DATA TRANSLATION

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DT3157
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.

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About this Manual

This manual describes the features of the DT3157 frame grabber board and how to use the DT3157 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 DT3157 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 DT3157 board and the DT3157 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 DT3157 Device Driver and the initialized control values.

- Chapter 4, "Troubleshooting," describes the processes you must follow to program the DT3157 board using the DT-Open Layers™ Frame Grabber SDK and DT3157 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 DT3157 board:

- *DT3157 Getting Started Manual* (UM-18308), included on the Imaging OMNI CD™ provided with the DT3157 board, describes how to set up, install, and wire signals to the DT3157 board, how to install the DT3157 software and DT3157 Device Driver, and how to verify the operation of the board.
- *Frame Grabber SDK User's Manual* (UM-13442) and online help, included on the Imaging OMNI CD provided with the DT3157 board, describe 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 DT3157 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 2
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Features

The DT3157 frame grabber accepts video from digital input sources, and uses the host system's system memory to store images and the host system's display controller to display images. It is suitable for both image analysis and machine vision applications.

Key features of the DT3157 board are summarized as follows:

- Operates as a PCI bus master;
- Accepts 8-, 10-, 12-, 14-, or 16-bit monochrome video from a single RS-422 video channel (programmable to 2 KB x 2 KB, 4 KB x 1 KB, or 1 KB x 4 KB), or 8-bit monochrome from two RS-422 video channels (programmable to 1 KB x 1 KB);
- Supports Kodak dual 8-bit video format (such as the Model ES1.0);
- Supports up to 20 MHz on a single channel (8 to 16 bits), and 40 MHz for dual channels;
- Provides real-time image transfer to host memory or to the display frame buffer;
- Provides real-time scaling via decimation up to 1/16 size (except in dual-channel mode);
- Accepts an external trigger;
- Provides an input look-up-table that supports single- and dual-channel mode;
- Provides eight TTL lines, each programmable as either input or output; and
- Provides a standard SCSI-II, 68-pin, D-shell connector for I/O connections.

Supported Software

The following software is available for use with the DT3157 board:

- **DT3157 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 DT3157 board with any of the supported software packages or utilities. Refer to the *DT3157 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 *DT3157 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 DT3157 board using the Microsoft C compiler in Windows 98, Windows Me, Windows 2000, or Windows XP.
- **DT-Active Open Layers** –Order this optional software package if you want to use the DT-Active Open Layers ActiveX control to access the capabilities of the DT3157 board using Microsoft Visual Basic or Visual C++.
- **GLOBAL LAB Image/2** –Order this optional software package if you want to develop scientific applications using object-oriented image processing tools.
- **DT Vision Foundry** –Order this optional software package if you want to develop machine vision applications using object-oriented image processing tools.

Refer to the Data Translation catalog for information on additional software packages available for the DT3157 board.

Accessories

The following accessories are available for the DT3157 board:

- **EP-299 cable** –The EP299 cable is for use with Kodak (and similar) digital cameras. The cable provides connection between the DT3157 and the camera's 68-pin, D-shell connector. It also has a BNC connector at the camera end for connecting an external trigger, and a 9-pin, RS-232 connector at the board end for connecting other signals. This cable is 9 feet (2.75 m) long, and is constructed with 105 Ω differential, 28 AWG wire, aluminum polyester foil cover, and tinned copper-braid shielding.
- **EP-300 cable** –The EP300 cable is for use with EG&G (and similar) digital cameras. The cable provides connection between the DT3157 and the camera's 37-pin, D-shell connector. It also has a BNC connector at the camera end for connecting an external trigger. This cable is 9 feet (2.75 m) long, and is constructed with 105 Ω differential, 28 AWG wire, aluminum polyester foil cover, and tinned copper-braid shielding.
- **EP-301 cable** –The EP301 cable is for use with Pulnix (and similar) digital cameras. The cable provides connection between the DT3157 and the camera's 31-pin, D-shell connector. It also has a BNC connector at the camera end for connecting an external trigger. This cable is 9 feet (2.75 m) long, and is constructed with 105 Ω differential, 28 AWG wire, aluminum polyester foil cover, and tinned copper-braid shielding.

2

Principles of Operation

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This chapter describes the features of the DT3157 board from a functional point-of-view. To aid the discussions in this chapter, refer to the block diagram of the DT3157, shown in Figure 1.

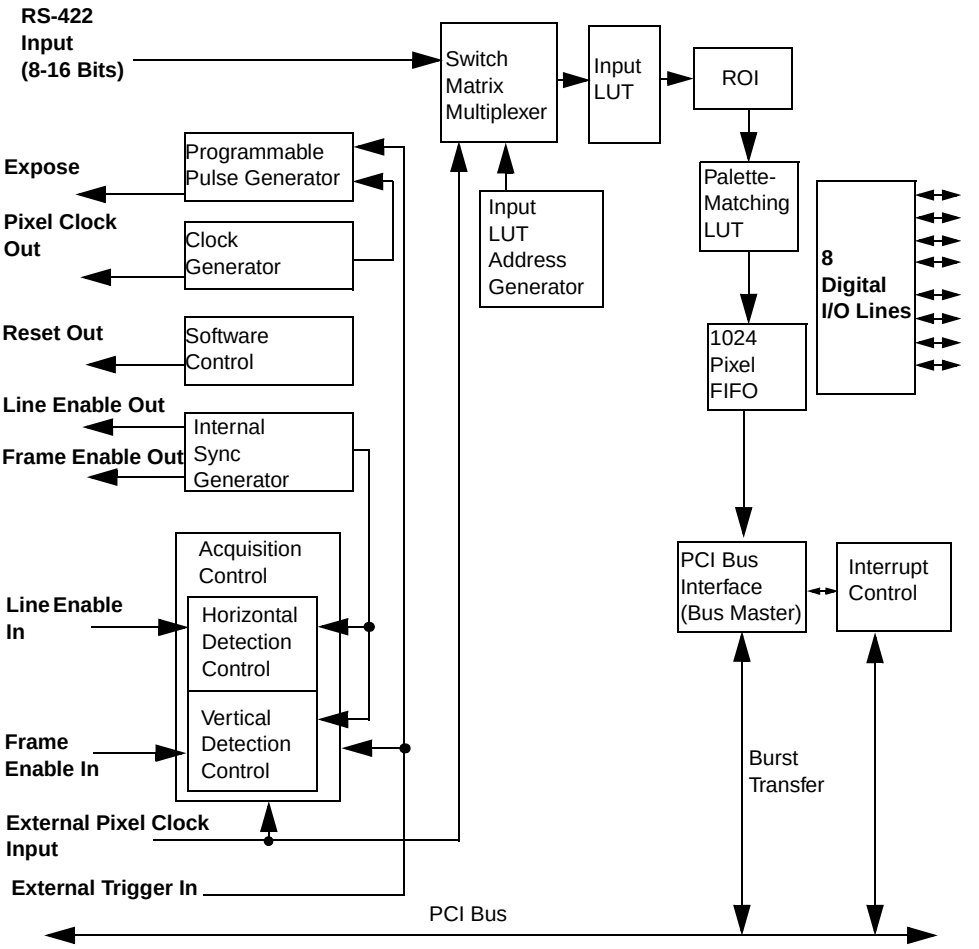

Figure 1: DT3157 Block Diagram

Video Input Signals

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

- Video format (described on this page),
- Video input channels (described on page 8),
- Pixel clock (described on page 9), and
- External trigger (described on page 10).

Video Formats

The DT3157 acquires digital images using the RS-422 format.

The RS-422 interface consists of 19 differential receivers and five differential drivers. The RS-422 input functional block diagram is shown in Figure 2.

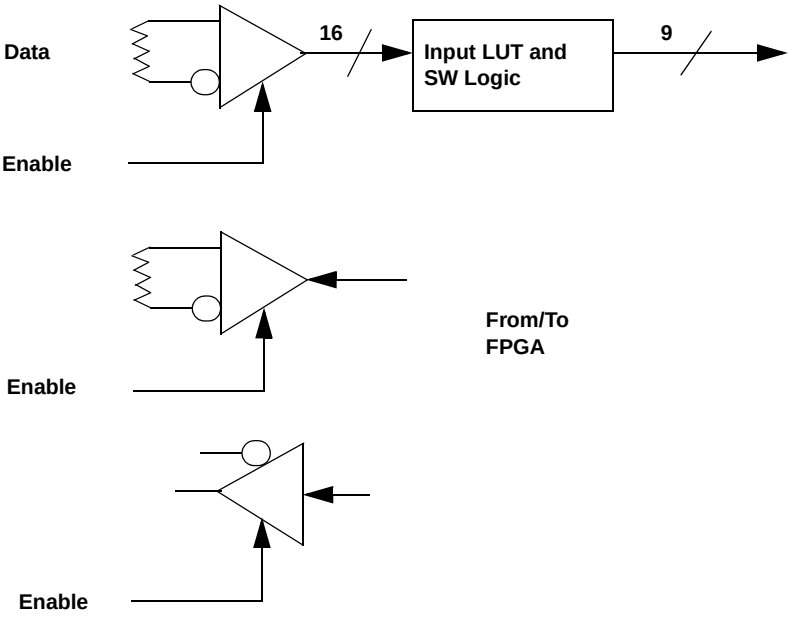

Figure 2: RS-422 Interface

Videos Input Channels

The DT3157 board can accept 8-, 10-, 12-, 14-, or 16-bit monochrome video from one RS-422 differential digital input (single-channel mode) or 8-bit monochrome video from two RS-422 differential digital inputs (dual-channel mode).

Note: Only one video input connector exists on the board. The number of video channels (single or dual-channel) is determined by your video source and the configuration of the video input source in software.

When using single-channel mode, the size of the image can be 2048 pixels x 2048 pixels, 4096 pixels x 1024 pixels, or 1024 pixels x 4096 pixels. The image size is the size of the frame you want to digitize (maximum 4 Mpixels).

When using dual-channel mode, the size of the image is always 1024 pixels x 1024 pixels.

Pixel Clock

The frequency of the pixel clock determines the video input signal capture rate. To determine the appropriate pixel clock frequency, divide the number of pixels per line (including the active pixels and blank pixels) by the length of the horizontal line (in time).

Pixels are available to the DT3157 frame grabber board in increments of *PixelPeriod*, which is equal to 1 /pixel clock frequency.

The board synchronizes the pixel clock to the first frame of an asynchronous external video source. Synchronization occurs when a horizontal sync is received or is inserted.

The DT3157 supports an internal and external pixel clock, described in the following subsections.

Internal Pixel Clock

The DT3157 frame grabber board provides a programmable clock that generates the base frequency for video input timing. This clock is subsequently phase adjusted and divided down to produce the desired capture rate.

For each video channel, you can program the pixel clock for any frequency from 1 kHz to 20 MHz, limited by the granularity of the pixel clock controller. The default frequency is 12.5 MHz.

Note: In dual-channel mode, the board provides a maximum pixel clock frequency of 20 MHz per channel, for a total throughput of 40 MHz.

The Pixel Clock Out signals are internally generated clock signals that are output to the digital camera (see page 16 for more information).

External Pixel Clock

The external pixel clock signals Pixel Clock In+(pin 29) and Pixel Clock In–(pin 63) are provided on connector J1 for connecting the RS-422 differential clock input signals from the video source. Using software, the incoming data can be latched by either the leading or trailing edge depending on the timing requirements of the specific camera.

By default, an external pixel clock is selected.

External Trigger

The DT3157 frame grabber provides pin 21 (External Trigger In) on connector J1 for connecting an external trigger input. Using an external trigger, you can synchronize frame acquisitions with external events.

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 21 of connector J1.

Input Look-Up Table

An input look-up table (ILUT) allows you to change the value of an incoming pixel. When the ILUT gets an input pixel value, it retrieves the digital value of each 8-, 10-, 12-, 14-, or 16-bit pixel from the ILUT and passes the output value to the frame (region of interest). Pixel values range from 0 to 65,535 to support 256 gray levels.

Note: If you are using dual-channel mode, the ILUT is configured to support both channels.

Using software, you can specify the relationship between the pixel input value and the ILUT output value by loading the 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 an input value of 255 (which has an output value of 255 or white in monochrome mode).

As another example, if you load the 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 pattern of 254, and so on, up to an input value of 255 (which has an output value of 0 or black in monochrome mode).

Note that in addition to ILUTs, passthru operations make use of passthru LUTs. For more information about passthru LUTs, refer to page 31.

Sync Signals

This section describes the following aspects of sync signals:

- Sync source (described on this page),
- Sync Master mode (described on this page), and
- Sync Sentinel (described on page 14).

Sync Source

The differentially driven horizontal (line) and vertical (frame) syncs come directly from the video source. Four inputs are provided on connector J1 to accept separate horizontal and vertical sync signals. Line Enable+ (pin 26) and Line Enable–(pin 60) are used to indicate the start of a line. Frame Enable In+ (pin 25) and Frame Enable In– (pin 59) are used to indicate the start of a frame. The trigger edge of these inputs is user-programmable.

Sync Master Mode

Note: Enabling Sync Master mode automatically disables the Sync Sentinel. For more information about the Sync Sentinel, refer to page 14.

Typically, the camera generates the sync signals, and the board locks to them. If this is not appropriate for your application, you can use Sync Master mode to set up the DT3157 board to generate the sync signals to drive one or more digital cameras, if desired. The video signal from the camera is then captured as usual, using the syncs generated by the board as the sync basis. This process is called *gen-locking*. Gen-locking allows you to synchronize signals when switching among channels.

You can enable or disable Sync Master mode through software. When Sync Master mode is enabled, the horizontal sync output signals are output on pin 27 (Line Enable Out+) and pin 61 (Line Enable Out-) of connector J1; the vertical sync signals are output on pin 24 (Frame Enable Out+) and pin 58 (Frame Enable Out-) of connector J1. These are RS-422, TTL signals.

Note: If you need an active-high signal for Line Enable Out or Frame Enable Out, you can switch the wires in the cable.

Using software, you can specify the following:

- The width of the horizontal sync signal –Ranges from 250 ns (or 4 pixels, whichever is greater) to 950,000,000 ns (total pixels per line - 15); the nominal value is 4,800 ns.
- The width of the vertical sync signal –Ranges from 500 ns (2 lines) to 950,000,000 ns (total lines per field - 5). The nominal value is 190,000 ns.
- The frequency of the horizontal sync –Ranges from 1 Hz to 2 MHz (nominal is 15.75 kHz).
- The frequency of the vertical sync –Ranges from 0.00024 Hz to 488.28 Hz (nominal is 30 Hz).
- The phase between the horizontal sync and vertical sync signals – Specified as a percentage of the horizontal period multiplied by 100, ranges from 100 (1%) to 9,900 (99%); nominal is 5,000 (50%). Figure 3 illustrates adjusting the phase.

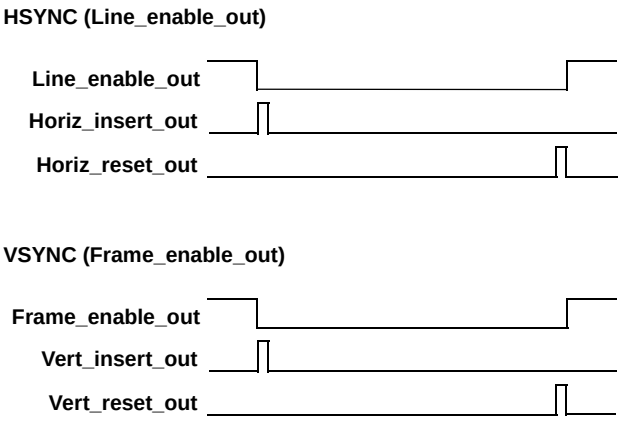

Figure 3: Sync Out Phase Adjustment

Sync Sentinel

The Sync Sentinel circuitry provides sync continuity for the DT3157 board. The Sync Sentinel is especially useful for noisy input sources such as VCRs, where the DT3157 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 threshold.

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

When the Sync Sentinel is enabled, you determine a window in which a sync can be detected by specifying the following positions:

- Horizontal sync search position –Defines the pixel location within a line at which the DT3157 board begins to search for the horizontal sync. The default value is 95.0% of the total pixels per line.

- Horizontal sync insert position –Defines the pixel location within a line at which the DT3157 board inserts a horizontal sync if a horizontal sync is not detected. The default value for the horizontal insert position is 101.5% of the total pixels per line.
- Vertical sync search position –Defines the line location within a field at which the DT3157 board begins to search for the vertical sync. The default value is 50.0% of the total lines per field.
- Vertical sync insert position –Defines the line location within a field at which the DT3157 board inserts a vertical sync if a vertical sync is not detected. The default value for the horizontal insert position is 115% of the total lines per field.

By setting the sync search position immediately before the falling edge of the sync and setting the sync insert position immediately after the falling edge of the sync, you can prevent the DT3157 board from searching for syncs except where they are expected.

If you are switching among multiple input sources that are not synchronized with each other or if the sync signals occur at random intervals, you can disable the Sync Sentinel. This allows the DT3157 frame grabber to lock to the sync from the new video signal as soon as it occurs.

Note: Instead of disabling the Sync Sentinel, you can set the sync search position to a very low value (such as 4) and set the sync insert position as far after the falling edge of sync as possible. This allows the board to search for sync for almost the entire line and/or field.

Enabling Sync Master mode automatically disables the Sync Sentinel. For more information about Sync Master mode, refer to page 12.

Clock Output, Expose, and Reset Signals

In addition to the sync output signals discussed on page 12, the DT3157 board generates the following output signals for controlling digital cameras:

- **RS-422 Pixel Clock Output Signals** –Pixel Clock Out+ (pin 28) and Pixel Clock Out–(pin 62) on connector J1 are internally generated pixel clock signals that are output to the digital camera. The frequency of the clock output signal is user-programmable and ranges from 1 kHz to 20 MHz (the default is 12.5 MHz).
- **Expose Output Signal** –Expose+ (pin 30) and Expose–(pin 64) on connector J1 are programmable pulse output signals. The clock to this pulse generator is selected from the baud rate generator. Using software, you can set the pulse width of the exposure pulse from 82 µs to 1.33 s (using the internal clock default of 12.5 MHz) and the polarity of the exposure pulse (active-high or active-low). The pulse generator counter is triggered using software. By default, the pulse width is 82 µs and the polarity is active high.
- **Reset Output Signal** –Reset Out+ (pin 23) and Reset Out–(pin 57) signals are generated by the board to reset the digital camera.

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:

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

You can use software to define the total video area for the DT3157 frame grabber board. Table 1 lists the settings you can program.

Table 1: Total Video Area Settings (Area-Scan Mode Only)

Setting	Description	Range	Nominal Values
Total Pixels per Line	The total number of pixels in a single horizontal line of video, where a horizontal line is defined as the area between two consecutive horizontal sync signals.	Single Channel: 4 to 4096[a] pixels Dual Channel: 32 to 4096[a] pixels	640
Total Lines per Field[a]	The total number of lines in a single noninterlaced frame of video, where a field is defined as the area between two consecutive vertical sync signals.	1 to 4096[a] lines	480

a. Because the DT3157 deals with noninterlaced frames, this setting is also the Total Lines per Frame.

Active Video Area

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

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

Horizontal Video Signal

Each line of video comprising the total video area contains blanking information and active video. Figure 4 shows the components of a single horizontal line of video.

Note: The figure in this section represents an analog signal for illustration purposes. Your camera digitizes the signal and presents the digitized version of the signal to the DT3157 board.

Note that the frame is an area that you establish within the active video area. For information about the frame, refer to page 22.

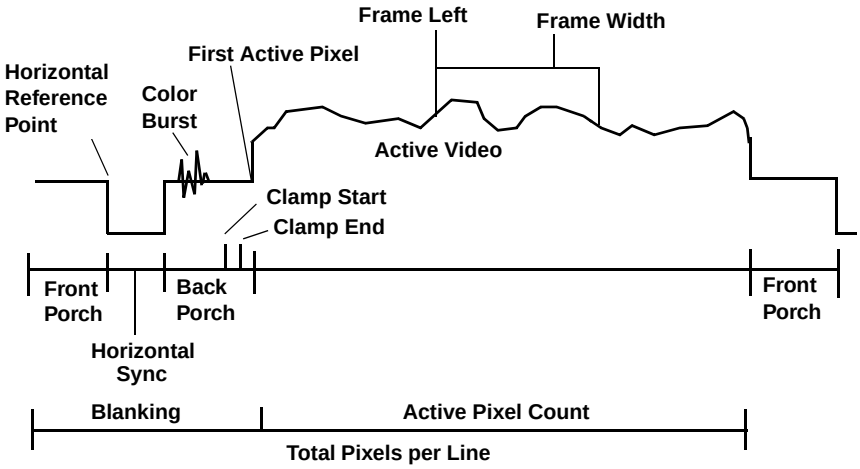

Figure 4: Horizontal Video Signal

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

Table 2 lists the horizontal input settings you can program on the DT3157 board.

Table 2: Horizontal Input Settings for DT3157

Setting	Description	Range	Nominal Values
First Active Pixel	The position of the first active video signal on the line, as a pixel value offset from the beginning of the horizontal sync.	4 to 4095[a] pixels	4
Active Pixel Count	The number of pixels per line in the active video area.	Single Channel: 4 to 4096[a] pixels Dual Channel: 32 to 1024[b] pixels	640

a. The granularity is 1.

Vertical Video Signal

Each field of video also contains blanking information and lines of active video. Figure 5 shows the components of a single vertical field of noninterlaced video.

Note: The illustrations in this section represent an analog signal for illustration purposes. Your camera digitizes the signal and presents the digitized version of the signal to the DT3157 board.

Note that the frame is an area that you establish within the active video area. For information about the frame, refer to page 22.

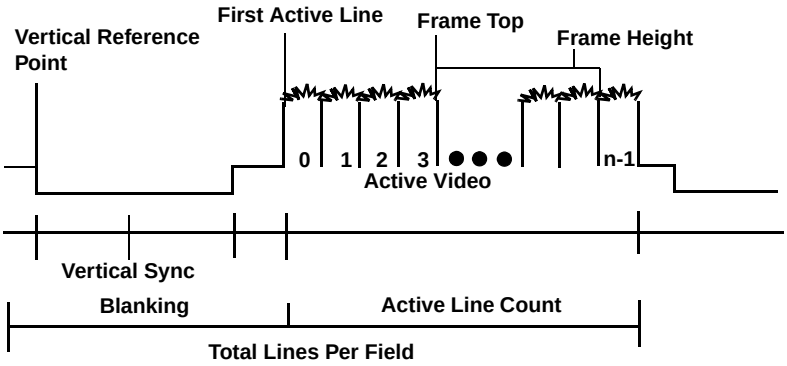

Figure 5: Vertical Video Signal

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.

Table 3 lists the vertical input settings you can program on the DT3157 board.

Table 3: Vertical Input Settings for DT3157

Setting	Description	Range	Nominal Values
First Active Line	The position of the first active video signal within the noninterlaced frame, as a line offset from the beginning of the vertical sync.	0 to 4095[a] lines	0
Active Line Count	The number of lines per noninterlaced frame in the active video area.	Single Channel: 1 to 4096[a] lines Dual Channel: 2 to 4096[c] lines	480

a. The granularity is 1.

Frame (Region of Interest)

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

This section describes the following aspects of frames:

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

Frame Size

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

Table 4 shows the settings you can program on DT3157 board to define the frame. Figure 6 illustrates these relationships.

Table 4: Frame Settings for the DT3157 Board

Setting	Description	Range	Nominal Values
Frame Left	The first pixel in the region of interest, relative to the first active pixel, to capture.	0 to 4095[a] pixels	0
Frame Width	The number of pixels per line of video to capture.	Single Channel: 4 to 4096[a] pixels Dual Channel: 32 to 1024[b] pixels	640
Frame Top	The first line of the region of interest, relative to the first active line, to capture.	0 to 4095[a] lines	0
Frame Height	The number of lines per noninterlaced frame to capture.	SIngle Channel: 1 to 4096[a] lines Dual Channel: 2 to 4096[c] lines	480

a. The minimum value is 8 for 8-bit, single-channel operations.
b. The granularity is 32 for dual-channel operations.
c. The granularity is 2.

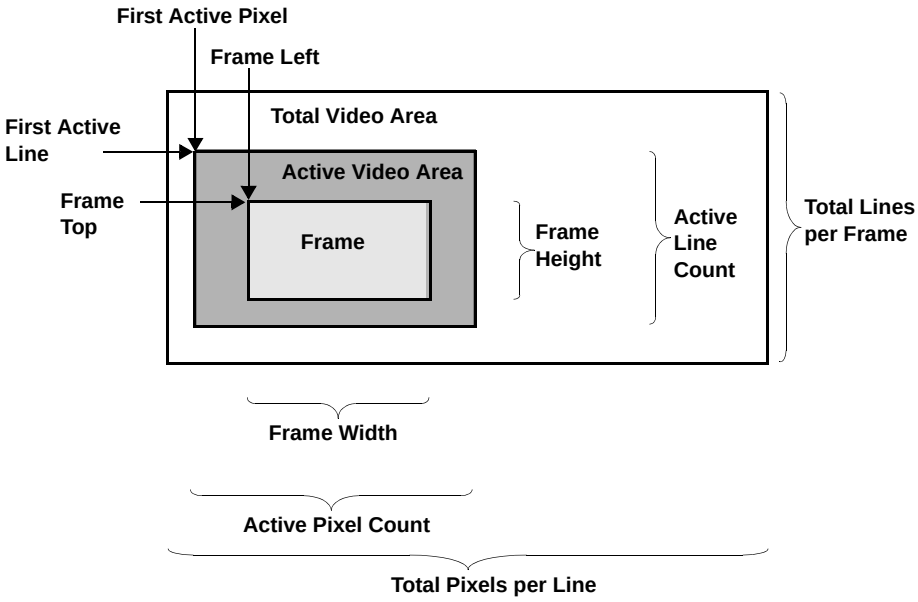

Figure 6: Spatial Relationship of Video Signal

Types of Frames

The DT3157 board can acquire noninterlaced frames only.

The video signal is defined as a single field (or frame), where the start of each frame is identified by the falling edge of the vertical sync.

Scaling Frames

When using single-channel mode only, you can scale images by discarding pixels, lines, or both in software. This feature is useful if you want to reduce the size of an image.

You provide the scale factor for the horizontal direction (range between pixels in the horizontal direction) and the vertical direction (range between lines in the vertical direction) separately.

The minimum scale factor is 1; the maximum scale factor is 16 (nominal is 1). For example, to scale the image so that every 16th pixel is displayed, set the horizontal scale factor to 16. To scale the image so that every other line is displayed, set the vertical scale factor to 2. For a one-to-one representation, set the scale factor to 1.

Note: When using dual-channel mode, the horizontal and vertical scale factors are always 1. All acquisitions can begin anywhere along a 4096 pixel line, but the width of the frame to acquire is limited to a maximum of 1024 pixels.

For example, OLC_FG_CTL_ACTIVE_PIXEL_WIDTH could be set at 3000, OLC_FG_FRAME_LEFT could be set at 1000, and OLC_FG_CTL_FRAME_WIDTH could be set at 2024. The minimum frame height for an acquisition is 2 lines.

Frame Storage Mode

The DT3157 board is capable of acquiring images with pixel sizes of 8, 10, 12, 14, and 16 bits. Any image with a pixel depth of greater than 8 bits requires two bytes of storage; the valid pixel data is stored right-justified within those two bytes.

To display the pixel data, the data must be in 8-bit Device Independent Bitmap (DIB) form. When there are more than 8 bits per pixel, you probably want to display the most significant 8 bits. To do this, shift the pixel data until the most significant 8 bits are located in either the upper or lower byte of the pixel word. For example, to display a 10-bit image, shift the pixel data right by 2 bits so that the lower byte contains the most significant 8 bits; this byte could then be used for creating the 8-bit DIB.

For 8-bit and 16-bit pixel data, no shifting is required since the most significant 8 bits of pixel data are already contained in a single byte. You can use the HIBYTE and LOBYTE macros to retrieve the portion of the pixel data that is used for creating the DIB.

Passthru Modes

In a passthru operation, the DT3157 board continuously captures and displays video data until you stop the operation. Typically, you use passthru to view images (in as close to real time as possible for the configuration and passthru method chosen) for the purpose of focusing or positioning the camera.

This section describes the following aspects of passthru:

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

Passthru Modes

The DT3157 board supports bitmap passthru mode.

Note: When performing any passthru operation with pixel sizes of greater than 8 bits, only the most significant 8 bits are displayed.

The DT3157 board supports both synchronous and asynchronous bitmap passthru mode.

In a synchronous operation, you cannot perform another operation until the operation is stopped. In an asynchronous operation, the operation starts but gives control to you immediately, allowing you to perform other operations while data is displayed.

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

A 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.

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. For single-channel operations, values range from 0 to 4,088 pixels in the horizontal direction and 0 to 4095 lines in the vertical direction. For dual-channel operations, values range from 0 to 992 pixels in the horizontal direction and 0 to 1024 lines in the vertical direction. The default is 0 in both directions.

Note: The passthru source origin can be set to start on any pixel, but due to a hardware limitation, the board must transfer a width of 8 pixels for a single channel and 32 pixels for dual channels after any scaling has been calculated. This may result in the appearance of some data loss on the right side of the image that is displayed during passthru, since the hardware was forced to clip data.

The passthru source origin can also start on any line; but, in dual-channel mode, the hardware must transfer at least two lines of data causing a possible loss of, at most, 1 line.

Passthru Scaling

Using software, you can scale the passthru image to the height and width that most closely match the requested size. Unlike hardware scaling (see page 26), 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.

For single-channel operations, values range from 8 to 4,096 pixels in the horizontal direction (in increments of 4) and 1 to 4,096 lines in the vertical direction (in increments of 1). The default is 640-by-480.

For dual-channel operations, values range from 32 to 1,024 pixels in the horizontal direction (in increments of 4), and 2 to 4,096 lines in the vertical direction (in increments of 2). The default is 640-by-480.

Passthru LUT

It is assumed that the data passed to display memory is 8 bits/pixel. By default, passthru operations load the Windows system palette with 128 grayscale RGB values for display and use the default passthru LUT of 256 monotonically increasing grayscales.

Using software, you can modify the 256-position passthru LUT so that false coloring is used. For each entry in the passthru LUT, the index of the closest matching RGB value in the Windows system palette is used. If an exact match is needed, you can use software to define 15 extra entries in the Windows system palette.

Overlays

You can also add overlays to the display using software. 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 Modes

The DT3157 board can acquire noninterlaced frames either synchronously or asynchronously, and store them in system memory. In a synchronous acquisition, you cannot perform another operation until the synchronous acquisition completes. In an asynchronous acquisition, the operation starts but gives control to you immediately, allowing you to perform other operations while data is acquired.

Using the DT3157, 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 DT3157 Device Driver during system startup (called *device memory*) or provided by you (called *host memory*). Multiple frames are stored only in device memory.

Each frame buffer must be large enough to hold the acquired frame. The required 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. The pixel depth depends on whether you are acquiring 8-, 10-, 12-, 14-, or 16-bit data, as defined by the camera type. Strict matching of pixel bit depth is maintained. Therefore, if the camera type is 12 bits/pixel, then acquisitions must be made to frame buffers allocated to hold data of 12 bits/pixel.

An interrupt is generated when a noninterlaced 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 DT3157 to transfer an unlimited number of consecutive frames across the bus in real time. You can acquire consecutive images, up to the capacity of available system RAM.

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

Digital I/O Signals

The DT3157 board provides eight digital I/O lines on the following pins of connector J1:

- DIG_IO0 –pin 17,
- DIG_IO1 –pin 51,
- DIG_IO2 –pin 18,
- DIG_IO3 –pin 52,
- DIG_IO4 –pin 31,
- DIG_IO5 –pin 32,
- DIG_IO6 –pin 33, and
- DIG_IO7 –pin 67.

You program these lines for digital input or output. By default, lines 0 to 3 are inputs and lines 4 to 7 are outputs.

These digital I/O signals are simple register-driven, TTL-level signals 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

DT3157 Device Driver Capabilities 36
Initialized Control Values 55

DT3157 Device Driver Capabilities

Because the Frame Grabber SDK is intended to be used with all DT-Open Layers frame grabbers, the DT3157 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 DT3157 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 DT3157 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 DT3157 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 38
Input/output signals	page 39
Sync signals	page 42
Active video area	page 44
Frames	page 46
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 description of the functions in the *Frame Grabber SDK User's Manual* and online help.

Table 5: General Device Capabilities for the DT3157 Device Driver

Capability	DT3157 Support
OlImgQueryDeviceCaps	
Device Signature OLC_IMG_DC_OL_SIGNATURE	Ox44544F4C
Device ID OLC_IMG_DC_DEVICE_ID	0x2B
Device Name OLC_IMG_DC_DEVICE_NAME	“DT3157”
Device Type OLC_IMG_DC_OL_DEVICE_TYPE Monochrome Frame Grabber OLC_IMG_DEV_MONO_FRAME_GRABBER Color Frame Grabber OLC_IMG_DEV_COLOR_FRAME_GRABBER	 Yes No
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 Yes

Table 5: General Device Capabilities for the DT3157 Device Driver (cont.)

Capability	DT3157 Support
Dt3157QueryDigitalCameraType	
Camera type DT3157_DIGCAM_16BIT_INPUT DT3157_DIGCAM_14BIT_INPUT DT3157_DIGCAM_12BIT_INPUT DT3157_DIGCAM_10BIT_INPUT DT3157_DIGCAM_8BIT_SINGLE_CHANNEL_INPUT DT3157_DIGCAM_8BIT_DUAL_CHANNEL_INPUT	 16 bits/pixel 14 bits/pixel 12 bits/pixel 10 bits/pixel 8 bits/pixel 8 bits/pixel (two channels)

Table 6: Input/Output Signal Capabilities for the DT3157 Device Driver

Capability	DT3157 Support
OlFgQueryInputCaps	
Number of Input Sources OLC_FG_INPUT_SOURCE_COUNT	 1
Supports Input Filter Selection OLC_FG_IC_DOES_INPUT_FILTER	 No
Supports Input Filter Query OLC_FG_IC_DOES_QUERY_INPUT_FILTER	 No
Supported Filters OLC_FG_IC_INPUT_FILTER_LIMITS AC Coupled, no Input Filter OLC_FG_FILT_AC_NONE AC Coupled, 50 Hz Input Filter OLC_FG_FILT_AC_50 AC Coupled, 60 Hz Input Filter OLC_FG_FILT_AC_60 DC Coupled, no Input Filter OLC_FG_FILT_DC_NONE	 N/A
Supports Programmable A/D OLC_FG_IC_DOES_PROG_A2D	 No

Table 6: Input/Output Signal Capabilities for the DT3157 Device Driver (cont.)

Capability	DT3157 Support
Supports Programmable A/D Query OLC_FG_IC_DOES_QUERY_PROG_A2D	No
Voltage Range of Black Level, in µV OLC_FG_IC_BLACK_LEVEL_LIMITS	N/A
Voltage Range of White Level, in µV OLC_FG_IC_WHITE_LEVEL_LIMITS	N/A
Supports Programmable Pixel Clock OLC_FG_IC_DOES_PIXEL_CLOCK	Yes
Supports Pixel Clock Query OLC_FG_IC_DOES_QUERY_PIXEL_CLOCK	Yes
Range of Internal Input Clock Frequency, in Hz OLC_FG_IC_CLOCK_FREQ_LIMITS	min: 1000 max: 20,000,000[a] nominal: 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 Yes
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

Table 6: Input/Output Signal Capabilities for the DT3157 Device Driver (cont.)

Capability	DT3157 Support
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 No
Number of LUTs OLC_FG_ILUT_COUNT	 1
Maximum Index Number Allowed in each ILUT OLC_FG_IC_MAX_ILUT_INDEX	 65535[b]
Maximum Value Allowed in each ILUT OLC_FG_IC_MAX_ILUT_VALUE	 65535
Dt3157QueryExposure	
Pulse duration, in μs	82 to 1,330,000 Nominal: 82
Pulse polarity	Active high Active low

a. In dual-channel mode, 20 MHz is provided on each channel for a total throughput of 40 MHz.

b. The maximum number of entries allowed is 65536 in the ILUT.

Table 7: Sync Signal Capabilities for the DT3157 Device Driver

Capability	DT3157 Support
OlFgQueryInputCaps	
Supports Input Video Selection OLC_FG_IC_DOES_VIDEO_SELECT	No
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 Yes
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	N/A
Composite Sync Threshold Limits, in mV OLC_FG_IC_CSYNC_THRESH_LIST_LIMITS	N/A
Composite Sync Threshold List OLC_FG_IC_CSYNC_THRESH_LIST	N/A
Supports Sync Sentinel OLC_FG_IC_DOES_SYNC_SENTINEL	Yes
Supports Sync Sentinel Query OLC_FG_IC_DOES_QUERY_SYNC_SENTINEL	Yes
Sync Sentinel Types OLC_FG_IC_SYNC_SENTINEL_TYPE_LIMITS Supports Fixed Sync Sentinel OLC_FG_SYNC_SENTINEL_FIXED Supports Variable Sync Sentinel OLC_FG_SYNC_SENTINEL_VARIABLE	 No Yes

Table 7: Sync Signal Capabilities for the DT3157 Device Driver (cont.)

Capability	DT3157 Support
Dt3157QuerySyncMasterControlValue	
Horizontal Frequency, Hz DT3157_SYNC_CTL_HORIZ_FREQ	min: 1 max: 2,000,000 nominal: 15,750
Vertical Frequency, Hz DT3157_SYNC_CTL_VERT_FREQ	min: 0.00024 max: 488.28 nominal: 30
Horizontal Sync Pulse Width, ns DT3157_SYNC_CTL_HPULSE_WIDTH	min: 250 max: 950,000,000 nominal: 4,800
Vertical Sync Pulse Width, ns DT3157_SYNC_CTL_VPULSE_WIDTH	min: 500 max: 950,000,000 nominal: 190,000
Phase, % of total line x 100 DT3157_SYNC_CTL_PHASE	min: 100 (1%) max: 9,900 (99%) nominal: 5,000 (50%)

Table 8: Active Video Area Capabilities for the DT3157 Device Driver

Capability	DT3157 Support	
	Single Channel	Dual Channel
OlFgQueryInputCaps		
Supports Defining of Active Video Area OLC_FG_IC_DOES_ACTIVE_VIDEO	Yes	
Supports Active Video Area Query OLC_FG_IC_DOES_QUERY_ACTIVE_VIDEO	Yes	
Range of Back Porch Start Position[a] OLC_FG_IC_BACK_PORCH_START_LIMITS	N/A	
Range of Clamp Start Position[a] OLC_FG_IC_CLAMP_START_LIMITS	N/A	
Range of Clamp End Position[a] OLC_FG_IC_CLAMP_END_LIMITS	N/A	
Range of Total Pixels Per Line Control OLC_FG_IC_TOTAL_PIX_PER_LINE_LIMITS	min: 4[b] max: 4096 nominal: 640 granularity: 1	min: 32 max: 4096 nominal: 640 granularity: 1
Range of First Active Pixel Position OLC_FG_IC_ACTIVE_PIXEL_LIMITS	min: 4 max: 4095 nominal: 4 granularity: 1	
Range of Active Pixels Count OLC_FG_IC_ACTIVE_WIDTH_LIMITS	min: 4[b] max: 4096 nominal: 640 granularity: 4[b]	min: 32 max: 1024 nominal: 640 granularity: 32
Range of Total Lines per Field Control[c] OLC_FG_IC_TOTAL_LINES_PER_FLD_ LIMITS	min: 1 max: 4096 nominal: 480 granularity: 1	

Table 8: Active Video Area Capabilities for the DT3157 Device Driver (cont.)

Capability	DT3157 Support	
	Single Channel	Dual Channel
Range of First Active Line Position OLC_FG_IC_ACTIVE_LINE_LIMITS	min: 0 max: 4095 nominal: 0 granularity: 1	
Range of Active Lines Count OLC_FG_IC_ACTIVE_HEIGHT_LIMITS	min: 1 max: 4096 nominal: 480 granularity: 1	min: 2 max: 4096 nominal: 480 granularity: 2

a. Video controls are not supported due to the nature of digital video.

b. The value for 8-bit, single-channel operations is 8.

c. Because it operates in noninterlaced mode, the DT3157 is not field-based. The Total Lines per Field Control parameter represents total lines per frame.

Table 9: Frame Capabilities for the DT3157 Device Driver

Capability	DT3157 Support	
	Single Channel	Dual Channel
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: 4095 nominal: 0 granularity: 1	
Range of Frame Left Control OLC_FG_IC_FRAME_LEFT_LIMITS	min: 0 max: 4095 nominal: 0 granularity: 1	
Range of Frame Height Control OLC_FG_IC_FRAME_HEIGHT_LIMITS	min: 1 max: 4096 nominal: 480 granularity: 1	min: 2 max: 4096 nominal: 480 granularity: 2
Range of Frame Width Control OLC_FG_IC_FRAME_WIDTH_LIMITS	min: 4[a] max: 4096 nominal: 640 granularity: 4[a]	min: 32 max: 1024 nominal: 640 granularity: 32
Range Between Pixels (Scale factor - horizontal) OLC_FG_IC_FRAME_HINC_LIMITS	min: 1 max: 16 nominal: 1 granularity: 1	min: 1 max: 1 nominal: 1 granularity: 1

Table 9: Frame Capabilities for the DT3157 Device Driver (cont.)

Capability	DT3157 Support	
	Single Channel	Dual Channel
Range Between Lines (Scale factor - vertical) OLC_FG_IC_FRAME_VINC_LIMITS	min: 1 max: 16 nominal: 1 granularity: 1	min: 1 max: 1 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	No	
Acquire Interlaced Frame Starting on Odd Field OLC_FG_FRM_IL_FRAME_ODD	No	
Acquire Interlaced Frame Starting on Next Field OLC_FG_FRM_IL_FRAME_NEXT	No	
Acquire the Even Field OLC_FG_FRM_FIELD_EVEN	No	
Acquire the Odd Field OLC_FG_FRM_FIELD_ODD	No	
Acquire the Next Field OLC_FG_FRM_FIELD_NEXT	No	
Acquire the Next Noninterlaced Frame OLC_FG_FRM_NON_INTERLACED	Yes	
Maximum Number of Pixels in Frame OLC_FG_IC_MAX_FRAME_SIZE	4,194,304	
Number of Bytes in a Pixel OLC_FG_IC_PIXEL_DEPTH	1 or 2[b]	

a. The value for 8-bit, single-channel operations is 8.

b. This value varies depending on the digital camera type. Call **DT3157QueryDigitalCameraType** to determine what camera type is currently specified (8, 10, 12, 14, or 16 bits/pixel).

Table 10: Passthru Capabilities for the DT3157 Device Driver

Capability	DT3157 Support	
	Single Channel	Dual Channel
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 Supports Continuous-Acquire OLC_FG_PASSTHRU_ASYNC_BITMAP_EXTENDED	 Yes[a] Yes[a,b] No No[c] 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: 4088 nominal: 0 granularity: 1 min: 0 max: 4095 nominal: 0 granularity: 1	Yes min: 0 max: 992 nominal: 0 granularity: 1 min: 0 max: 1024 nominal: 0 granularity: 1

Table 10: Passthru Capabilities for the DT3157 Device Driver (cont.)

Capability	DT3157 Support	
	Single Channel	**Dual Channel**
Passthru Scaling OLC_FG_PC_DOES_SCALING	Yes	Yes[d]
Range of Legal Values for Height OLC_FG_PC_SCALE_HEIGHT_LIMITS	min: 1 max: 4096 nominal: 480 granularity: 1	min: 2 max: 4096 nominal: 480 granularity: 2
Range of Legal Values for Width OLC_FG_PC_SCALE_WIDTH_LIMITS	min: 8 max: 4096 nominal: 640 granularity: 4	min: 32 max: 1024 nominal: 640 granularity: 4
Passthru LUT OLC_FG_PC_DOES_PASSTHRU_LUT	Yes	
Number of Extra Palette Entries OLC_FG_PC_MAX_PALETTE_INDEX	15	
Maximum Value for Palette OLC_FG_PC_MAX_PALETTE_VALUE	255	
Maximum Index Allowed in Passthru LUT OLC_FG_PC_MAX_PLUT_INDEX	255[e]	
Maximum Value for Passthru LUT OLC_FG_PC_MAX_PLUT_VALUE	255	
Passthru snapshot OLC_FG_PC_DOES_PASSTHRU_SNAPSHOT	Yes	

a. This mode is available when the graphics adapter is in 256 color mode.
b. This mode is available when the graphics adapter is in 65536 color (16 bit) mode, if the graphics adapter supports DDI.
c. Asynchronous Direct Passthru is available only if the video board provides functional Direct Draw support.
d. In dual-channel mode, "scaling" clips the image to the portion of the original image bounded by the upper, left corner and selected values for height and width.
e. The maximum number of entries allowed is 255 in the passthru LUT, since the index number is zero-based.

Table 11: Overlay Capabilities for the DT3157 Device Driver

Capability	DT3157 Support
OlFgQueryDDICaps	
Passthru with DDI OLC_FG_DDI_FAST_PASSTHRU	Yes
Overlay support OLC_FG_DDI_OVERLAYS	Yes[a]
Translucent overlay capability OLC_FG_DDI_TRANSLUCENT_OVERLAYS	Yes[a]
Color overlay capability OLC_FG_DDI_COLOR_OVERLAY	Yes[a]
Multiple overlay surface capability OLC_FG_DDI_MULTIPLE_SURFACES	Yes[a]
Color keying (filtering) OLC_FG_DDI_COLOR_KEY_CONTROL	Yes[a]
Add overlay to image OLC_FG_DDI_OVERLAY_ON_FRAME	No
User-managed DDI surface support OLC_FG_DDI_USER_SURFACE_PTR	No
Passthru event synchronization support OLC_FG_DDI_PASSTHRU_SYNC_EVENT	Yes

a. This mode is available when the graphics adapter is in 65536 color (16 bit) mode, if the graphics adapter supports DDI.

Table 12: Memory Capabilities for the DT3157 Device Driver

Capability	DT3157 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 the maximum number of pixels in the frame
Number of Nonvolatile Buffer Handles OLC_FG_MC_NONVOL_COUNT	N/A

Table 13: Acquisition Capabilities for the DT3157 Device Driver

Capability	DT3157 Support
OlFgQueryInputCaps	
Acquisition Types	
OLC_FG_IC_SINGLE_FRAME_OPS	
-Single Frame to Host (sync)	
Supports Full Frame Acquisition	
OLC_FG_ACQ_FRAME	Yes
Supports Subframe Acquisition	
OLC_FG_ACQ_SUBFRAME	No
Supports Frame-to-Fit Acquisition	
OLC_FG_ACQ_FRAME_TO_FIT	No
-Single Frame to Device (sync)	
Supports Full Frame Acquisition	
OLC_FG_ACQ_FRAME	Yes
Supports Subframe Acquisition	
OLC_FG_ACQ_SUBFRAME	No
Supports Frame-to-Fit Acquisition	
OLC_FG_ACQ_FRAME_TO_FIT	No
-Single Frame to Host (async)	
Supports Full Frame Acquisition	
OLC_FG_ACQ_FRAME	Yes
Supports Subframe Acquisition	
OLC_FG_ACQ_SUBFRAME	No
Supports Frame-to-Fit Acquisition	
OLC_FG_ACQ_FRAME_TO_FIT	No
-Single Frame to Device (async)	
Supports Full Frame Acquisition	
OLC_FG_ACQ_FRAME	Yes
Supports Subframe Acquisition	
OLC_FG_ACQ_SUBFRAME	No
Supports Frame-to-Fit Acquisition	
OLC_FG_ACQ_FRAME_TO_FIT	No

Table 13: Acquisition Capabilities for the DT3157 Device Driver (cont.)

Capability	DT3157 Support
Acquisition Types (cont.)	
OLC_FG_IC_MULT_FRAME_OPS	
-Multiple Frames to Host (sync)	
Supports Full Frame Acquisition	
OLC_FG_ACQ_FRAME	No
Supports Subframe Acquisition	
OLC_FG_ACQ_SUBFRAME	No
Supports Frame-to-Fit Acquisition	
OLC_FG_ACQ_FRAME_TO_FIT	No
-Multiple Frames to Device (sync)	
Supports Full Frame Acquisition	
OLC_FG_ACQ_FRAME	Yes
Supports Subframe Acquisition	
OLC_FG_ACQ_SUBFRAME	No
Supports Frame-to-Fit Acquisition	
OLC_FG_ACQ_FRAME_TO_FIT	No
-Multiple Frames to Host (async)	
Supports Full Frame Acquisition	
OLC_FG_ACQ_FRAME	No
Supports Subframe Acquisition	
OLC_FG_ACQ_SUBFRAME	No
Supports Frame-to-Fit Acquisition	
OLC_FG_ACQ_FRAME_TO_FIT	No
-Multiple Frames to Device (async)	
Supports Full Frame Acquisition	
OLC_FG_ACQ_FRAME	Yes
Supports Subframe Acquisition	
OLC_FG_ACQ_SUBFRAME	No
Supports Frame-to-Fit Acquisition	
OLC_FG_ACQ_FRAME_TO_FIT	No
Supports Drawing Acquired Frame OLC_FG_IC_DOES_DRAW_ACQUIRED_FRAME	Yes

Table 14: Digital I/O Capabilities for the DT3157 Device Driver

Capability	DT3157 Support
OlFgQueryCameraControlCaps	
Number of Digital Output Lines OLC_FG_CC_DIG_OUT_COUNT	N/A[a]
Dt3157QueryDigitalIOConfiguration	
Digital I/O Configuration	0 to 255[b]

a. The DT3157 supports eight digital I/O lines, each of which can be configured for input or output. Use the **Dt3157QueryDigitalIOConfiguration** function to determine the configuration of the digital I/O lines. Use the **Dt3157QueryDigitalIO** function to read from the digital input lines. Use the **Dt3157SetDigitalIO** function to write to the digital output lines.

b. This value represents a bit mask in which each bit represents a different line, interpreted for the low-order bit. If a bit is set to 1, the corresponding line is configured for output. If a bit is set to 0, the corresponding line is configured for input.

Initialized Control Values

Table 15 lists the default control values after opening or initializing the DT3157 Device Driver.

Table 15: Default Control Values for the DT3157

Control Name	Value
OLC_FG_CTL_INPUT_FILTER	N/A
OLC_FG_CTL_BLACK_LEVEL	N/A
OLC_FG_CTL_WHITE_LEVEL	N/A
OLC_FG_CTL_VIDEO_TYPE	OLC_FG_VID_VARSCAN
OLC_FG_CTL_CSYNC_SOURCE	N/A
OLC_FG_CTL_CSYNC_THRESH	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	11500 (115%)
OLC_FG_CTL_VSYNC_SEARCH_POS	5000 (50.0%)
OLC_FG_CTL_FRAME_TOP	0
OLC_FG_CTL_FRAME_LEFT	0
OLC_FG_CTL_FRAME_WIDTH	640
OLC_FG_CTL_FRAME_HEIGHT	480
OLC_FG_CTL_HOR_FRAME_INC	1
OLC_FG_CTL_VER_FRAME_INC	1
OLC_FG_CTL_CLOCK_FREQ	12,500,000 Hz
OLC_FG_CTL_CLOCK_SOURCE	OLC_FG_CLOCK_EXTERNAL
OLC_FG_CTL_FRAME_TYPE	OLC_FG_FRM_NON_ INTERLACED

Table 15: Default Control Values for the DT3157 (cont.)

Control Name	Value
OLC_FG_CTL_ILUT	N/A
Camera Type	8-bit, single
Exposure Duration	82 µs
Exposure Pulse Polarity	0 (logic high)
Digital I/O Mask	F0
Sync Master Controls Horizontal Frequency Vertical Frequency Horizontal Sync Pulse Width Vertical Sync Pulse Width Sync Phase	 15,750 Hz 30 Hz 4,800 ns 190,000 ns 5,000 (50%)

4

Programming Flowcharts

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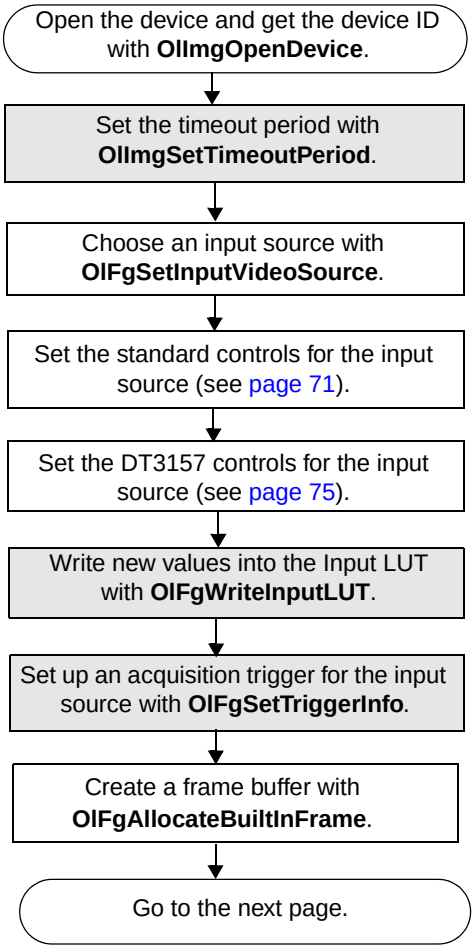
Passthru with Overlays 67

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.

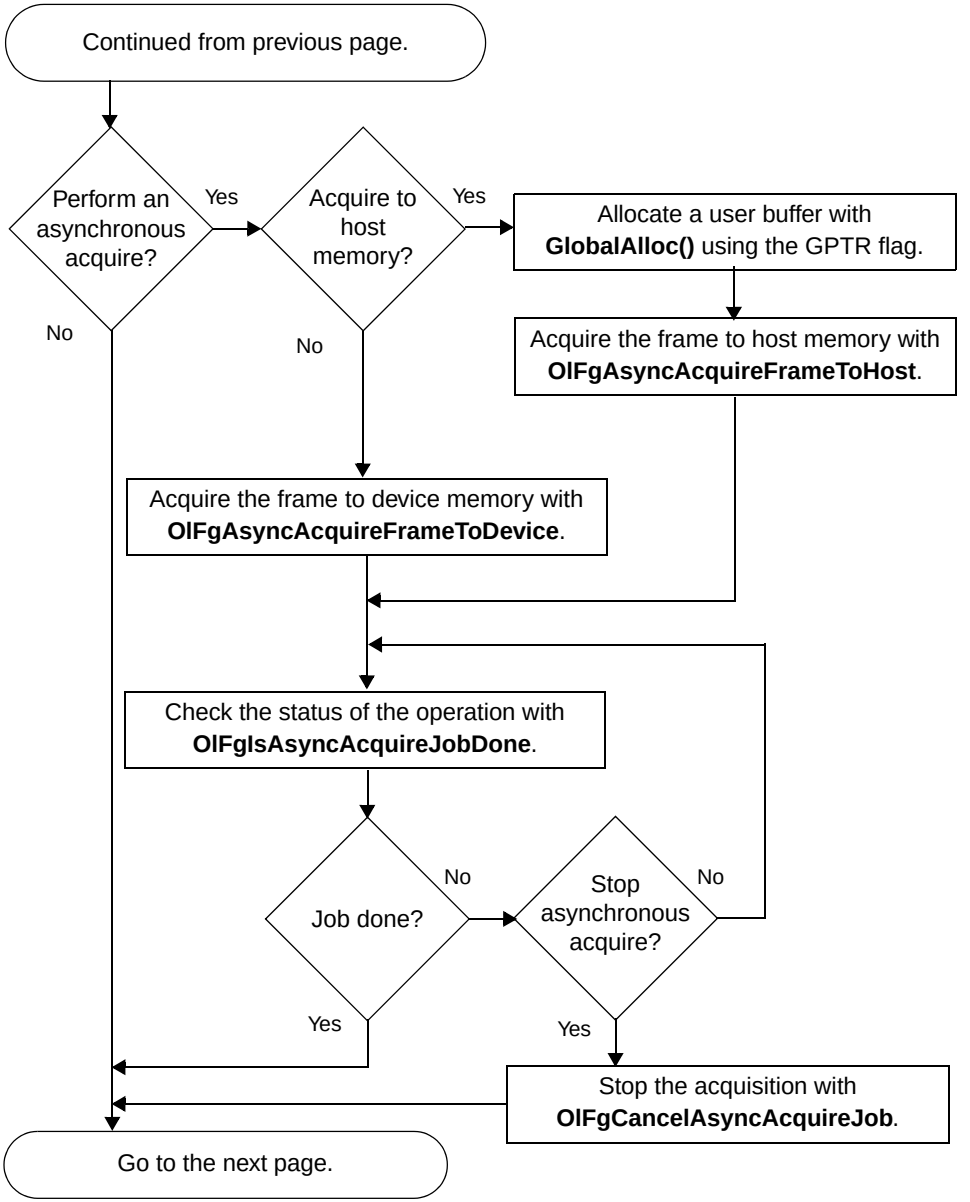
Many steps represent several substeps; if you are unfamiliar with the detailed operations involved with any one step, refer to the indicated page for detailed information. Optional steps appear in shaded boxes.

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

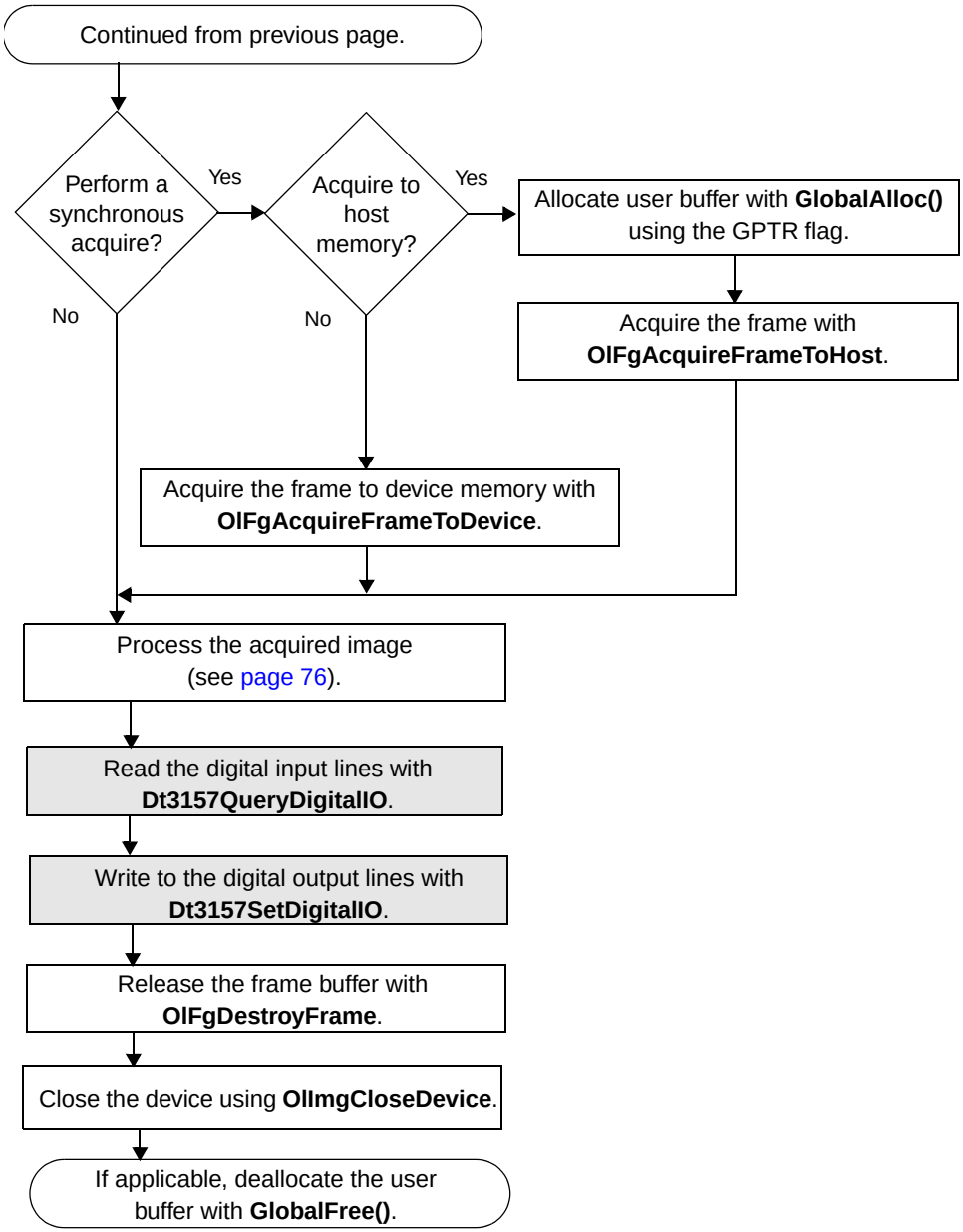
Single-Frame Acquisition



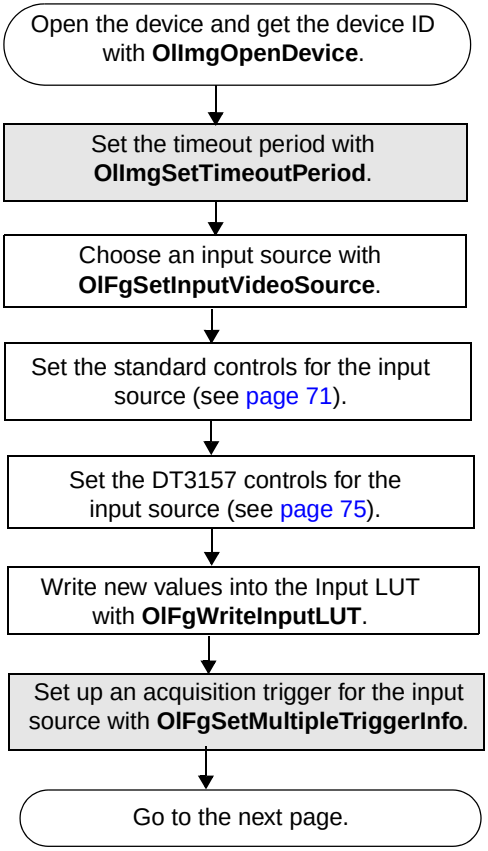
Single-Frame Acquisition (cont.)



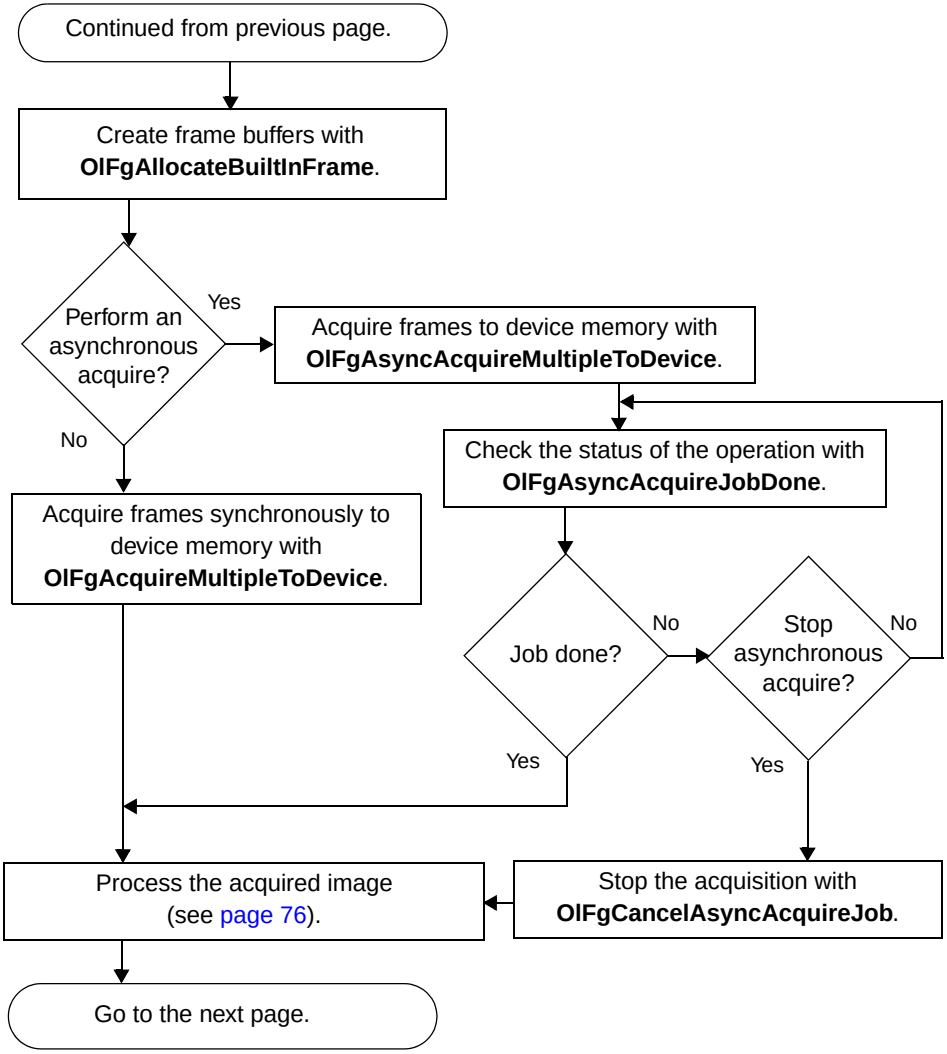
Single-Frame Acquisition (cont.)



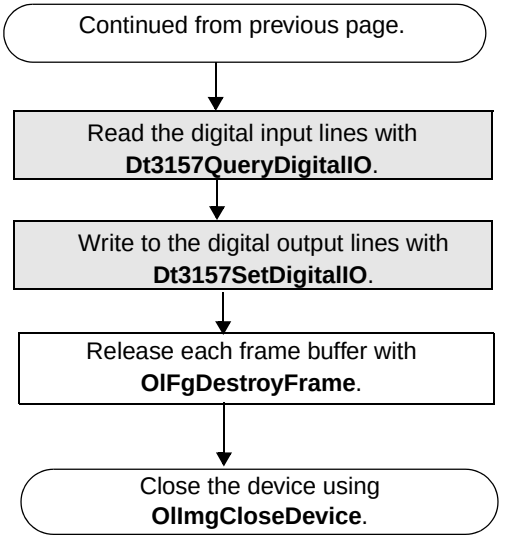
Multiple-Frame Acquisition



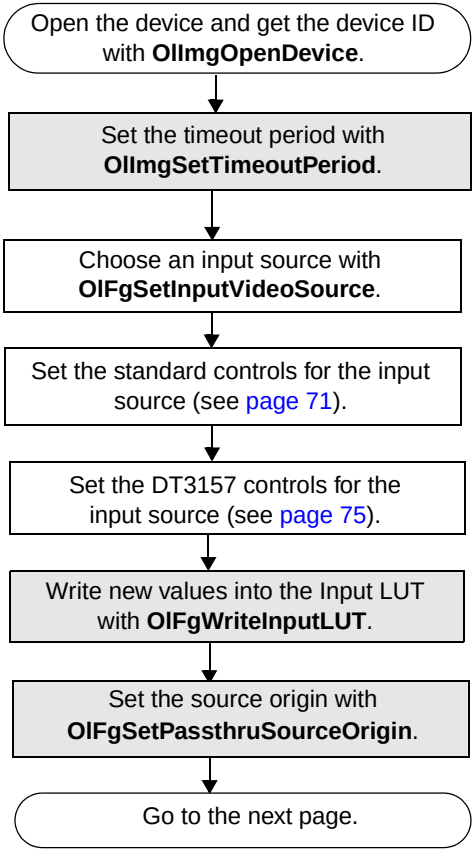
Multiple-Frame Acquisition (cont.)



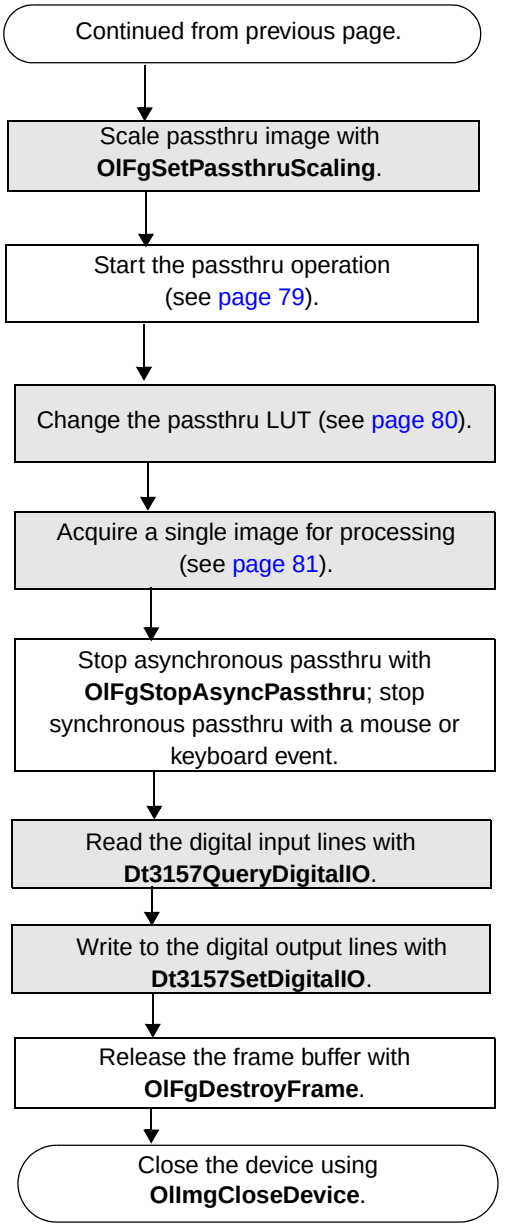
Multiple-Frame Acquisition (cont.)



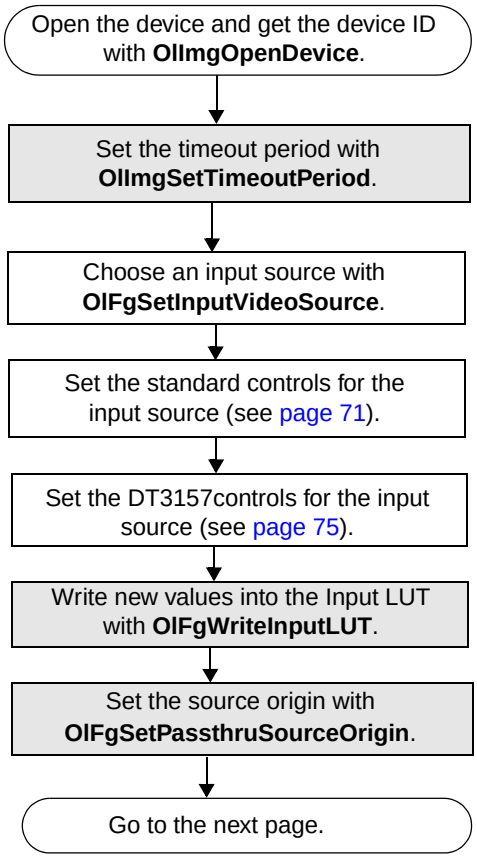
Passthru without Overlays



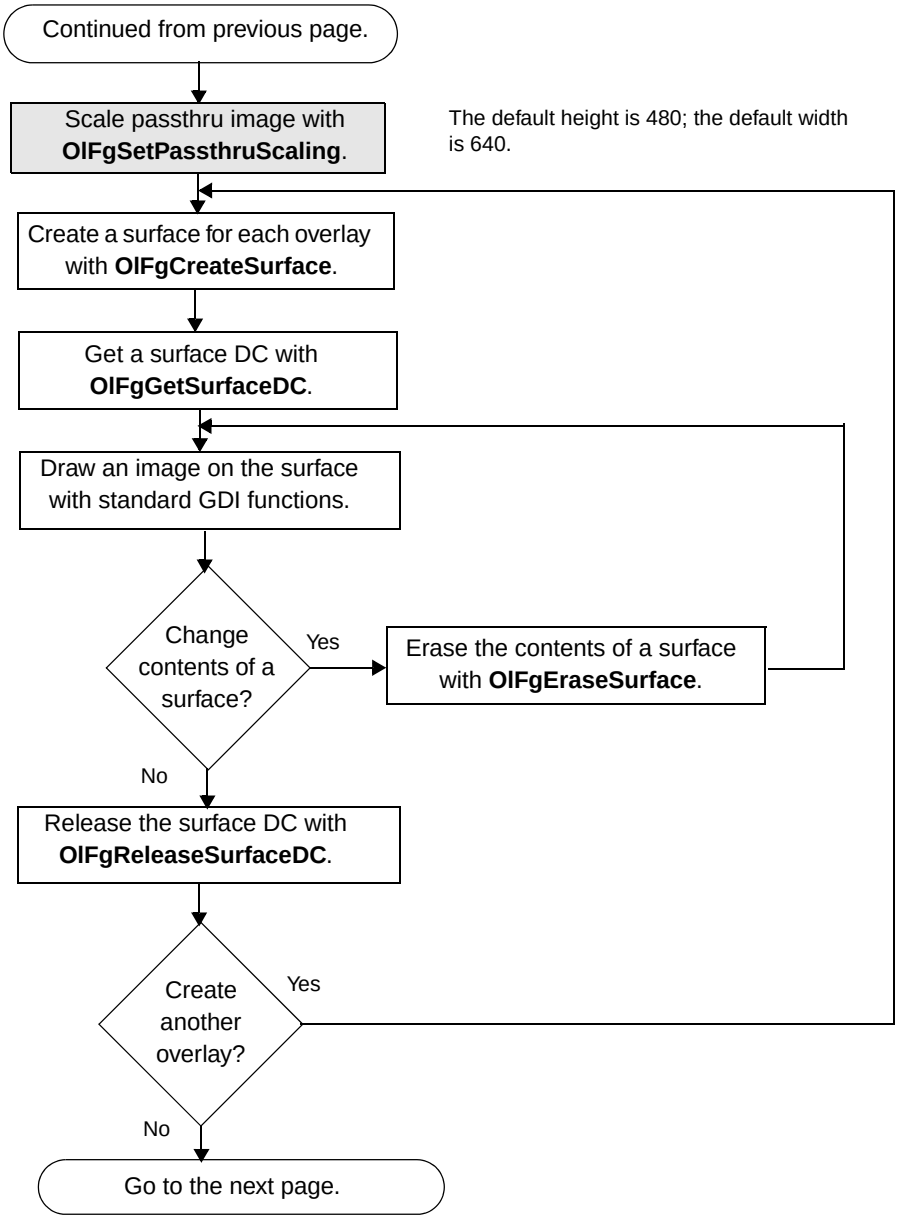
Passthru without Overlays (cont.)



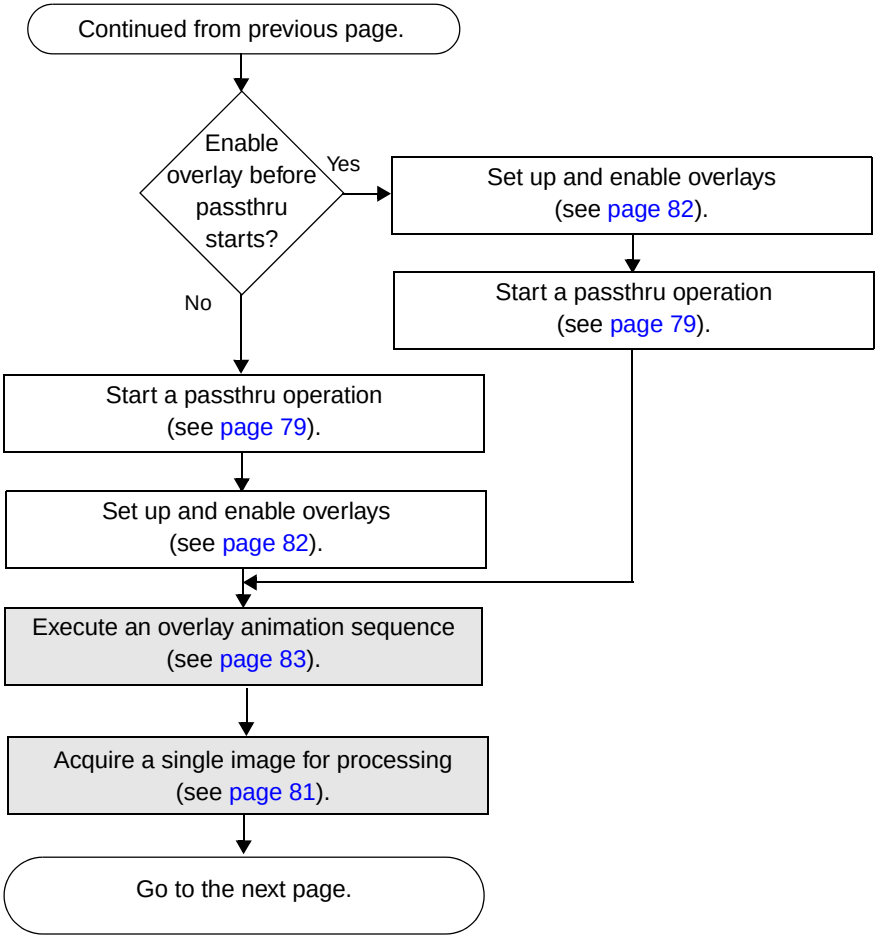
Passthru with Overlays



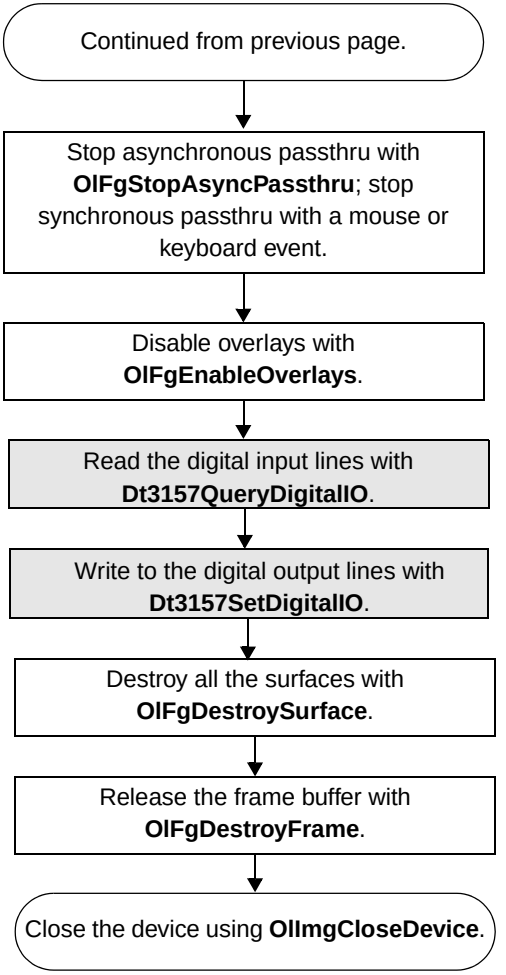
Passthru with Overlays (cont.)



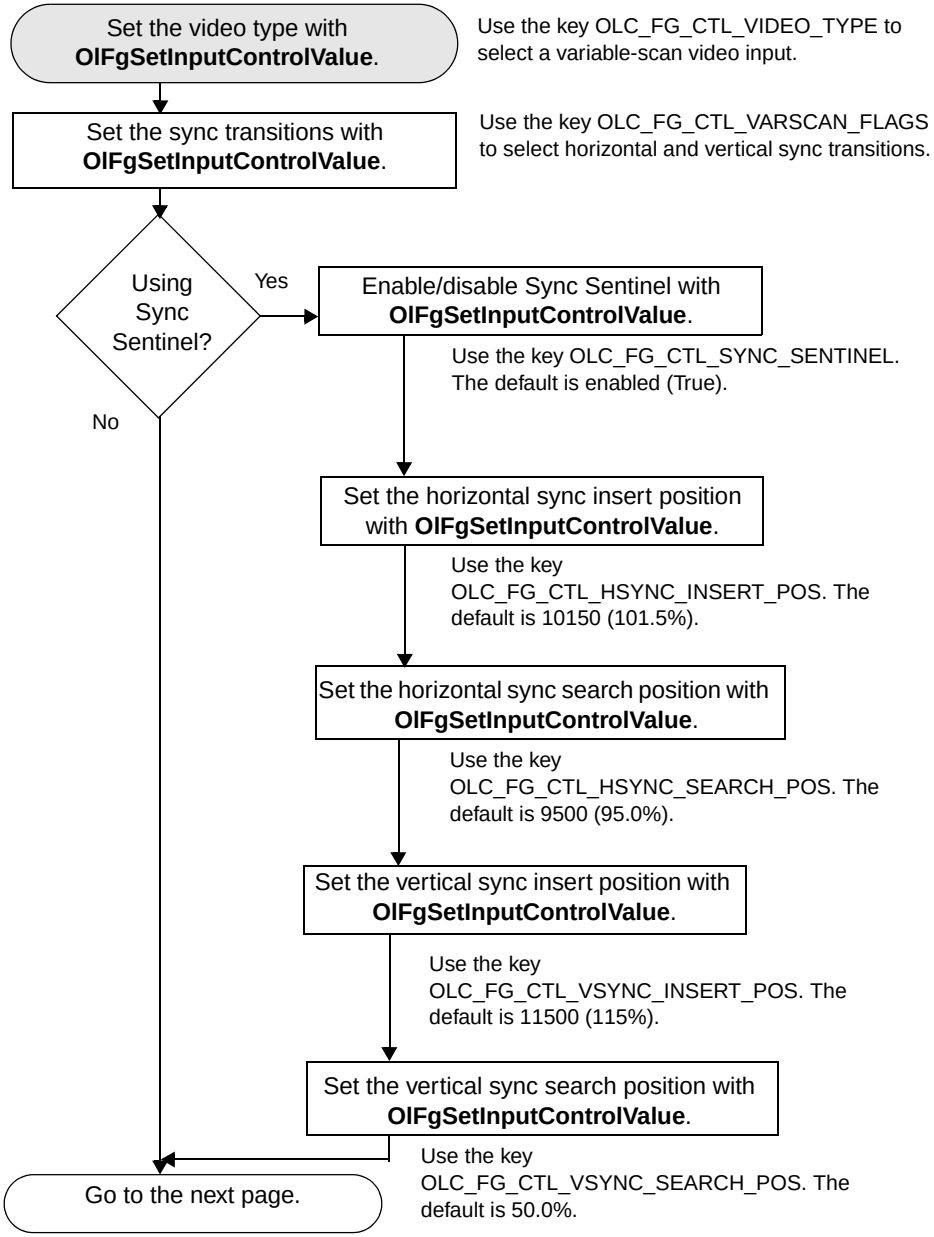
Passthru with Overlays (cont.)



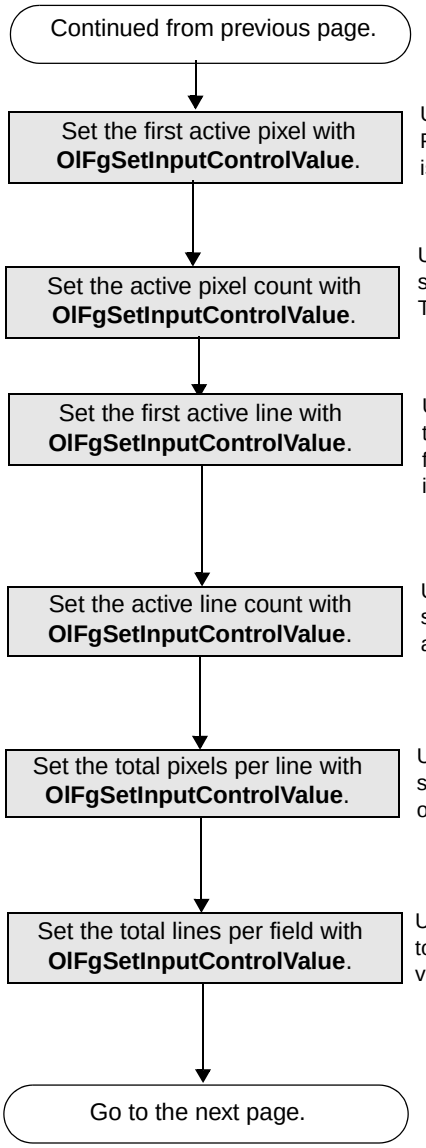
Passthru with Overlays (cont.)



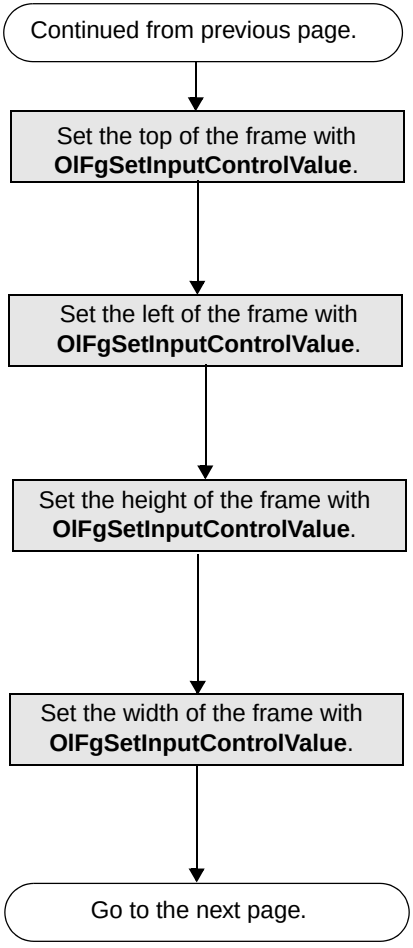
Set the Standard Controls for the Input Source



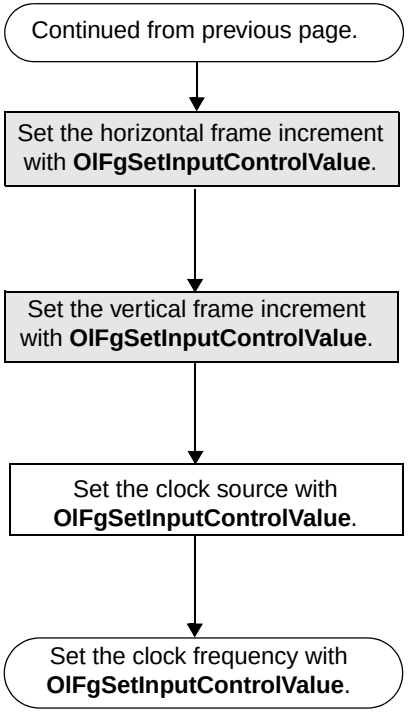
Set the Standard Controls for the Input Source (cont).



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



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



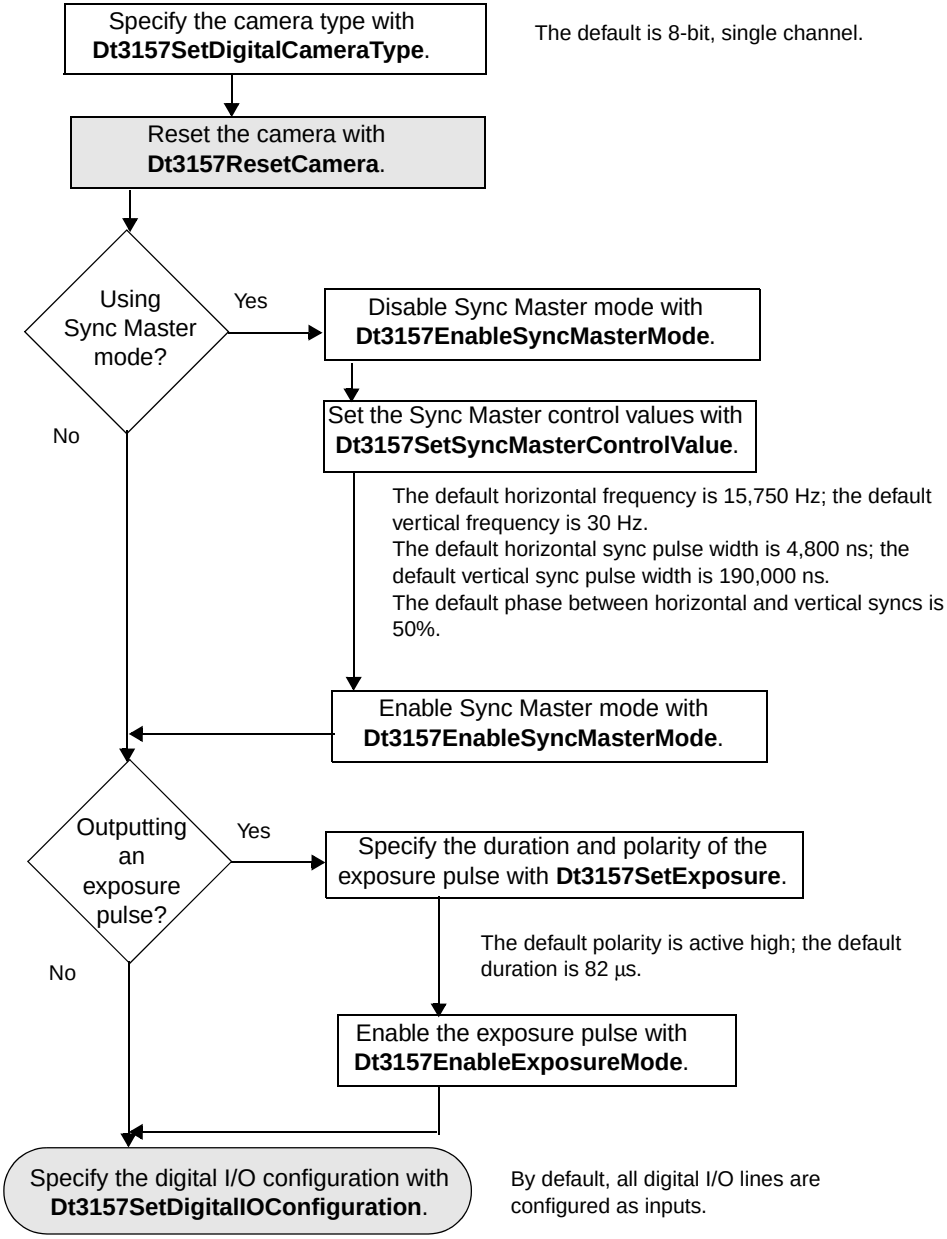
For single-channel mode, use the key OLC_FG_CTL_HOR_FRAME_INC to set the horizontal scale factor. For dual-channel mode, this value must be 1. The default is 1.

For single-channel mode, use the key OLC_FG_CTL_VER_FRAME_INC to set the vertical scale factor. For dual-channel mode, this value must be 1.The default is 1.

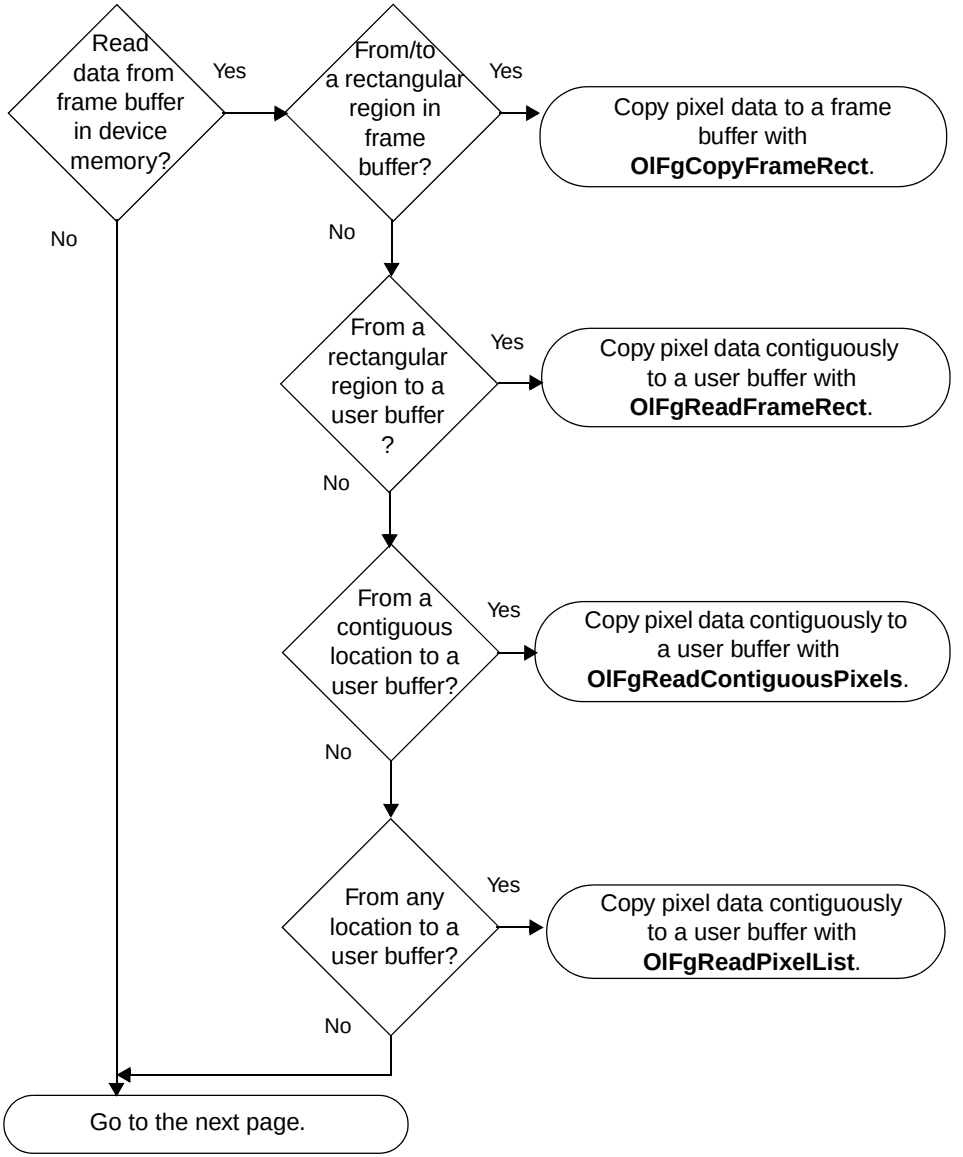
Use the key OLC_FG_CTL_CLOCK_SOURCE to set the pixel clock to internal or external.The default is external.

Use the key OLC_FG_CTL_CLOCK_FREQ to set the frequency of the internal clock source. The default frequency is 12,500,000 Hz.

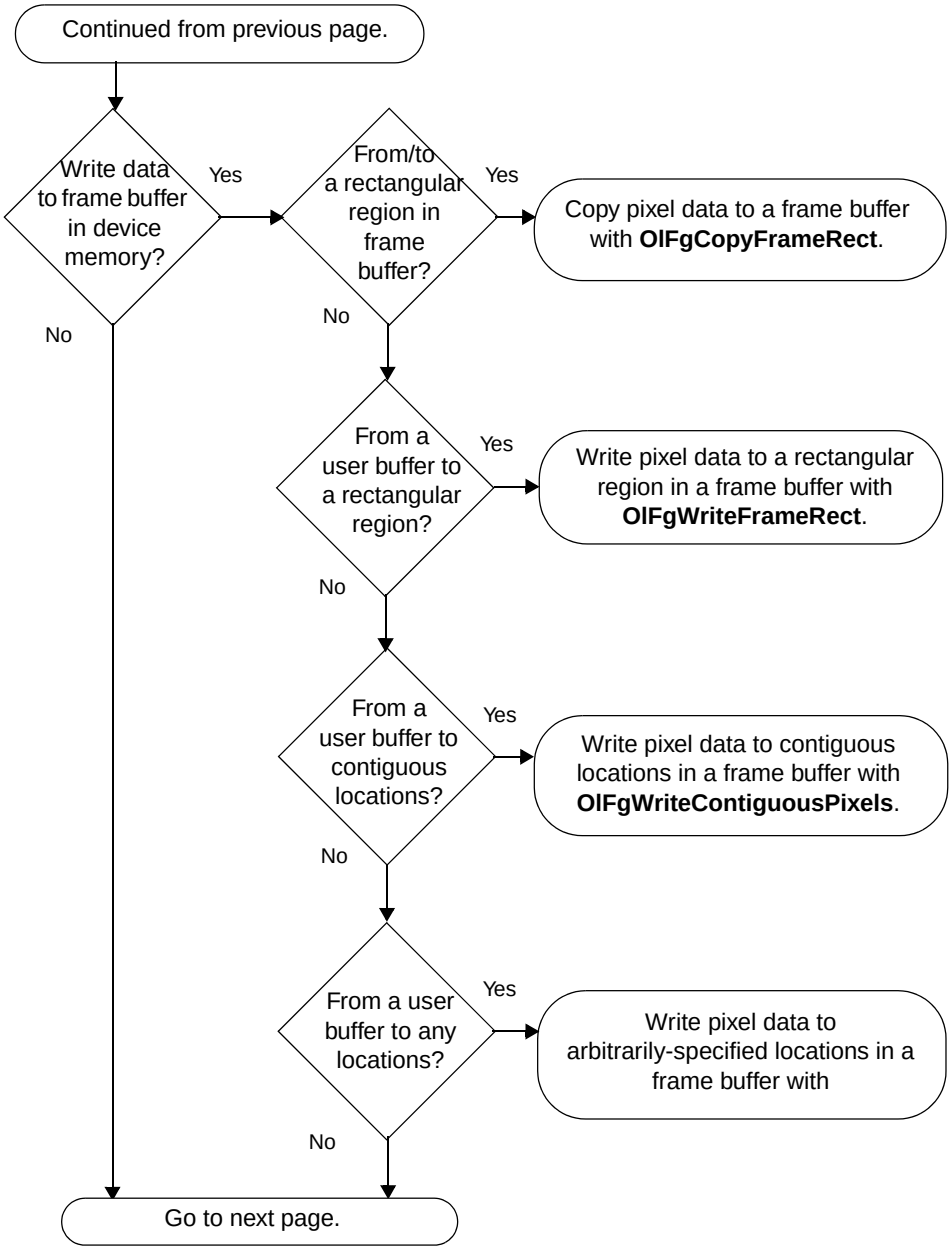
Set the DT3157-Specific Controls



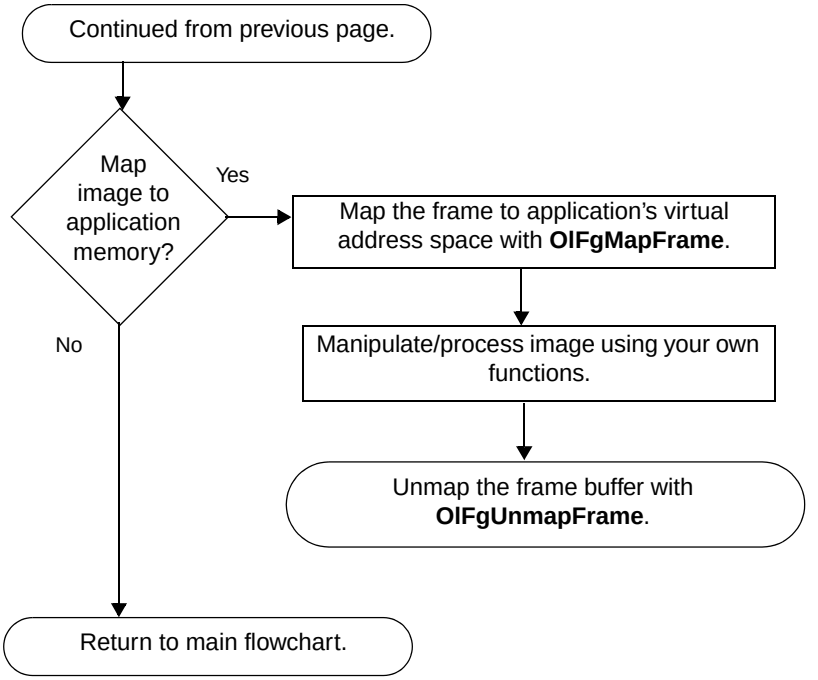
Process the Acquired Image



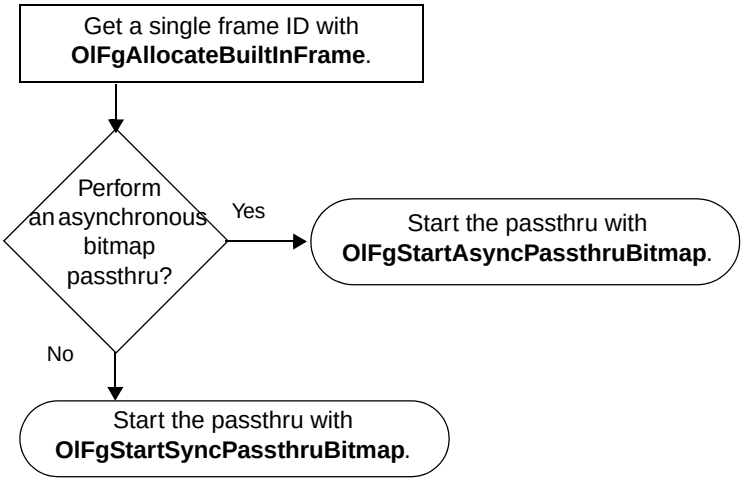
Process the Acquired Image (cont.)



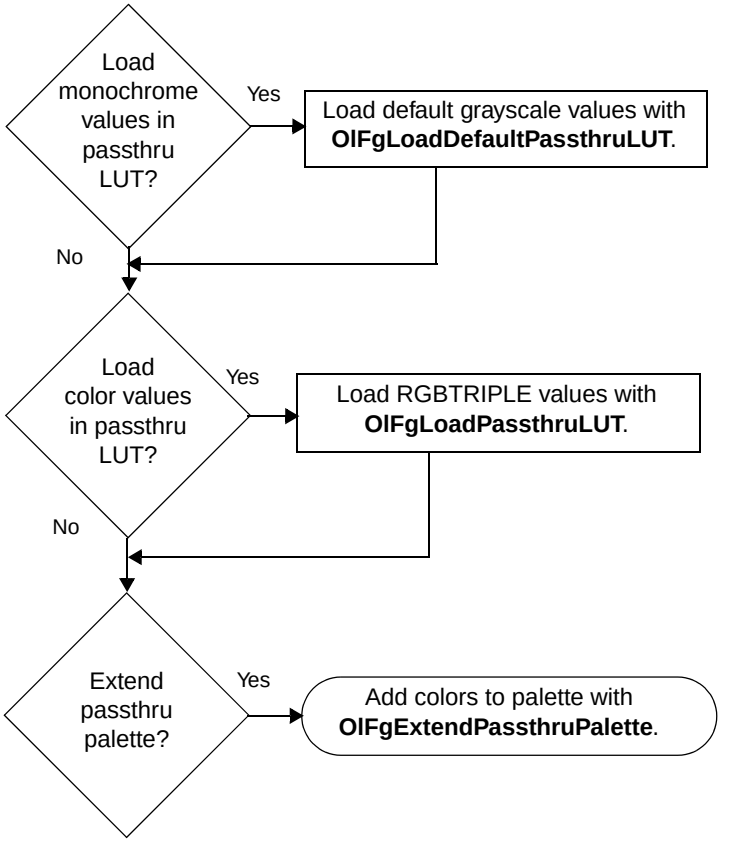
Process the Acquired Image (cont.)



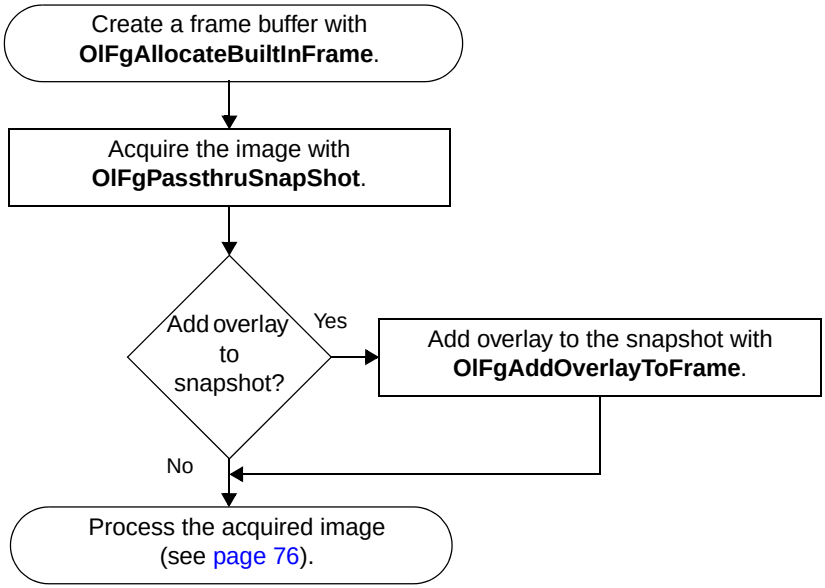
Start the Passthru Operation Mode



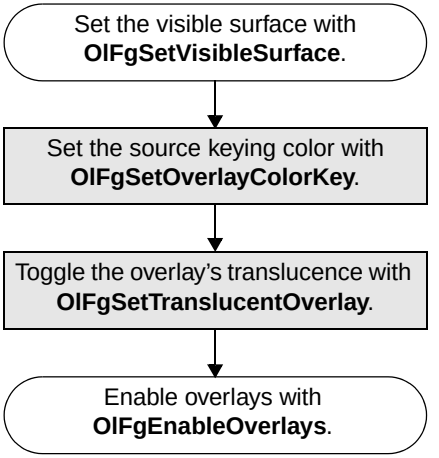
Change the Passthru LUT



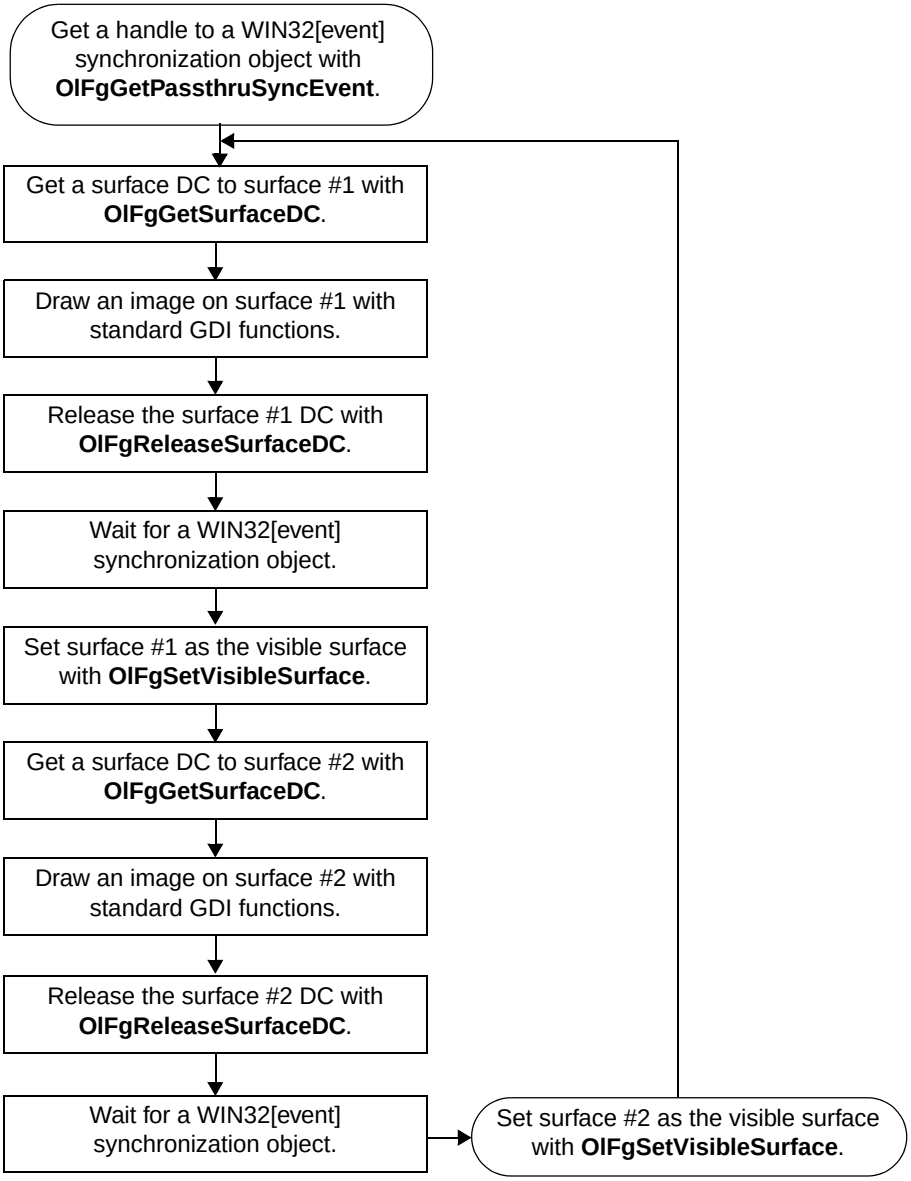
Take a Snapshot



Set up and Enable Overlays



Execute an Overlay Animation Sequence



Troubleshooting

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Service and Support 90
If Your Board Needs Factory Service 94

General Checklist

Should you experience problems using the DT3157 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 *DT3157 Getting Started Manual*.
4. Check that you have installed your hardware properly using the instructions in the *DT3157 Getting Started Manual*.
5. Check that you have installed and configured the device driver properly using the instructions in the *DT3157 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 16 to isolate and solve the problem. If you cannot identify the problem, refer to page 90.

Table 16: 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 DT3157 board is located is a PCI slot and that the board is correctly seated in the slot; see the instructions in the *DT3157 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 DT3157 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 16: 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 *DT3157 Getting Started Manual.*
	Electrical noise exists.	Check your connections; see the instructions in the *DT3157 Getting Started Manual.*
	The board is overheating.	Check environmental and ambient temperature; consult the board's specifications on page 98 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 *DT3157 Getting Started Manual.*
Computer does not boot.	Board is not seated properly.	Check that the slot in which your DT3157 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 *DT3157 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 98 of this manual.

Table 16: Troubleshooting Problems (cont.)

Symptom	Possible Cause	Possible Solution
System lockup.	Board is not seated properly.	Check that the slot in which your DT3157 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 *DT3157 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 DT3157 board and rebooting the system, then reinserting the network device.

Service and Support

If you have difficulty using the DT3157 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

Table 17 lists the DT3157 board's digital output electrical specifications for signals DIG_IO0 to DIG_IO7.

Table 17: Digital Output Electrical Specifications

Symbol	Parameter	Minimum	Maximum
IOH	HIGH Level Output Current	–	5.0 mA
IOL	LOW Level Output Current	–	10 mA
VOH	HIGH Level Output Voltage	2.4 V	–
VOL	LOW Level Output Voltage	–	0.5 V

Table 18 lists the DT3157 board's digital input electrical specifications for signals DIG_IO0 to DIG_IO7.

Table 18: Digital Input Electrical Specifications

Symbol	Parameter	Minimum	Maximum
V_{IH}	Input HIGH Level	2.0 V	5.5 V
V_{IL}	Input LOW Level	-0.3 V	0.8 V
C_{IN}	Input Capacitance	–	10 pF

Table 19 lists the DT3157 board's differential output electrical specifications for signals Frame Enable Out, Line Enable Out, Pixel Clock Out, and Expose.

Table 19: Differential Output Electrical Specifications

Symbol	Parameter	Minimum	Maximum
IOH	HIGH Level Output Current	–	–20 mA
IOL	LOW Level Output Current	–	20 mA
VOH	HIGH Level Output Voltage	2.5 V	–
VOL	LOW Level Output Voltage	–	0.5 V
VOD	Differential Output Voltage[a]	1.5 V	6.0 V
VOC	Common Mode Output Voltage[b]	–	±3.0 V

a. Test condition @ Vcc = MIN, Io = 0. The minimum VOD with a 100 Ω load is either 1/2 VOD or 2 V whichever is greater.
b. Test Condition @ RL = 100 Ω

Table 20 lists the DT3157 board's differential input electrical specifications for signals AD0 to AD15, Frame Enable In, Line Enable, In and Pixel Clock In.

Table 20: Differential Input Electrical Specifications

Symbol	Parameter	Minimum	Maximum
V_{IH}	Input HIGH Level	2.0 V	7.0 V
V_{IL}	Input LOW Level	–7.0 V	0.8 V
V_T	Threshold Voltage	2.4 V	
VOL	LOW Level Output Voltage	–300 mV	300 mV
V_{IC}	Common Mode Input Voltage		±7 V
V_{ID}	Differential Mode Input Voltage		±12 V

Table 21 lists the power, physical, and environmental specifications.

Table 21: Power, Physical, and Environmental Specifications

Features	Specifications
Power (+5 V)	1.8 A (typical)
Dimensions	6.875” (L) x 4.2” (H) (not including faceplate and connectors)
Weight	6.4 ounces (181.4 grams)
Operating Temperature Range	0 to 50° C (32 to 122° F)
Storage Temperature Range	25 to 70° C (-13 to 158° F)
Relative Humidity	0 to 90%, noncondensing

B

Connector Pin Assignments

The video input connector, J1, on the DT3157 is a SCSI-II 68-pin, subminiature 'D' shell connector that accepts the digital input signals using cables from Data Translation or cables that you design. Figure 7 illustrates the J1 connector pin orientation.

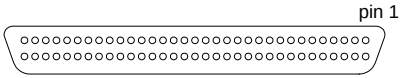

Figure 7: 68-pin DT3157 Connector (J1)

Table 22 lists the signals.

Note: The ADn signals (A channel) are used for single-channel mode (up to 16-bit operation). The BDn signals (B channel) are used (along with AD0 to AD7) for dual-channel operation. Signals DIG_IO0 to DG_IO7 are the eight programmable digital I/O lines.

Table 22: J1 Connector Pin Assignments

Pin	Signal Name	Pin	Signal Name
1	Ground	35	Ground
2	AD0 (+) (MSB)	36	AD0 (-) (MSB)
3	AD1 (+)	37	AD1 (-)
4	AD2 (+)	38	AD2 (-)
5	AD3 (+)	39	AD3 (-)
6	AD4 (+)	40	AD4 (-)
7	AD5 (+)	41	AD5 (-)
8	AD6 (+)	42	AD6 (-)
9	AD7 (+)	43	AD7 (-)
10	AD8 (+) or BD0 (+)	44	AD8 (-) or BD0 (-)
11	AD9 (+) or BD1 (+)	45	AD9 (-) or BD1 (-)
12	Ground	46	Ground
13	AD10 (+) or BD2 (+)	47	AD10 (-) or BD2 (-)
14	AD11 (+) or BD3 (+)	48	AD11 (-) or BD3 (-)
15	AD12 (+) or BD4 (+)	49	AD12 (-) or BD4 (-)
16	AD13 (+) or BD5 (+)	50	AD13 (-) or BD5 (-)
17	DIG_IO0	51	DIG_IO1
18	DIG_IO2	52	DIG_IO3
19	AD14 (+) or BD6 (+)	53	AD14 (-) or BD6 (-)
20	AD15 (+) or BD7 (+) (LSB)	54	AD15 (-) or BD7 (-) (LSB)
21	External Trigger In	55	Ground
22	Reserved	56	Reserved

Table 22: J1 Connector Pin Assignments (cont.)

Pin	Signal Name	Pin	Signal Name
23	Reset Out (+)	57	Reset Out (-)
24	Frame Enable Out (+)	58	Frame Enable Out (-)
25	Frame Enable In (+)	59	Frame Enable In (-)
26	Line Enable In (+)	60	Line Enable In (-)
27	Line Enable Out (+)	61	Line Enable Out (-)
28	Pixel Clock Out (+)	62	Pixel Clock Out (-)
29	Pixel Clock In (+)	63	Pixel Clock In (-)
30	Expose (+) or SHUT(+)	64	Expose (-) or SHUT(-)
31	DIG_IO4	65	Ground
32	DIG_IO5	66	Ground
33	DIG_IO6	67	DIG_IO7
34	Ground	68	Ground

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Windows XP Procedures 115

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 106); and
- Uninstalling the device driver, if necessary (on page 108).

Adding a Board to the Device Driver Configuration after System Startup

To add a new board to the DT3157 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 *DT3157 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 DT3157 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 DT3157 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\DT3157\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 DT3157 board to the configuration.
    The DT3157 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 DT3157 board is allowed.
    The DT3157 Configuration dialog box appears.
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 **Camera Type**, specify the type of digital camera attached to the input source of the board. Note that selecting the camera type selects the number of bytes required to store pixel data.

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. For a 640-by-480 image, using an 8-bit digital camera, 1 MB holds approximately three frames. 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. Click **Done**.
    The DT3157 Device Driver Configuration dialog box is redisplayed; you can see the name of the board you just added.

21. Click **Close** to end the DT3157 configuration.

22. 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.

23. 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 **DT3157 Mach Series Frame Grabber**.
   The DT3157 Device Driver Properties dialog box appears.
5. Click **Use this Media Control device**, then click **Settings**.
   The DT3157 Device Driver Configuration dialog box appears.
6. Select the name of the DT3157 board that you want to modify.
7. Click **Modify** to modify the board.
   The DT3157 Configuration dialog box appears.
8. 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.
9. For **Camera Type**, specify the type of digital camera attached to the input source of the board. Note that selecting the camera type selects the number of bytes required to store pixel data.
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. For a 640-by-480 image, using an 8-bit digital camera, 1 MB holds approximately three frames. 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. Click **Done**, then click **Close** to end the DT3157 configuration.
12. If you made any changes to the default settings, click **OK** to confirm that you need to restart Windows before the changes take effect.
13. Click **OK** to close the **DT3157 MACH Series Frame Grabber Properties** dialog box, then click **OK** to close the **Multimedia Properties** or **Sounds and Multimedia Properties** dialog box.

14. Close the Control Panel.

15. 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 DT3157 Device Driver. However, if you are no longer using the DT3157 board with the supported software, you can uninstall the DT3157 Device Driver from the system.

To uninstall the device driver, perform the following steps:

1. Click **Start/Programs/Data Translation, Inc/MACHUnLd**.

2. Click **DT3157**.

3. Click **OK**.
The DT3157 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 111);
- Removing a board from the device driver configuration (on page 113); and
- Uninstalling the device driver, if necessary (on page 114).

Adding a Board to the Device Driver Configuration

To add a board to the DT3157 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 *DT3157 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 DT3157 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 DT3157 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 **DT3157 MACH Series Frame Grabber**, then click **Properties**.
11. Click the **Properties** tab.
12. Double-click **Multimedia Drivers**.
13. Click **DT3157 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. 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 **Camera Type**, specify the type of digital camera attached to the input source of the board. You can change this setting at a later time using software. Note that selecting the camera type selects the number of bytes required to store pixel data.
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. For a 640-by-480 image, using an 8-bit digital camera, 1 MB holds approximately three frames. 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. Click **Done**.
    The DT3157 Device Driver Configuration dialog box is redisplayed with the name of the board you just added.

21. Click **Close** to finish.
    A dialog box appears, indicating that you must restart Windows 2000 for the changes to take effect.

22. Click **Restart Now** to restart your system.

Modifying a Board in the Device Driver Configuration

To modify the board settings in the DT3157 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 **DT3157 MACH Series Frame Grabber**, then click **Properties**.
5. Click the **Properties** tab.
6. Double-click **Multimedia Drivers**.
7. Click **DT3157 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 DT3157 Device Driver Configuration dialog box appears.

10. 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.

11. For **Camera Type**, specify the type of digital camera attached to the input source of the board. You can change this setting at a later time using software. Note that selecting the camera type selects the number of bytes required to store pixel data.

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. For a 640-by-480 image, using an 8-bit digital camera, 1 MB holds approximately three frames. 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. Click **Done**.
    The DT3157 Device Driver Configuration dialog box reappears with the name of the board you just modified.

14. Click **Close**.

15. 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 DT3157 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 **DT3157 MACH Series Frame Grabber**, then click **Properties**.
5. Click the **Properties** tab.
6. Double-click **Multimedia Drivers**.
7. Click **DT3157 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 DT3157 boards you want to remove are removed.
11. Click **Close**.
    The Drivers dialog box appears. The DT3157 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 114. 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 DT3157 boards in your system using the preceding section before uninstalling the device driver.

Generally, you will always require the DT3157 Device Driver. However, if you are no longer using the DT3157 board with the supported software, you can uninstall the DT3157 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 **DT3157 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 117);
- Removing a board from the device driver configuration (on page 119); and
- Uninstalling the device driver, if necessary (on page 120).

Adding a Board to the Device Driver Configuration

To add a board to the DT3157 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 *DT3157 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 DT3157 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 DT3157 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 DT3157 MACH Series Frame Grabber**.
12. Click **Properties**.
13. Double-click **Multimedia Drivers**.
14. Click **DT3157 MACH Series Frame Grabber**, then click **Properties**.
15. Click **Settings**.
16. Click **Add New** to add a DT3157 board to the configuration.
    The DT3157 Installation dialog box appears for the new board.
17. Enter any unique name (or alias) for the DT3157 board, then click **Add**. Only one alias per installed board is allowed.
    The DT3157 Configuration dialog box appears.
18. 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.
19. For **Camera Type**, specify the type of digital camera attached to the input source of the board. You can change this setting at a later time using software. Note that selecting the camera type selects the number of bytes required to store pixel data.

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. For a 640-by-480 image, using an 8-bit digital camera, 1 MB holds approximately three frames. 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. Click **Done**.
The DT3157 Configuration dialog box is redisplayed; you can see the name of the board you just added.

22. Click **Close** to finish.
A dialog box appears, indicating that you must restart Windows XP for the changes to take effect.

23. 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 DT3157 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 DT3157 MACH Series Frame Grabber**.
5. Click **Properties**.
6. Click the **Properties** tab.

7. Double-click **Multimedia Drivers**.
8. Click **DT3157 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 DT3157 Device Driver Configuration dialog box appears.
11. 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.
12. For **Camera Type**, specify the type of digital camera attached to the input source of the board. You can change this setting at a later time using software. Note that selecting the camera type selects the number of bytes required to store pixel data.
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. For a 640-by-480 image, using an 8-bit digital camera, 1 MB holds approximately three frames. 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. Click **Done**.
    The DT3157 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 DT3157 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 DT3157 MACH Series Frame Grabber**.
5. Click **Properties**.
6. Click the **Properties** tab.
7. Double-click **Multimedia Drivers**.
8. Click **DT3157 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 DT3157 boards you want to remove are removed.
12. Click **Close**.
    The Drivers dialog box appears. The DT3157 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 120. 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 DT3157 boards in your system using the preceding section before uninstalling the device driver.

Generally, you will always require the DT3157 Device Driver. However, if you are no longer using the DT3157 board with the supported software, you can uninstall the DT3157 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 DT3157 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.

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