT	N/A

Table 12: Acquisition Capabilities for the DT3154 Device Driver

Capability	DT3154 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 Supports Subframe Acquisition OLC_FG_ACQ_SUBFRAME Supports Frame-to-Fit Acquisition OLC_FG_ACQ_FRAME_TO_FIT *-Single Frame to Device (sync)* Supports Full Frame Acquisition OLC_FG_ACQ_FRAME Supports Subframe Acquisition OLC_FG_ACQ_SUBFRAME Supports Frame-to-Fit Acquisition OLC_FG_ACQ_FRAME_TO_FIT *-Single Frame to Host (async)* Supports Full Frame Acquisition OLC_FG_ACQ_FRAME Supports Subframe Acquisition OLC_FG_ACQ_SUBFRAME Supports Frame-to-Fit Acquisition OLC_FG_ACQ_FRAME_TO_FIT -Single Frame to Device (async) Supports Full Frame Acquisition OLC_FG_ACQ_FRAME Supports Subframe Acquisition OLC_FG_ACQ_SUBFRAME Supports Frame-to-Fit Acquisition OLC_FG_ACQ_FRAME_TO_FIT	 Yes No No Yes No No Yes No No Yes No No

Table 12: Acquisition Capabilities for the DT3154 Device Driver (cont.)

Capability	DT3154 Support
Acquisition Types (multiple frame) OLC_FG_IC_MULT_FRAME_OPS *-Multiple Frames to Host (sync)* Supports Full Frame Acquisition OLC_FG_ACQ_FRAME Supports Subframe Acquisition OLC_FG_ACQ_SUBFRAME Supports Frame-to-Fit Acquisition OLC_FG_ACQ_FRAME_TO_FIT *-Multiple Frames to Device (sync)* Supports Full Frame Acquisition OLC_FG_ACQ_FRAME Supports Subframe Acquisition OLC_FG_ACQ_SUBFRAME Supports Frame-to-Fit Acquisition OLC_FG_ACQ_FRAME_TO_FIT *-Multiple Frames to Host (async)* Supports Full Frame Acquisition OLC_FG_ACQ_FRAME Supports Subframe Acquisition OLC_FG_ACQ_SUBFRAME Supports Frame-to-Fit Acquisition OLC_FG_ACQ_FRAME_TO_FIT *-Multiple Frames to Device (async)* Supports Full Frame Acquisition OLC_FG_ACQ_FRAME Supports Subframe Acquisition OLC_FG_ACQ_SUBFRAME Supports Frame-to-Fit Acquisition OLC_FG_ACQ_FRAME_TO_FIT	 No No No Yes No No No No No Yes No No
Supports Drawing Acquired Frame OLC_FG_IC_DOES_DRAW_ACQUIRED_FRAME	Yes

Table 13: Digital I/O Capabilities for the DT3154 Device Driver

Capability	DT3154 Support
OlFgQueryCameraControlCaps	
Number of Digital Output Lines OLC_FG_CC_DIG_OUT_COUNT	0[a]
DtColorDigitalIOControl	
Number of Digital I/O Lines	5[b]

a. Digital output lines are not supported by the Frame Grabber SDK; use the Color SDK function **DtColorDigitalIOControl**.

b. The DT3154 has 2 fixed digital input lines and 3 fixed digital output lines accessible through the Color SDK function **DtColorDigitalIOControl.**

Initialized Control Values

Table 14 lists the default control values after opening or initializing the DT3154 Device Driver.

Table 14: Default Control Values for the DT3154

Control Name	Value
OLC_FG_CTL_INPUT_FILTER	OLC_FG_FILT_AC_NONE
OLC_FG_CTL_BLACK_LEVEL	N/A
OLC_FG_CTL_WHITE_LEVEL	N/A
OLC_FG_CTL_VIDEO_TYPE	N/A
OLC_FG_CTL_CSYNC_SOURCE	OLC_FG_CSYNC_SELECTED_SRC (GVID0)
OLC_FG_CTL_CSYNC_THRESH	125 mV
OLC_FG_CTL_BACK_PORCH_START	N/A
OLC_FG_CTL_CLAMP_START	N/A
OLC_FG_CTL_CLAMP_END	N/A
OLC_FG_CTL_TOTAL_PIX_PER_LINE	N/A
OLC_FG_CTL_FIRST_ACTIVE_PIXEL	N/A
OLC_FG_CTL_ACTIVE_PIXEL_COUNT	N/A
OLC_FG_CTL_TOTAL_LINES_PER_FLD	N/A
OLC_FG_CTL_FIRST_ACTIVE_LINE	N/A
OLC_FG_CTL_ACTIVE_LINE_COUNT	N/A
OLC_FG_CTL_SYNC_SENTINEL	TRUE
OLC_FG_CTL_HSYNC_INSERT_POS	10150 (101.5%)
OLC_FG_CTL_HSYNC_SEARCH_POS	9500 (95.0%)
OLC_FG_CTL_VSYNC_INSERT_POS	10150 (101.5%)
OLC_FG_CTL_VSYNC_SEARCH_POS	9000 (90.0%)
OLC_FG_CTL_FRAME_TOP	0

Table 14: Default Control Values for the DT3154 (cont.)

Control Name	Value
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_SOURCE	OLC_FG_CLOCK_INTERNAL
OLC_FG_CTL_CLOCK_FREQ	50 Hz: 15,000,000 60 Hz: 12,500,000
OLT_FG_TRIGGER	OLC_FG_TRIGGER_NONE
OLC_FG_CTL_FRAME_TYPE	OLC_FG_FRM_IL_FRAME_EVEN
OLC_FG_CTL_ILUT	0
OLT_SIGNAL_TYPE	OLC_RGB_SIGNAL
OLC_SET_BRIGHTNESS	N/A
OLC_SET_CONTRAST	N/A
OLC_SET_V_SAT	N/A
OLC_SET_U_SAT	N/A
OLC_SET_HUE	N/A
OLC_SET_RED_LEVEL	N/A
OLC_SET_GREEN_LEVEL	N/A
OLC_SET_BLUE_LEVEL	N/A
OLC_SET_RED_REF	707,414
OLC_SET_RED_OFF	53,350
OLC_SET_GREEN_REF	707,414
OLC_SET_GREEN_OFF	53,350
OLC_SET_BLUE_REF	707,414

Table 14: Default Control Values for the DT3154 (cont.)

Control Name	Value
OLC_SET_BLUE_OFF	53,350
OLT_SCALE_PARAM Horizontal scale factor Vertical scale factor	 100 100
Digital I/O Configuration	3 fixed outputs; 2 fixed inputs

4

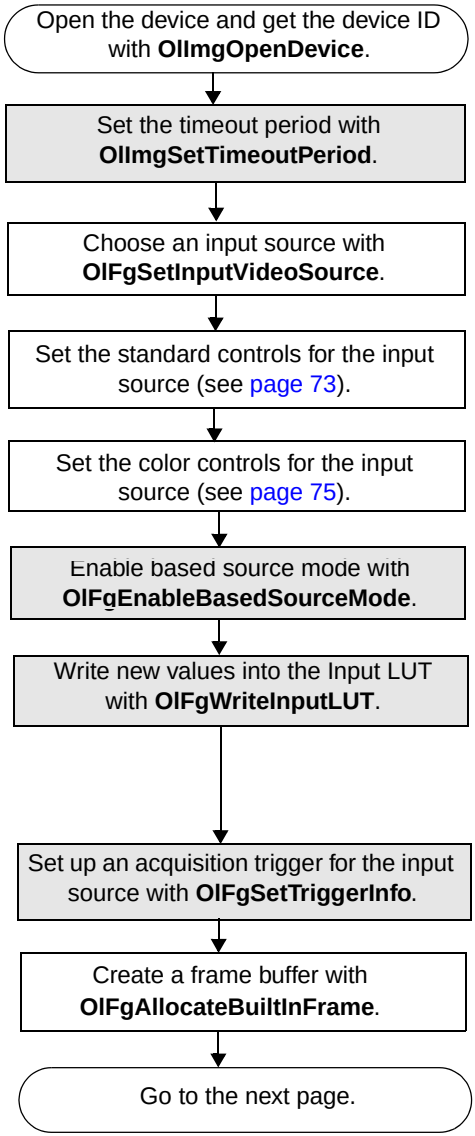
Programming Flowcharts

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.

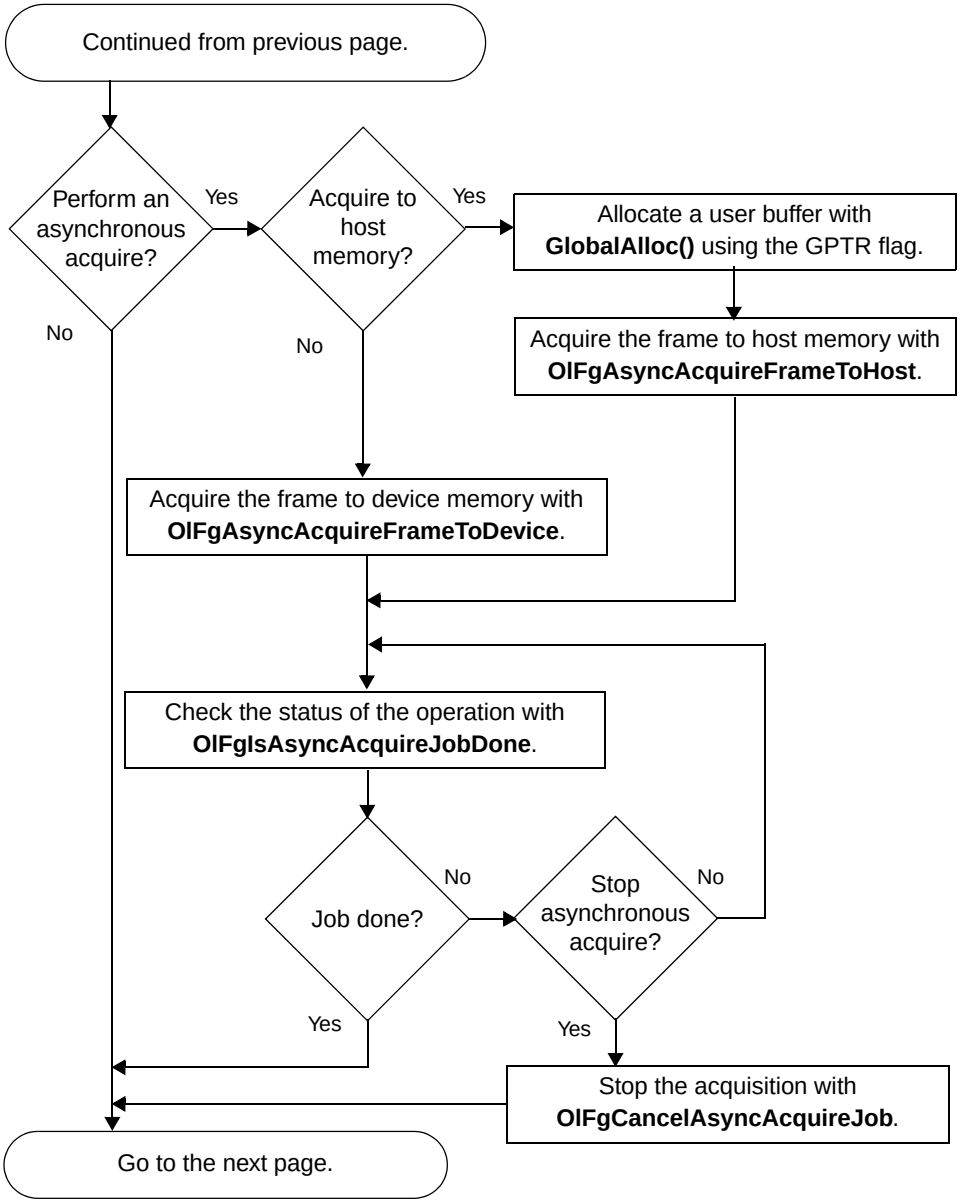
Note that many steps represent several substeps; if you are unfamiliar with the detailed operations involved with any one step, refer to the indicated page for detailed information. Optional steps appear in shaded boxes.

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

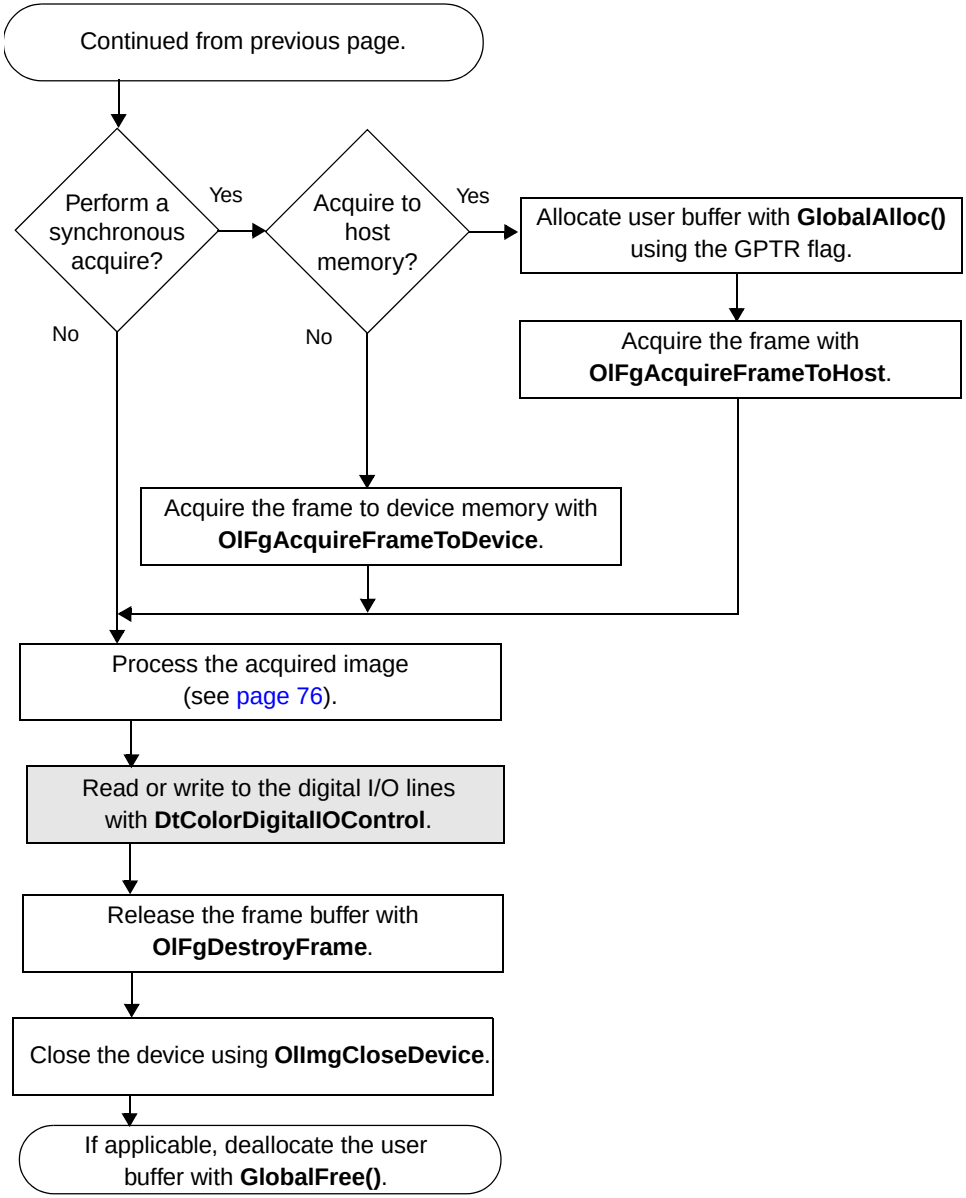
Single-Frame Acquisition



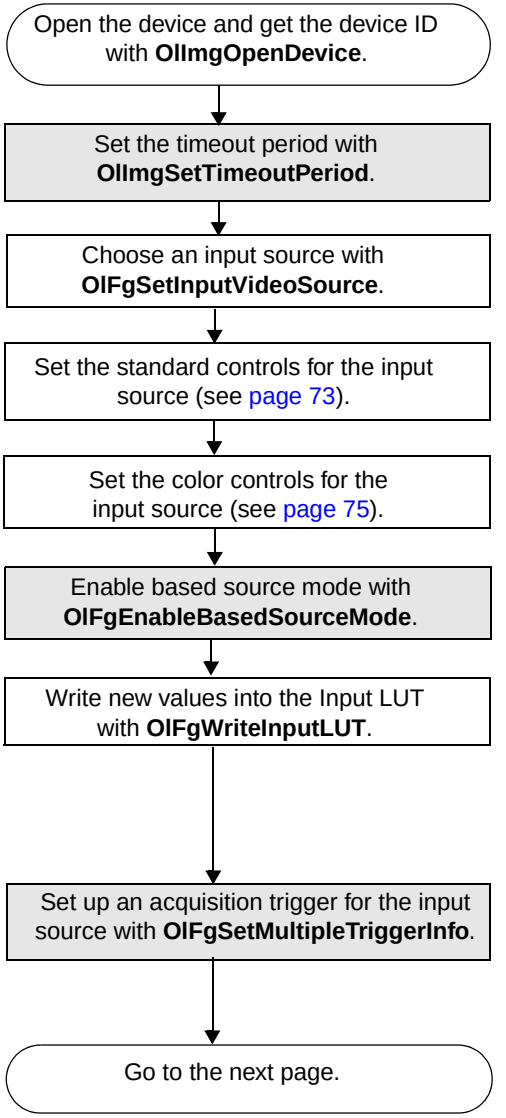
Single-Frame Acquisition (cont.)



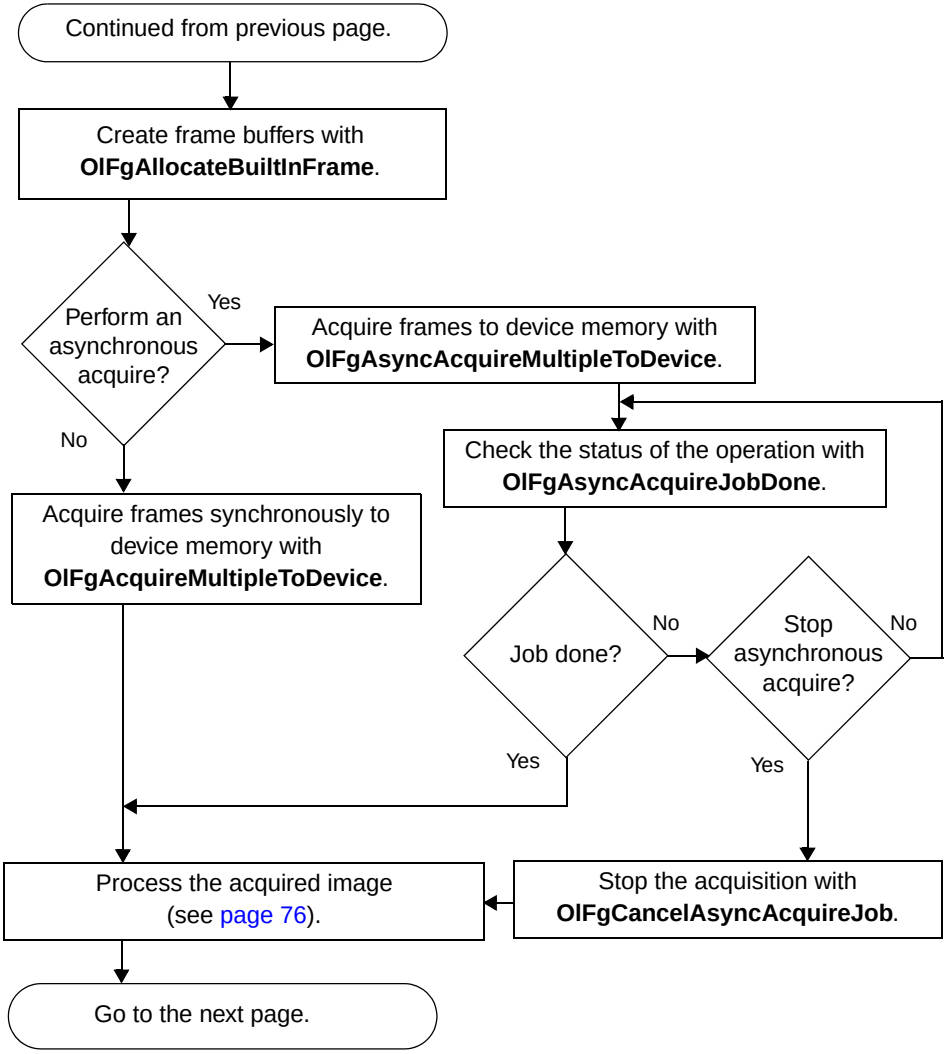
Single-Frame Acquisition (cont.)



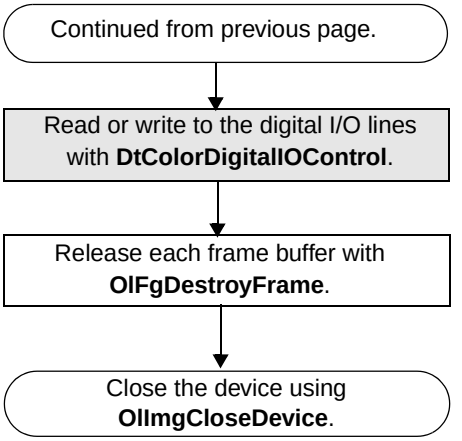
Multiple-Frame Acquisition



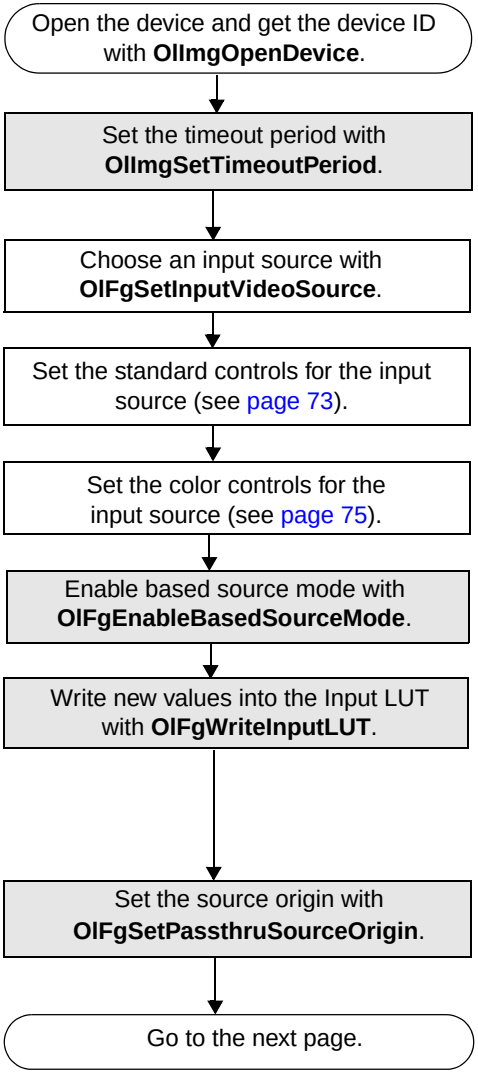
Multiple-Frame Acquisition (cont.)



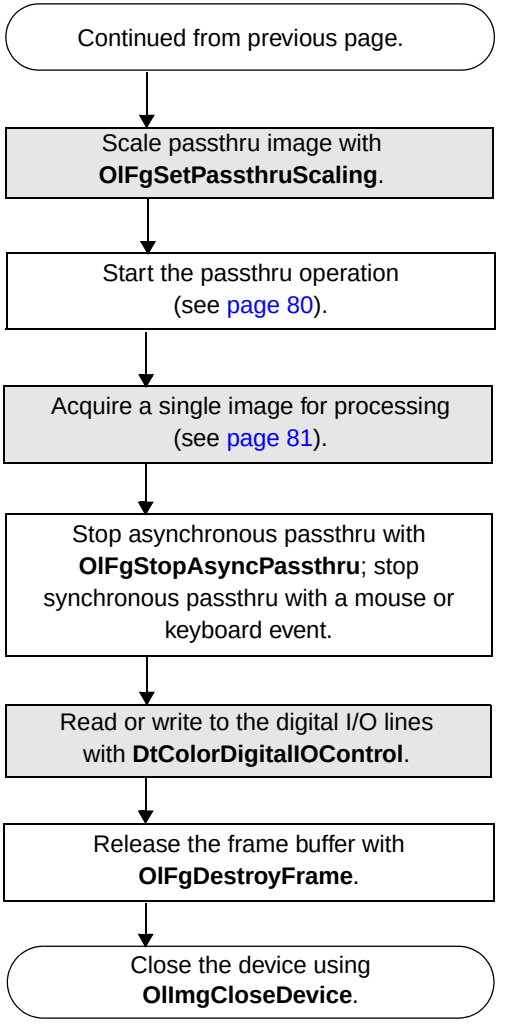
Multiple-Frame Acquisition (cont.)



Passthru without Overlays

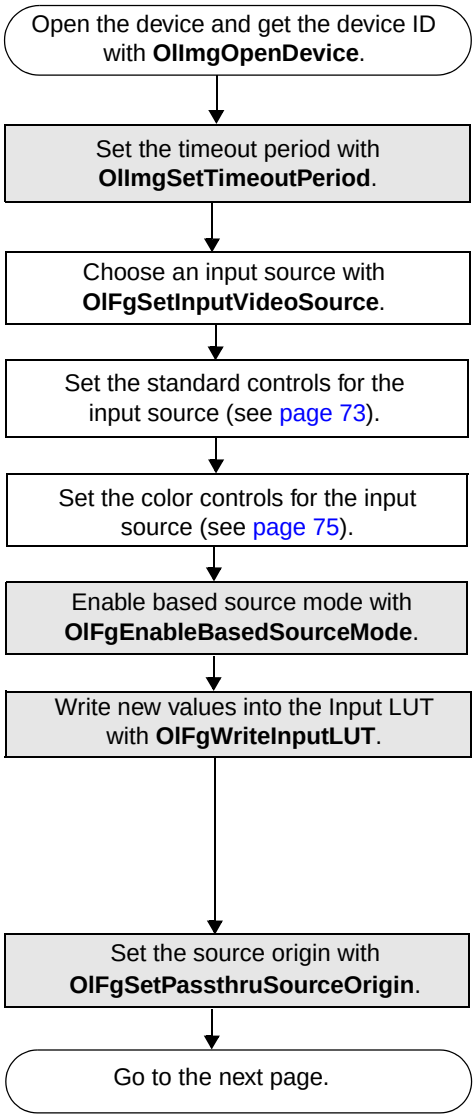


Passthru without Overlays (cont.)



The default height is 480 for 60 Hz and 576 for 50 Hz. The default width is 640 for 60 Hz, and 768 for 50 Hz.

Passthru with Overlays

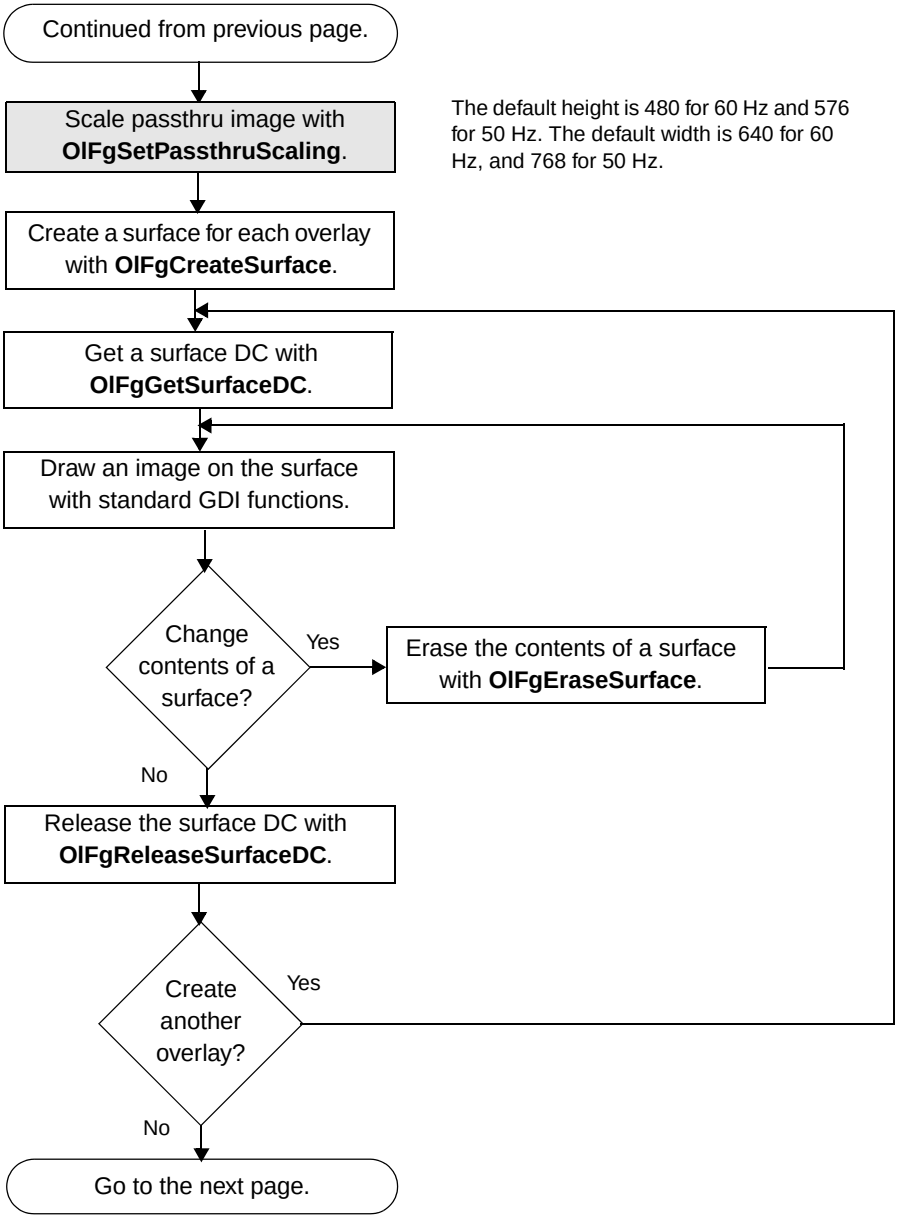


Select input channel 0 or 1. The default value is 0.

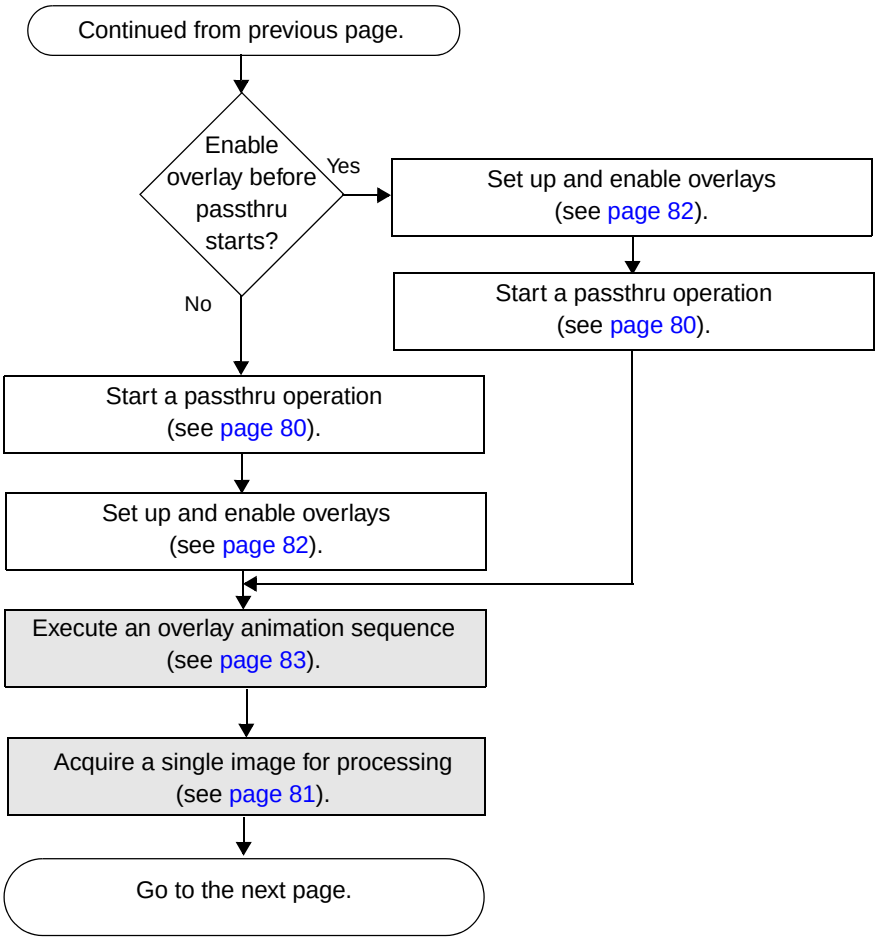
On the DT3154, this function changes the ILUT corresponding to a specific signal of the input channel. The default is identity (the pixel value is not modified). Use the defines in the file DtColorSDK.h, described in the *Frame Grabber SDK User's Manual* and online help file, to specify the ILUT to modify.

The default is 0 for both the x-axis and y-axis.

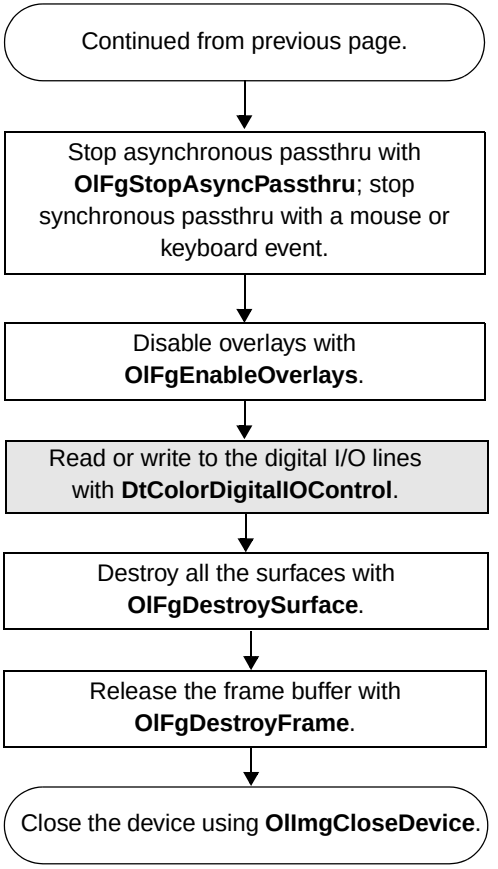
Passthru with Overlays (cont.)



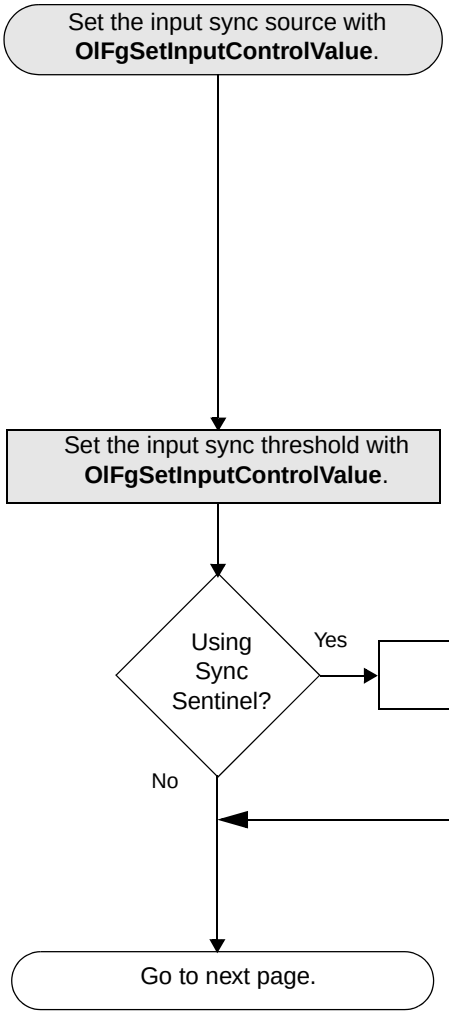
Passthru with Overlays (cont.)



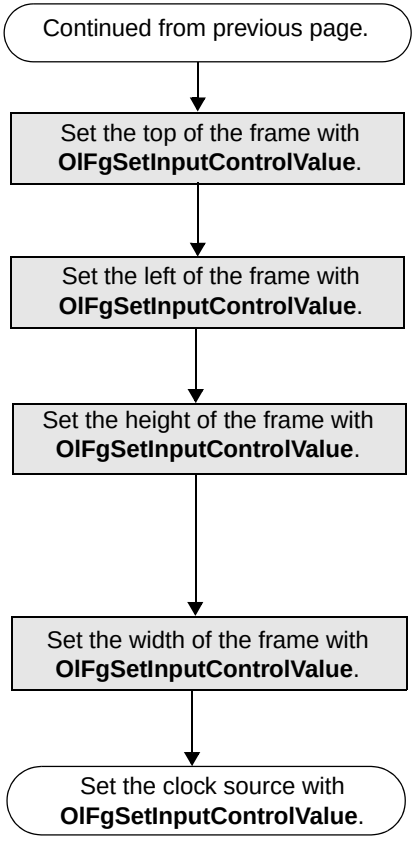
Passthru with Overlays (cont.)



Set the Standard Controls for the Input Channel



Set the Standard Controls for the Input Channel (cont).



Use the key OLC_FG_CTL_FRAME_TOP to set the first line of video, relative to the active video area, to digitize for the selected input channel. The default is 0.

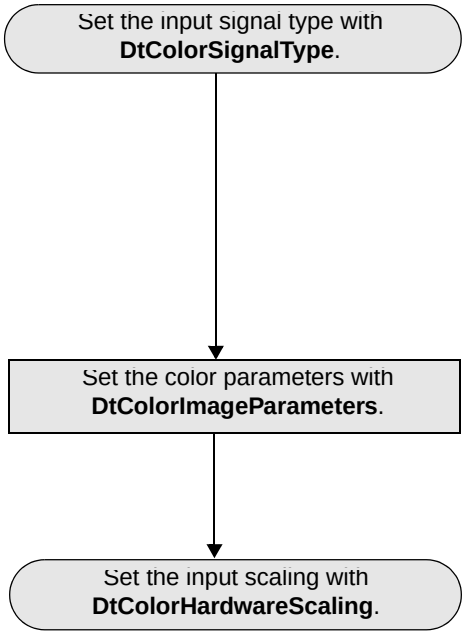
Use the key OLC_FG_CTL_FRAME_LEFT to set the first pixel of video, relative to the active video area, to digitize for the selected input channel. The default is 0.

Use the key OLC_FG_CTL_FRAME_HEIGHT to set the number of lines per field (or noninterlaced frame) of video to digitize for the selected input channel.The default is 576 for
50 Hz and 480 for 60 Hz.

Use the key OLC_FG_CTL_FRAME_WIDTH to set the number of pixels per line of video to digitize for the selected input channel. The default is 786 for 50 Hz and 640 for 60 Hz.

Use the key OLC_FG_CTL_CLOCK_SOURCE to set the pixel clock to internal.

Set the Color Controls for the Input Channel

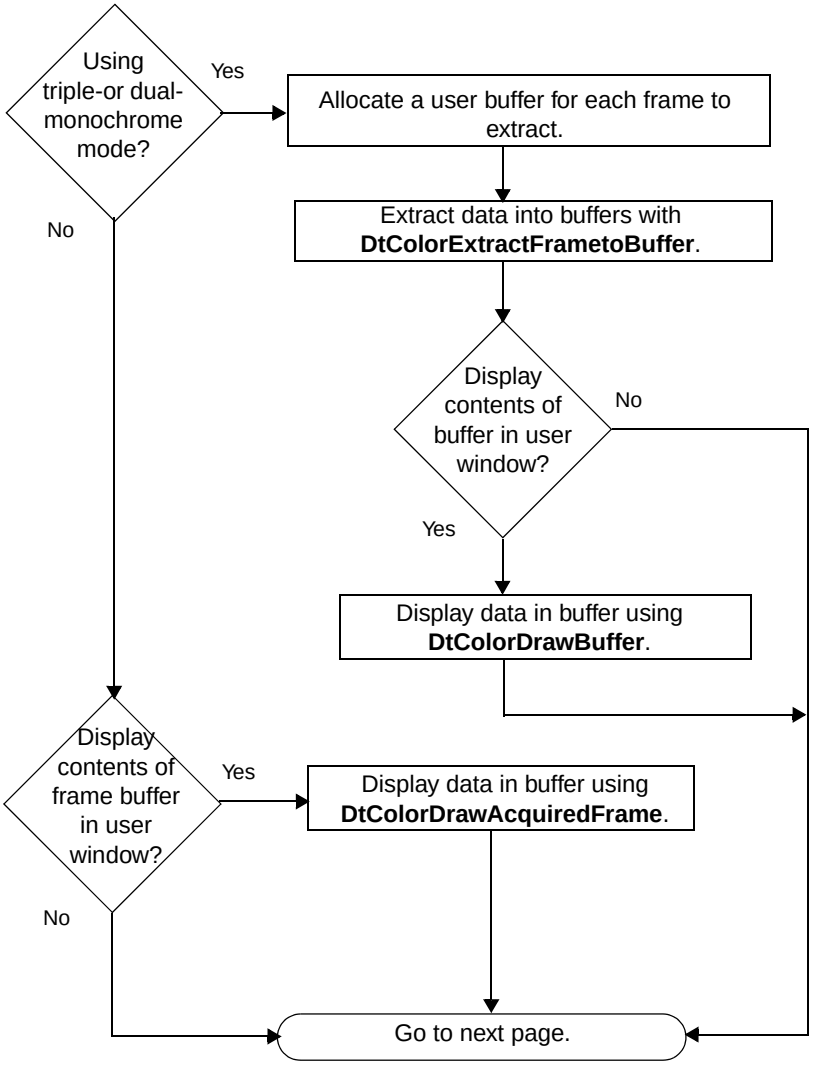


If acquiring color images, specify RGB for the input channel; if acquiring monochrome images from two channels simultaneously (progressive scan), specify dual-monochrome for the input channel; if acquiring monochrome images from three channels simultaneously, specify triple-monochrome for the input channel. The default is RGB.

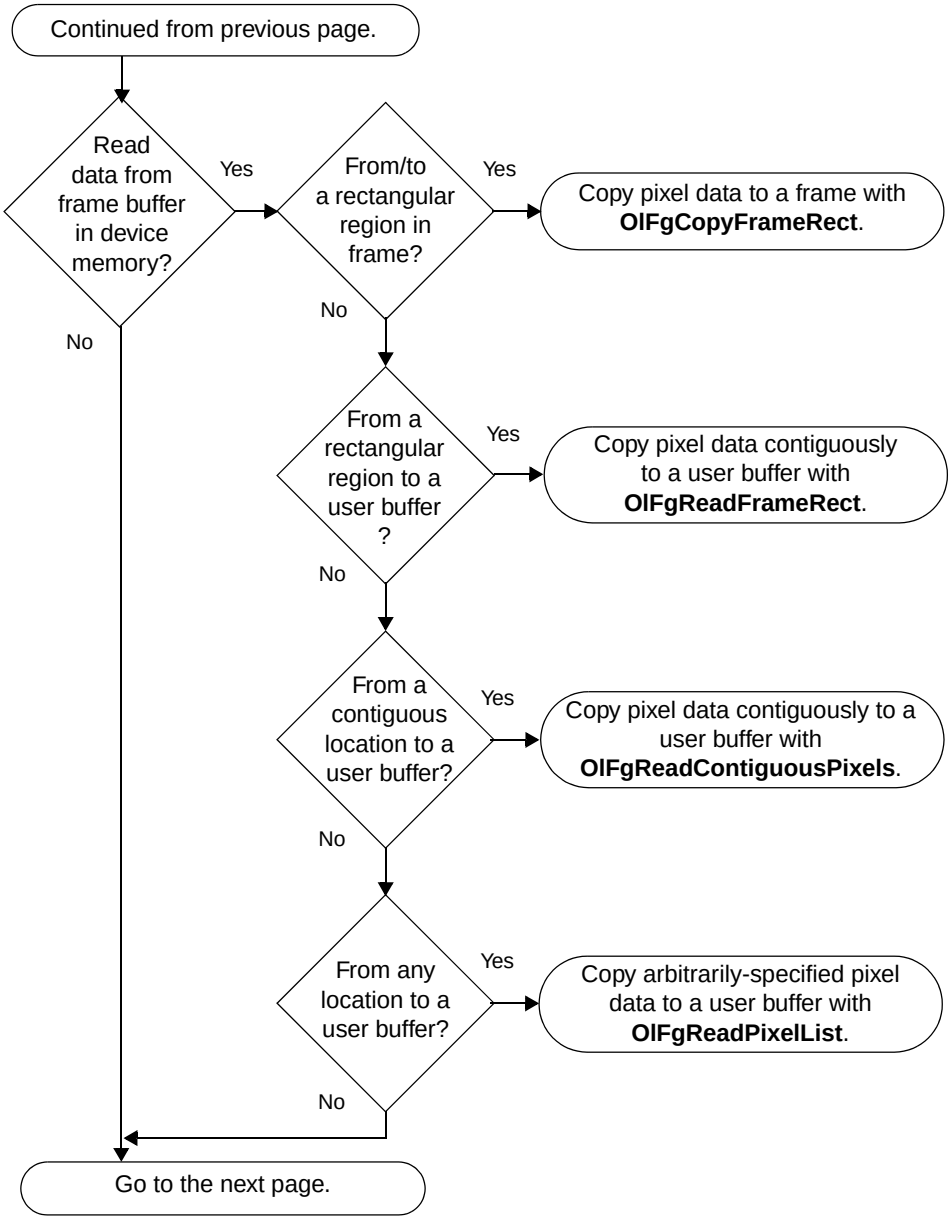
Set the offset (default = 53350 µV), and the reference (default = 707414 µV) for the red, green, and blue signals corresponding to the selected input channel.

Specify the scaling factors for the input channel as a percentage of the original size (default = 100).

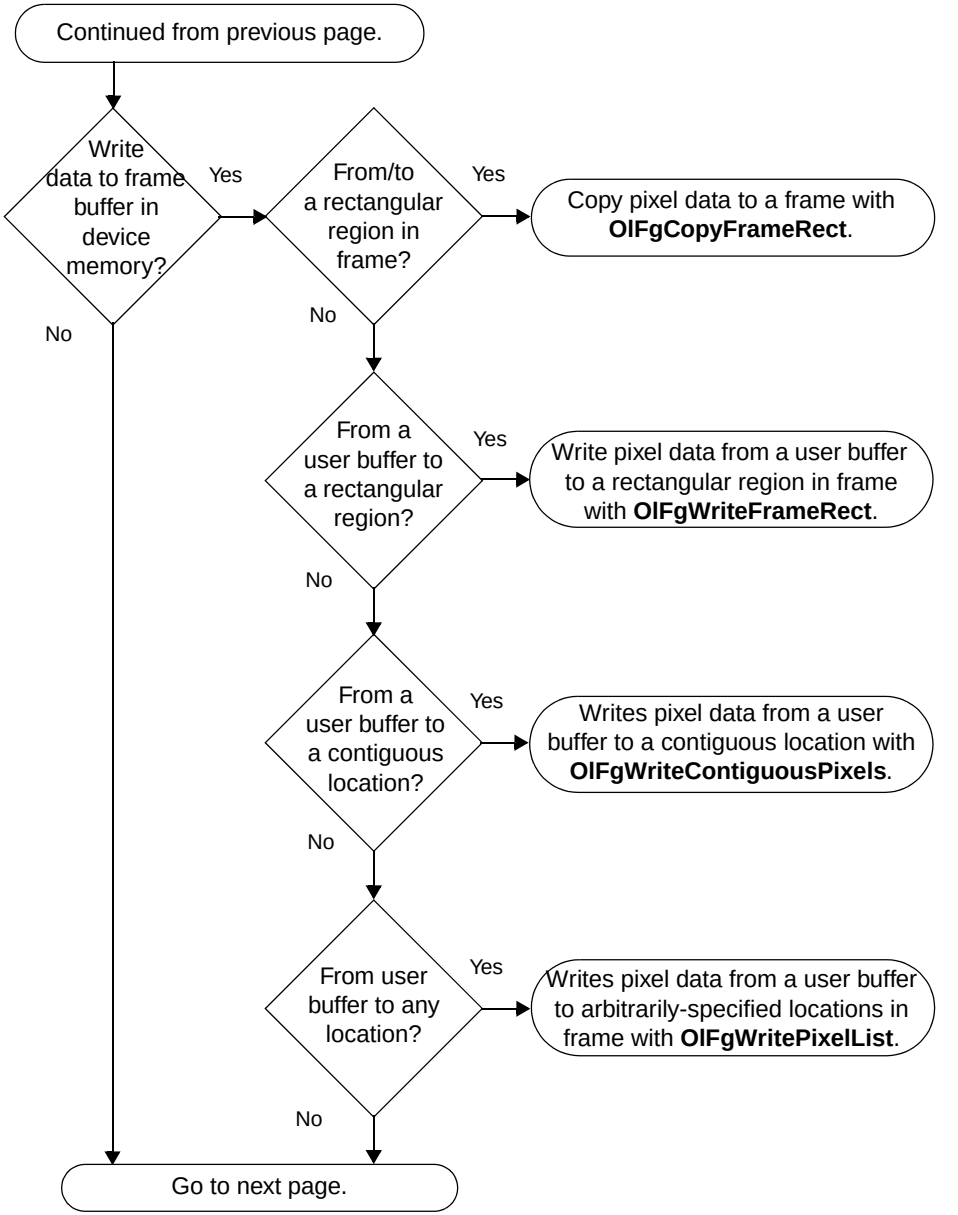
Process the Acquired Image



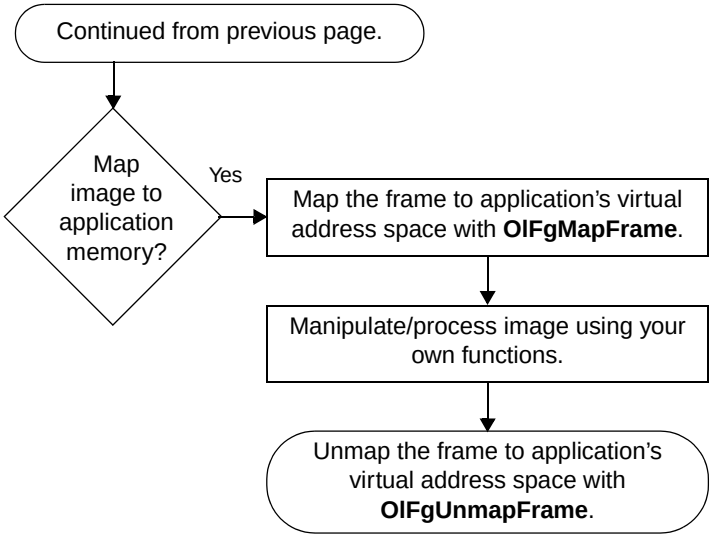
Process the Acquired Image (cont.)



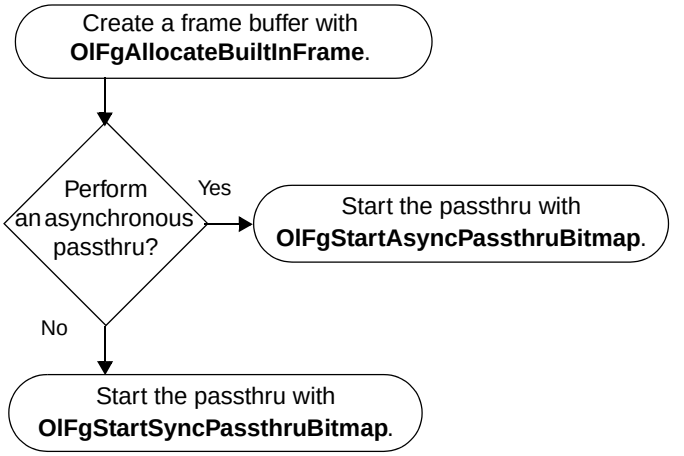
Process the Acquired Image (cont.)



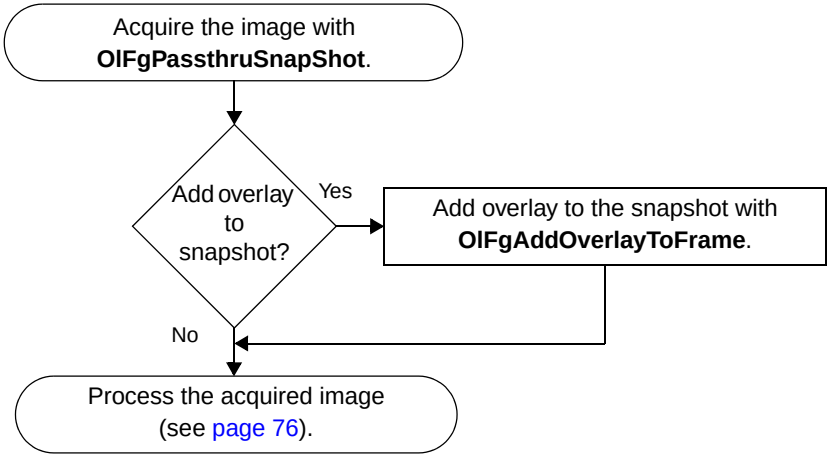
Process the Acquired Image (cont.)



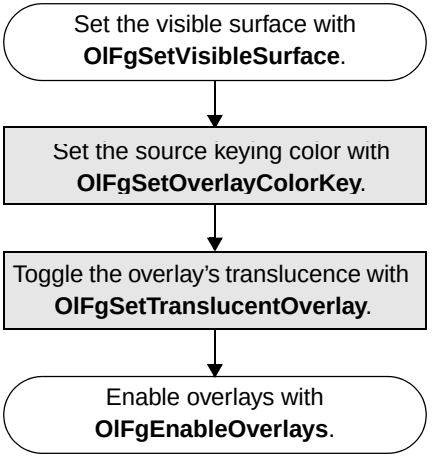
Start the Passthru Operation



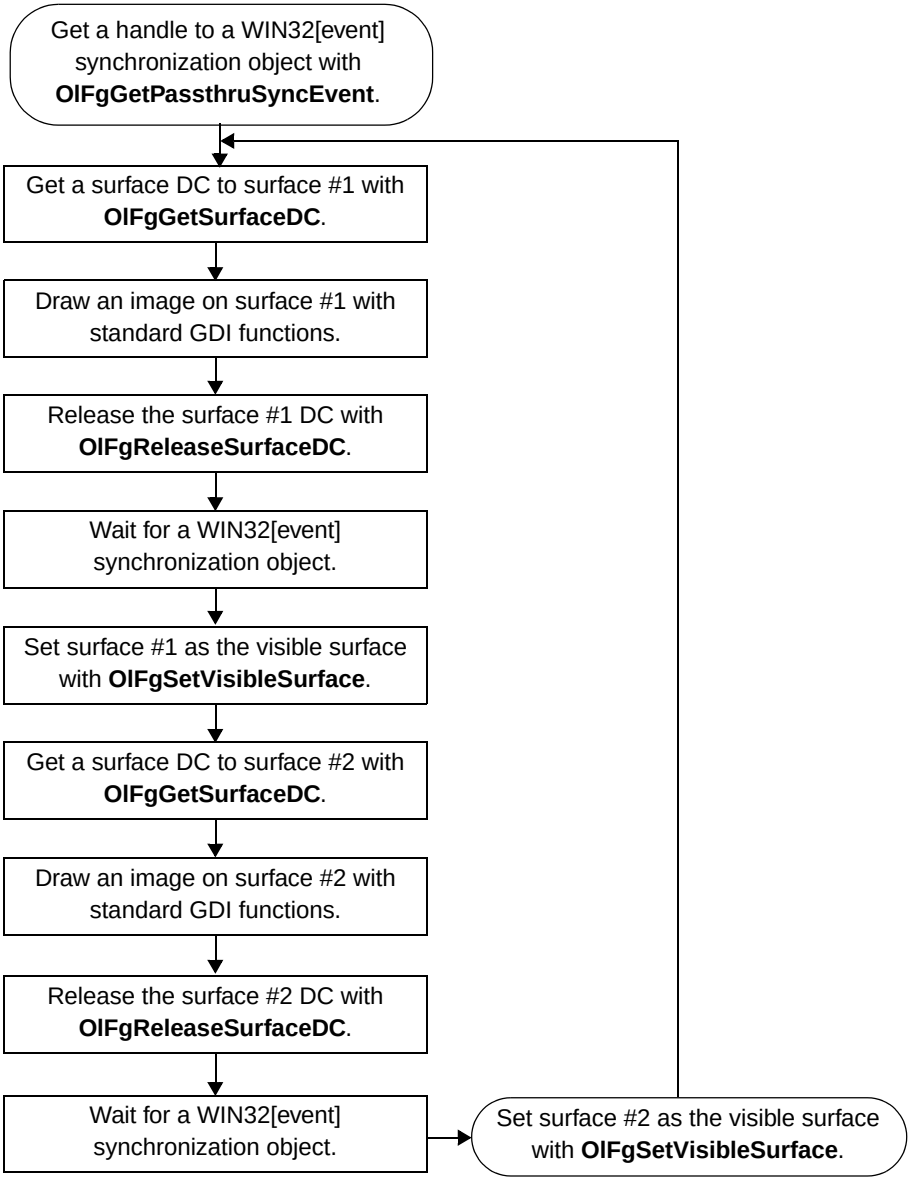
Take a Snapshot



Set up and Enable Overlays



Execute an Overlay Animation Sequence



Troubleshooting

General Checklist

Should you experience problems using the DT3154 board, please follow these steps:

1. Read all the documentation provided for your product. Make sure that you have added any "Read This First" information to your manual and that you have used this information.
2. Check the Imaging OMNI CD for any README files and ensure that you have used the latest installation and configuration information available.
3. Check that your system meets the requirements stated in the *DT3154 Getting Started Manual*.
4. Check that you have installed your hardware properly using the instructions in the *DT3154 Getting Started Manual*.
5. Check that you have installed and configured the device driver properly using the instructions in the *DT3154 Getting Started Manual*.
6. Search the DT Knowledgebase in the Support section of the Data Translation web site (at www.datatranslation.com) for an answer to your problem.

If you still experience problems, try using the information in Table 15 to isolate and solve the problem. If you cannot identify the problem, refer to page 90.

Table 15: 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 DT3154 board is located is a PCI slot and that the board is correctly seated in the slot; see the instructions in the *DT3154 Getting Started Manual.*
	The interrupt level is unacceptable.	An interrupt conflict exists in your system. The most common interrupt conflict occurs with a PCI device and a device that is plugged into the ISA bus. To resolve this problem, change the interrupt setting (usually by changing a jumper) on the ISA device. An interrupt conflict can also occur if a PCI device was not designed to share interrupts. To resolve this problem, 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, try removing the network device, installing the DT3154 board and rebooting the system, then reinserting the network device.
	The board is damaged.	Contact Data Translation for technical support; refer to page 90.

Table 15: 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 *DT3154 Getting Started Manual.*
	Electrical noise exists.	Check your connections; see the instructions in the *DT3154 Getting Started Manual.*
	The board is overheating.	Check environmental and ambient temperature; consult the board's specifications on page 97 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 *DT3154 Getting Started Manual.*
Computer does not boot.	Board is not seated properly.	Check that the slot in which your DT3154 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 *DT3154 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 97 of this manual.

Table 15: Troubleshooting Problems (cont.)

Symptom	Possible Cause	Possible Solution
System lockup.	Board is not seated properly.	Check that the slot in which your DT3154 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 *DT3154 Getting Started Manual.*
	Interrupt level is unacceptable.	An interrupt conflict exists in your system. The most common interrupt conflict occurs with a PCI device and a device that is plugged into the ISA bus. To resolve this problem, change the interrupt setting (usually by changing a jumper) on the ISA device. An interrupt conflict can also occur if a PCI device was not designed to share interrupts. To resolve this problem, 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, try removing the network device, installing the DT3154 board and rebooting the system, then reinserting the network device.

Service and Support

If you have difficulty using the DT3154 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 92 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 92, 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

The input impedance for the video input signal is 75 Ω

Table 16 lists the digital input specifications for the DT3154 board.

Table 16: Digital Input Specifications

Feature	Minimum Specification	Maximum Specification
High level input (V_{IH})	2.0 V	7.0 V
Low level input (V_{IL})	-0.3 V	0.8 V
Input capacitance	–	6 pF

Table 17 lists the digital output specifications for the DT3154 board.

Table 17: Digital Output Specifications

Feature	Minimum Specification	Maximum Specification
High level output current (IOH)	–	2.0 mA
Low level output current (IOL)	–	20 mA
High level output voltage (VOH)	2.4 V	–
Low level output voltage (VOL)	–	0.5 V

Table 18 lists the power, physical, and environmental specifications.

Table 18: Power, Physical, and Environmental Specifications

Feature	Specification
Power consumption	5 V @ 2 A ±12 V@ 100 mA
Operating temperature	0 to 50° C (32 to 122° F)
Storage temperature	–25 to 70° C (–13 to 158° F)
Humidity	0 to 90%, noncondensing
Dimensions	6.875 inches (length) x 4.2 inches (height)
Weight	5.3 ounces (150 grams)

B

Connector Pin Assignments

Connector J1 is a 15-pin, male, D-shell connector that accepts the video input signals via the EP306 cable or a user-designed cable. Figure 8 illustrates the pin locations for connector J1.

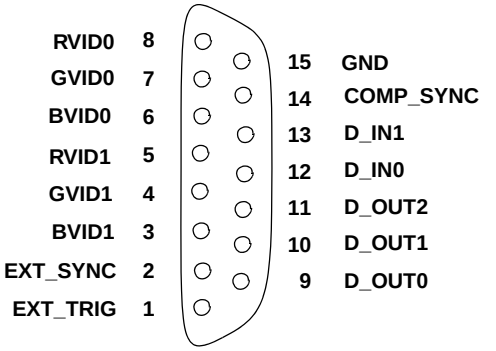


Figure 8: Video Input Connector - J1

Table 19 lists the pins of connector J1 by signal name, and by the corresponding EP306 BNC connector assignments.

Table 19: J1 Pin Assignments

J1 Pin	EP306 BNC Connector	Signal Name
1	7	EXT_TRG
2	6	EXT_SYNC
3	5	BVID1
4	4	GVID1
5	3	RVID1
6	2	BVID0
7	1	GVID0
8	0	RVID0
9	8	D_OUT0
10	9	D_OUT1
11	10	D_OUT2
12	11	D_IN0
13	12	D_IN1
14	13	COMP_SYNC
15	14	GND

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 107); and
- Uninstalling the device driver, if necessary (on page 109).

Adding a Board to the Device Driver Configuration

To add a new board to the DT3154 Device Driver configuration after system startup, perform the following steps:

1. If you have not already done so, install the additional board in your computer following the instructions in the *DT3154 Getting Started Manual*, then power up your computer and any attached peripherals.

   Note: On power-up, the PCI bus takes one available interrupt from system resources for the DT3154 board. If any devices are using this interrupt, problems may arise. Verify that no other devices in your system are using the same interrupt that the DT3154 board is using and ensure that PCI interrupts are enabled in your system BIOS.

2. Start Windows 98 or Windows Me.
   The Found New Hardware dialog box appears.
3. Click **Next**.
4. For Windows Me, click **Specify the location of the device (Advanced)**, then click **Next**.

5. Click **Search for the best driver for your device (Recommended)**, then click **Next.**
6. Click **Specify a location** and uncheck all other options.
7. Insert the Imaging OMNI CD into the CD-ROM drive.
8. Click **Browse**, browse to **x:\DRIVERS\DT3154\WIN98** (where *x* is the letter of your CD-ROM drive), and click **Open**.
9. Click **OK**.
10. Click **Next.**
11. Click **Next.**
    The files are copied.
12. Click **Finish**.
13. Remove the Imaging OMNI CD from the CD-ROM, then click **Yes** to restart the system.
    When the system restarts, the driver configuration dialog box appears.
14. Click **OK**, then click **OK**.
15. Click **Add New** to add a DT3154 board to the configuration.
    The DT3154 Installation dialog box appears for the new board.
16. Enter a board name (alias), which can be any name you choose, then click **Add**. (The board name is used by supported software, such as DT-Acquire and the Frame Grabber SDK.) Only one name (alias) per installed DT3154 board is allowed.
    The DT3154 Configuration dialog box appears.
17. For **Enable Board**, ensure that a checkmark is next to Enable Board to activate the board. If you want to retain the settings but disable the board, remove the checkmark next to Enable Board.
18. For **Video Format**, indicate the video format that you want for the default setting by clicking 50 Hz or 60 Hz.

19. For **Desired Memory Size**, select the amount of contiguous memory (in MB) that you want to allocate in your system to hold the acquired frames. A 60 Hz, 640-by-480 image requires 1.2 MB per frame; a 50 Hz, 768-by-576 image requires 1.7 MB per frame. The actual amount of memory that the device driver can allocate depends on your system resources. It is recommended that you select only as much memory as you need to leave memory for other devices. Once you enter the desired memory size, the device driver allocates as much memory as possible to match the value you entered; the actual memory size allocated is shown in the **Actual Memory Size** text box when you restart your system.

20. For **Signal Type**, click RGB for one RGB input, Triple MONO for three monochrome inputs, or Dual MONO for two monochrome inputs.

21. Click **Done**.
    The DT3154 Device Driver Configuration dialog box is redisplayed; you can see the name of the board you just added.

22. Click **Close** to end the DT3154 configuration.

23. If you made any changes to the default settings, click **OK** to confirm that you need to restart Windows before the changes will take effect.

24. Click **OK** to restart Windows.
    For proper operation, it is very important that you restart Windows when prompted.

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. For Windows 98, double-click **Multimedia**.
   The Multimedia Properties dialog appears.

   For Windows Me, double-click **Sounds and Multimedia**.
   The Sounds and Multimedia Properties dialog appears.
3. Click the **Devices** tab, then double-click **Media Control Devices**.
4. Double-click **DT3154 Mach Series Frame Grabber**.
   The DT3154 Device Driver Properties dialog box appears.
5. Click **Use this Media Control device**, then click **Settings**.
   The DT3154 Device Driver Configuration dialog box appears.
6. Select the name of the DT3154 board that you want to modify.
7. Click **Modify** to modify the board.
   The DT3154 Configuration dialog box appears.
8. For **Enable Board**, ensure that a checkmark is next to Enable Board to activate the board. If you want to retain the settings but disable the board, remove the checkmark next to Enable Board.
9. For **Video Format**, indicate the video format that you want for the default setting by clicking 50 Hz or 60 Hz.

10. For **Desired Memory Size**, select the amount of contiguous memory (in MB) that you want to allocate in your system to hold the acquired frames. A 60 Hz, 640-by-480 image requires 1.2 MB per frame; a 50 Hz, 768-by-576 image requires 1.7 MB per frame. The actual amount of memory that the device driver can allocate depends on your system resources. It is recommended that you select only as much memory as you need to leave memory for other devices. Once you enter the desired memory size, the device driver allocates as much memory as possible to match the value you entered; the actual memory size allocated is shown in the **Actual Memory Size** text box when you restart your system.
11. For **Signal Type**, click RGB for one RGB input, Triple MONO for three monochrome inputs, or Dual MONO for two monochrome inputs.
12. Click **Done**, then click **Close** to end the DT3154 configuration.
13. If you made any changes to the default settings, click **OK** to confirm that you need to restart Windows before the changes take effect.
14. Click **OK** to close the **DT3154 MACH Series Frame Grabber Properties** dialog box, then click **OK** to close the **Multimedia Properties** or **Sounds and Multimedia Properties** dialog box.
15. Close the Control Panel.
16. Restart Windows for your changes to take effect.
    For proper operation, it is very important that you restart Windows.

Uninstalling the Device Driver

Generally, you will always require the DT3154 Device Driver. However, if you are no longer using the DT3154 board with the supported software, you can uninstall the DT3154 Device Driver from the system.

To uninstall the device driver, perform the following steps:

1. Click **Start/Programs/Data Translation, Inc/MACHUnLd**.
2. Click **DT3154**.
3. Click **OK**.
   The DT3154 device driver is uninstalled.
4. Click **Cancel** to exit from the MACHUnLd utility.

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 112);
- Removing a board from the device driver configuration (on page 114); and
- Uninstalling the device driver, if necessary (on page 115).

Adding a Board to the Device Driver Configuration

To add a board to the DT3154 Device Driver configuration, perform the following steps:

1. If you have not already done so, install the additional board in your computer following the instructions in the *DT3154 Getting Started Manual*, then power up your computer and any attached peripherals.

   Note: On power-up, the PCI bus takes one available interrupt from system resources for the DT3154 board. If any devices are using this interrupt, problems may arise. Verify that no other devices in your system are using the same interrupt that the DT3154 board is using and ensure that PCI interrupts are enabled in your system BIOS.

   ---

2. Start Windows 2000.
   The Found New Hardware dialog box appears.
3. Click **Next**.
4. Click **Search for a suitable driver for my device (recommended)**, then click **Next.**

5. Uncheck all checkboxes, then click **Next**.
6. Click **Disable the device**, then click **Finish**.
7. Open the **Control Panel**.
8. Double-click **Sounds and Multimedia**.
9. Click the **Hardware** tab.
10. Click **DT3154 MACH Series Frame Grabber**, then click **Properties**.
11. Click the **Properties** tab.
12. Double-click **Multimedia Drivers**.
13. Click **DT3154 MACH Series Frame Grabber**, then click **Properties**.
14. Click **Settings**.
15. Click **Add New**.
16. Enter a name for the device, then click **Add**.
17. Select **Enable Board** to activate the board. If you want to retain the settings but disable the board (and therefore not use the memory), remove the checkmark next to Enable Board.
18. For **Video Format**, indicate the video format of your video input source: 50 or 60 Hz.
19. For **Desired Memory Size**, select the amount of contiguous memory (in MB) that you want to allocate in your system to hold the acquired frames. A 60 Hz, 640-by-480 image requires 1.2 MB per frame; a 50 Hz, 768-by-576 image requires 1.7 MB per frame. The actual amount of memory that the device driver can allocate depends on your system resources. It is recommended that you select only as much memory as you need to leave memory for other devices. Once you enter the desired memory size, the device driver allocates as much memory as possible to match the value you entered; the actual memory size allocated is shown in the **Actual Memory Size** text box when you restart your system.

20. For **Signal Type**, click RGB for one RGB input, Triple MONO for three monochrome inputs, or Dual MONO for two monochrome inputs.
21. Click **Done**.
    The DT3154 Device Driver Configuration dialog box is redisplayed with the name of the board you just added.
22. Click **Close** to finish.
    A dialog box appears, indicating that you must restart Windows 2000 for the changes to take effect.
23. Click **Restart Now** to restart your system.

Modifying a Board in the Device Driver Configuration

To modify the board settings in the DT3154 Device Driver configuration, perform the following steps:

1. Open the **Control Panel**.
2. Double-click **Sounds and Multimedia**.
3. Click the **Hardware** tab.
4. Click **DT3154 MACH Series Frame Grabber**, then click **Properties**.
5. Click the **Properties** tab.
6. Double-click **Multimedia Drivers**.
7. Click **DT3154 MACH Series Frame Grabber**, then click **Properties**.
8. Click **Settings**.
9. Select the name of the board that you want to modify, then click **Modify**.
   Another DT3154 Device Driver Configuration dialog box appears.

10. Select **Enable Board** to activate the board. If you want to retain the settings but disable the board (and therefore not use the memory), remove the checkmark next to Enable Board.

11. For **Video Format**, indicate the video format of your video input source: 50 or 60 Hz.

12. For **Desired Memory Size**, select the amount of contiguous memory (in MB) that you want to allocate in your system to hold the acquired frames. A 60 Hz, 640-by-480 image requires 1.2 MB per frame; a 50 Hz, 768-by-576 image requires 1.7 MB per frame. The actual amount of memory that the device driver can allocate depends on your system resources. It is recommended that you select only as much memory as you need to leave memory for other devices. Once you enter the desired memory size, the device driver allocates as much memory as possible to match the value you entered; the actual memory size allocated is shown in the **Actual Memory Size** text box when you restart your system.

13. For **Signal Type**, click RGB for one RGB input, Triple MONO for three monochrome inputs, or Dual MONO for two monochrome inputs.

14. Click **Done**.
    The DT3154 Device Driver Configuration dialog box reappears with the name of the board you just modified.

15. Click **Close**.

16. Restart your system to cause the new configuration to take effect.

Removing a Board from the Device Driver Configuration

To remove a board from the DT3154 Device Driver configuration, perform the following steps:

1. Open the **Control Panel**.
2. Double-click **Sounds and Multimedia**.
3. Click the **Hardware** tab.
4. Click **DT3154 MACH Series Frame Grabber**, then click **Properties**.
5. Click the **Properties** tab.
6. Double-click **Multimedia Drivers**.
7. Click **DT3154 MACH Series Frame Grabber**, then click **Properties**.
8. Click **Settings**.
9. Select the name of the board that you want to remove, then click **Remove**.
10. Repeat step 9 until all the DT3154 boards you want to remove are removed.
11. Click **Close**.
    The Drivers dialog box appears. The DT3154 Device Driver is still installed in the system, but the board has been removed.
12. Click **OK**.
13. If you want to uninstall the driver at this point, continue with step 5 on page 115. Otherwise, continue with the next step.
14. Click **OK**, then click **OK** to finish.
15. Restart the system for the changes to take effect.

Uninstalling the Device Driver

Note: Ensure that you remove all the DT3154 boards in your system using the preceding section before uninstalling the device driver.

Generally, you will always require the DT3154 Device Driver. However, if you are no longer using the DT3154 board with the supported software, you can uninstall the DT3154 Device Driver from the system by performing the following steps:

1. Open the **Control Panel**.
2. Double-click **Sounds and Multimedia**.
3. Click the **Hardware** tab.
4. Click **DT3154 MACH Series Frame Grabber**, then click **Properties**.
5. Click the **Driver** tab, then click **Uninstall**.
6. Click **OK**.
7. Click **OK**.
8. Restart your system to cause the new configuration to take effect.

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 118);
- Removing a board from the device driver configuration (on page 120); and
- Uninstalling the device driver, if necessary (on page 121).

Adding a Board to the Device Driver Configuration

To add a board to the DT3154 Device Driver configuration, perform the following steps:

1. If you have not already done so, install the additional board in your computer following the instructions in the *DT3154 Getting Started Manual*, then power up your computer and any attached peripherals.

   Note: On power-up, the PCI bus takes one available interrupt from system resources for the DT3154 board. If any devices are using this interrupt, problems may arise. Verify that no other devices in your system are using the same interrupt that the DT3154 board is using and ensure that PCI interrupts are enabled in your system BIOS.

   ---

2. Start Windows XP.
   The Found New Hardware dialog box appears.
3. Click **Next**.
4. Click **Install from a list or specific location (advanced)**, then click **Next.**

5. Uncheck all checkboxes, then click **Next**.
6. Click **Finish**.
   The Technial Support page appears.
7. Click **Cancel**.
8. Open the Control Panel.
9. Double-click **Sounds and Audio Devices**.
10. Click Hardware.
11. Double-click **DT-Open Layers DT3154 MACH Series Frame Grabber**.
12. Click **Properties**.
13. Double-click **Multimedia Drivers**.
14. Click **DT3154 MACH Series Frame Grabber**, then click **Properties**.
15. Click **Settings**.
16. Click **Add New** to add a DT3154 board to the configuration.
    The DT3154 Installation dialog box appears for the new board.
17. Enter any unique name (or alias) for the DT3154 board, then click **Add**. Only one alias per installed board is allowed.
    The DT3154 Configuration dialog box appears.
18. Select **Enable Board** to activate the board. If you want to retain the settings but disable the board (and therefore not use the memory), remove the checkmark next to Enable Board.
19. Select the **Video Format** as either 50 Hz or 60 Hz.

20. For **Desired Memory Size**, select the amount of contiguous memory (in MB) that you want to allocate in your system to hold the acquired frames. A 60 Hz, 640-by-480 image requires 1.2 MB per frame; a 50 Hz, 768-by-576 image requires 1.7 MB per frame. The actual amount of memory that the device driver can allocate depends on your system resources. It is recommended that you select only as much memory as you need to leave memory for other devices. Once you enter the desired memory size, the device driver allocates as much memory as possible to match the value you entered; the actual memory size allocated is shown in the **Actual Memory Size** text box when you restart your system.
21. For **Signal Type**, click RGB for one RGB input, Triple MONO for three monochrome inputs, or Dual MONO for two monochrome inputs.
22. Click **Done**.
    The DT3154 Configuration dialog box is redisplayed; you can see the name of the board you just added.
23. Click **Close** to finish.
    A dialog box appears, indicating that you must restart Windows XP for the changes to take effect.
24. Remove the Imaging OMNI CD from the CD-ROM, then click **Restart Now** to restart the system.

Modifying a Board in the Device Driver Configuration

To modify the board settings in the DT3154 Device Driver configuration, perform the following steps:

1. Open the **Control Panel**.
2. Double-click **Sounds and Audio Devices**.
3. Click **Hardware**.
4. Double-click **DT-Open Layers DT3154 MACH Series Frame Grabber**.

5. Click **Properties**.
6. Click the **Properties** tab.
7. Double-click **Multimedia Drivers**.
8. Click **DT3154 MACH Series Frame Grabber**, then click **Properties**.
9. Click **Settings**.
10. Select the name of the board that you want to modify, then click **Modify**.
    Another DT3154 Device Driver Configuration dialog box appears.
11. Select **Enable Board** to activate the board. If you want to retain the settings but disable the board (and therefore not use the memory), remove the checkmark next to Enable Board.
12. For **Video Format**, indicate the video format of your video input source: 50 or 60 Hz.
13. For **Desired Memory Size**, select the amount of contiguous memory (in MB) that you want to allocate in your system to hold the acquired frames. A 60 Hz, 640-by-480 image requires 1.2 MB per frame; a 50 Hz, 768-by-576 image requires 1.7 MB per frame. The actual amount of memory that the device driver can allocate depends on your system resources. It is recommended that you select only as much memory as you need to leave memory for other devices. Once you enter the desired memory size, the device driver allocates as much memory as possible to match the value you entered; the actual memory size allocated is shown in the **Actual Memory Size** text box when you restart your system.
14. For **Signal Type**, click RGB for one RGB input, Triple MONO for three monochrome inputs, or Dual MONO for two monochrome inputs.
15. Click **Done**.
    The DT3154 Device Driver Configuration dialog box reappears with the name of the board you just modified.
16. Click **Close**.

17. Restart your system to cause the new configuration to take effect.

Removing a Board from the Device Driver Configuration

To remove a board from the DT3154 Device Driver configuration, perform the following steps:

1. Open the **Control Panel**.
2. Double-click **Sounds and Audio Devices**.
3. Click **Hardware**.
4. Double-click **DT-Open Layers DT3154 MACH Series Frame Grabber**.
5. Click **Properties**.
6. Click the **Properties** tab.
7. Double-click **Multimedia Drivers**.
8. Click **DT3154 MACH Series Frame Grabber**, then click **Properties**.
9. Click **Settings**.
10. Select the name of the board that you want to remove, then click **Remove**.
11. Repeat step 10 until all the DT3154 boards you want to remove are removed.
12. Click **Close**.
    The Drivers dialog box appears. The DT3154 Device Driver is still installed in the system, but the board has been removed.
13. If you want to uninstall the driver at this point, continue with step 5 on page 121. Otherwise, continue with the next step.
14. Click **OK**, then click **OK** to finish.
15. Restart the system for the changes to take effect.

Uninstalling the Device Driver

Note: Ensure that you remove all the DT3154 boards in your system using the preceding section before uninstalling the device driver.

Generally, you will always require the DT3154 Device Driver. However, if you are no longer using the DT3154 board with the supported software, you can uninstall the DT3154 Device Driver from the system by performing the following steps:

1. Open the **Control Panel**.
2. Double-click **Sounds and Audio Devices**.
3. Click the **Hardware** tab.
4. Double-click **DT-Open Layers DT3154 MACH Series Frame Grabber**.
5. Click the **Driver** tab, then click **Uninstall**.
6. Click **OK**.
7. Click **OK**.
8. Restart your system to cause the new configuration to take effect.

Index

A

B

C

D

E

F

G

H

I

L

M

N

O

P

R

S

T

U

V

W

Warranty and Service Policy

WARRANTY

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RETURN OUTSIDE USA

Contact the local sales representative or factory for authorization and shipping instructions.

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The warranty set forth above does not extend to and shall not apply to

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2. Products which have been subject to misuse, neglect, accident, or improper installation.

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Upon determining that repair services are required, or to return a product to Data Translation, contact the Data Translation Customer Service Department at (508) 481-3700, extension 394 to obtain a Return Material Authorization (RMA) number. Have the following information ready when you call: complete product model number, product serial number, name, address, and telephone number of person returning product; and any special repair instructions.

Carefully package the product in anti-static packaging, making sure the RMA number appears on the outside of the package. Ship prepaid to:

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

On completion of required service, an invoice is issued stating charges, when applicable, and the work that has been completed.

Data Translation Support Policy

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