

Teledyne LeCroy Envision X84 CSI-2 Protocol Suite

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Important Information

Safety and Handling

The circuit boards are delicate and require care in handling and installation. Do not remove circuit boards from their protective plastic coverings or from the shipping box until you are ready to install the boards.

If a board is removed from the chassis for any reason, be sure to store it in its original shipping box. Do not store boards on top of workbenches or other areas where they might be susceptible to damage or exposure to strong electromagnetic or electrostatic fields. Store circuit boards in protective anti-electrostatic wrapping and away from electromagnetic fields.

Disclaimer

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Table of Contents

T/	ABLE O	F CONTENTS	3		
FI	GURES		4		
1	ABC	OUT THIS MANUAL	5		
2	ENVISION X84 PROTOCOL ANALYZER				
- 2	ENVISION X84 CSI-2 PROTOCOL SUITE EVENTS OVERVIEW				
3		ISION X64 CSI-2 PROTOCOL SUITE EVENTS OVERVIEW			
4	SOF	TWARE INSTALLATION AND ANALYZER SETUP	9		
	4.1 4.2	INSTALLING ENVISION X84 CSI-2 PROTOCOL SUITE SETTING UP THE ENVISION X84 PROTOCOL ANALYZER	9 11		
5	ENV	ISION X84 CSI-2 PROTOCOL SUITE			
	5.1 5.1.1 5.1.2 5.1.3 5.1.4 5.1.5 5.2 5.2.1 5.2.2 5.2.3 5.2.4 5.3 5.4 5.5	ENVISION X84 CSI-2 PROTOCOL SUITE CONTROL PANEL Control Section Event Filters Section Setup Section Looping Captures Event Statistics Section ENVISION X84 CSI-2 PROTOCOL SUITE ANALYZER PANEL Event Tab Capture Setup Tab. Video Tab PRBS Tab CTS TAB GPIO TAB TIMING ANALYSIS TAB.			
6	ENV	ISION X84 CSI-2 PROTOCOL SUITE MENU OPTIONS			
	6.1 6.2 6.3 6.4	FILE MENU CONNECT MENU MODE MENU OPTIONS MENU	28 29 29 		
7	ENV	ISION X84 PROTOCOL ANALYZER APIS			
8	ENV	ISION X84 PROTOCOL ANALYZER C-PHY TIMING LIMITATIONS			

Figures

Figure 1 - Envision X84 CSI-2 Protocol Suite	6
Figure 2 - Envision X84 Protocol Analyzer	7
Figure 3 – MIPI C-PHY Timing Diagram	8
Figure 4 - Envision X84 CSI-2 Protocol Suite	12
Figure 5 - Control Panel	13
Figure 6 - Control Section	13
Figure 7 - Filters Section	14
Figure 8 - Event Code Filters Dialog	14
Figure 9 - Setup Section	15
Figure 10 - Setup Popup Menus	15
Figure 11 - Criteria Setup Dialog	15
Figure 12 - Statistics Section	16
Figure 13 - Analyzer Panel	17
Figure 14 - Low Power Packets	18
Figure 15 - Detailed Event Information Pop-up	18
Figure 16 - Event Data Dialog	19
Figure 17 - Find Menu	19
Figure 18 - Mark Events Menu	20
Figure 19 - Marked Event Block	20
Figure 20 - Capture Setup Tab	21
Figure 21 - Video Tab	22
Figure 22 - Image Format	22
Figure 23 - PRBS Tab	23
Figure 24 - CTS Tab	24
Figure 25 - GPIO Tab	24
Figure 26 - Timing Analysis Tab	27
Figure 27 - File Menu	28
Figure 28 - Connect Menu	29
Figure 29 - Mode Menu	29
Figure 30 - Options Menu	30

1 About This Manual

Manual Scope and Organization

This manual is intended to describe the capabilities and operation of the Envision X84 Protocol Analyzer and Envision X84 CSI Protocol Suite software application.

Conventions

monospace	examples of syntax and programming examples
bold	denotes items that you must enter or select. Also denotes default conditions of API parameters.
italic	specialized terms,

Related Documentation

Envision_X84_v1018 Datasheet <u>http://teledynelecroy.com/files/pdf/envision_x84_v1018.pdf</u> Envision X84 Protocol Analyzer API Manual

2 Envision X84 Protocol Analyzer

The Envision X84 Protocol Analyzer has a robust event-based infrastructure that is used for capturing detailed CSI-2 protocol information on a C/D-PHY bus during CSI camera testing. Using this data, real-time viewing of CSI-2, C/D-PHY operation is simple. For example, time correlated viewing of C/D-PHY CSI-2 events, both HS and LP, including errors. Also, per-lane low-level C/D-PHY states can be viewed and correlated with high-level protocol, to debug errors. This document explains the use and operation of the Envision X84 CSI-2 Protocol Suite and the functionality of the Envision X84 Protocol Analyzer.

🔤 CSI Protocol Tool							- 🗆	×
File Connect Mod	le Find Mark E	vents Loop	Options He	lp				
C-Phy	Event Filters		Capture Setup			Event Statistics		
TELEDYNE LECROY	All Events		Start on Even	s				
Everywhereyoulook	Show Error		Stop on Even	s				
Lanes:	Long pack	ets	···· Trigger on Eve	ents				
LP Frequency: 10 MHz \sim		tets	⊡ · Timeout					
US Sampla Pata (Mana):	Phy Events	3	····· 100 secor	nds				
Ho Salliple Nate (Msps).		w Level						
Detect								
			_					
PL 🖤 P 🖤 S 🖤 WC 🖤	Edit	Disable All	Loop Enable	Start C	apture			
Events Contu	m Satura Mide		CTS Vid	aa Anabusia	GRIO	Timing Analysis		
Capiu	re setup Vide	eo		eo Analysis	GFIO	Timing Analysis		
Index Time	Delta Time	Event Code	Event					-
397 171.565 uS	17.500 nS	0x02	Line Start (Line	14)				
401 171.632 uS	67.500 nS	0x48	HS Burst End					
407 172.003 uS	370.000 nS	0c47	Start of HS Bur	et				
408 172.022 uS	20.000 nS	0x24	RGB888 Data	Payload Size: 21	60 bytes			
412 181.565 uS	9.543 uS	0x48	HS Burst End					
418 181.933 uS	367.500 nS	0:47	Start of HS Bun	st				
413 181.300.05	17.000 n5	DCU3	Line End (Line	14)				
422 102.01505	1.6385	0~47	Start of HS Burn					
430 183.673 uS	20.000 nS	0x02	Line Start (Line	15)				
433 183.735 uS	62.500 nS	Dc48	HS Burst End					
440 184.108 uS	372.500 nS	0x47	Start of HS Bun	st				
441 184.127 uS	20.000 nS	0x24	RGB888 Data	Payload Size: 21	60 bytes			
444 193.667 uS	9.540 uS	0x48	HS Burst End					
451 194.038 uS	370.000 nS	0x47	Start of HS Bur	st				
452 194.055 uS	17.500 nS	0x03	Line End (Line	15)				
456 194.123 uS	67.500 nS	0x48	HS Burst End					
462 195.758 uS	1.635 uS	0x47	Start of HS Bur	st				
463 195.778 uS	20.000 nS	0x02	Line Start (Line	16)				
466 195.840 uS	62.500 nS	0x48	HS Bunst End					Ŧ
No Instrument Connected	ł					Offline		:

Figure 1 - Envision X84 CSI-2 Protocol Suite

The Envision X84 Protocol Analyzer is connected to the host computer via 1 Gb Ethernet connection and supports up to 3 lanes in C-Phy mode and 4 lanes in D-Phy mode, with frequencies up to 2500 Msps. The Analyzer connects to the device under test with MMCX connectors for each lane.



Figure 2 - Envision X84 Protocol Analyzer

3 Envision X84 CSI-2 Protocol Suite Events Overview

The Envision X84 Protocol Analyzer captures all CSI protocol packet events along with low-level state events and payload data into separate on-board memories. All events are time stamped for detailed time based debugging. The State Event memory is 32MB deep, the Packet Event memory is 256MB deep (each event is 16 bytes) and the Payload memory is 1.5 GB deep allowing the saving of more than 100 images depending on image size and image format.

The Envision X84 CSI-2 Protocol Suite is used to display and analyze the captured events. All events except for Packet Events (item #4 below) are catagorized as State Events and are saved in the State Event memory with a specific State Event code. Packet Events are stored in the Packet Event memory with the MIPI CSI-2 Data Type Code, while Long Packet Payload data is stored in the Payload memory.

Below in Figure 3, the specific timing of the low-level state events and the packet event of a CSI-2 transaction is detailed.



Figure 3 – MIPI C-PHY Timing Diagram

- 1. Low-level per lane Exit Stop State Events
 - 0x4F Exit Stop State Lane 0 Event
 - 0x60 Exit Stop State Lane 1 Event
 - 0x6B Exit Stop State Lane 2 Event
 - 0x76 Exit Stop State Lane 3 Event (D-PHY Only)
- 2. Low-level per lane Enter HS Mode Events (Sync Word Received)
 - 0x4C Enter HS Mode Lane 0 Event
 - 0x5D Enter HS Mode Lane 1 Event
 - 0x68 Enter HS Mode Lane 2 Event
 - 0x73 Enter HS Mode Lane 3 Event (D-PHY Only)
- Start of HS Burst Event (All Active Lanes Enter HS Mode) 0x47 - Start of HS Burst Event
- 4. Packet Event (Packet Data received) CSI Packet Data Type Code Event
- HS Burst End Event (Post Word Received on any Active Lane) 0x48 - HS Burst End Event
- 6. Low-level per lane Exit HS Mode Events (Post Word Received)
 - 0x4D Exit HS Mode Lane 0 Event
 - 0x5E Exit HS Mode Lane 1 Event
 - 0x69 Exit HS Mode Lane 2 Event
 - 0x74 Exit HS Mode Lane 3 Event (D-PHY Only)
- 7. Low-level per lane Enter Stop State Events
 - 0x4E Enter Stop State Lane 0 Event
 - 0x5F Enter Stop State Lane 1 Event
 - 0x6A Enter Stop State Lane 2 Event
 - 0x75 Enter Stop State Lane 3 Event (D-PHY Only)

4 Software Installation and Analyzer Setup

4.1 Installing Envision X84 CSI-2 Protocol Suite

The Envision X84 CSI-2 Protocol Suite is installed with the setup.exe in the installation package available for the Teledyne LeCroy website. <u>Envision X84 CSI-2 Protocol Suite</u> <u>Analysis Software</u>.

Click on the setup.exe file supplied with the Analyzer to start the installation:



Click the next button to continue:

🛃 CSI Protocol Suite					×			
Select Installation Folde	r			[
The installer will install CSI Protocol Suite to the following folder.								
To install in this folder, click "Next". To install to a different folder, enter it below or click "Browse".								
Eolder: C:\Program Files (x86)\LeCroy\CSI Pr	rotocol Suite\		E	frowse				
		[D	isk Cost				
Install CSI Protocol Suite for yourself, c	r for anyone who us	es this compute	r:					
	Cancel	< Back		Next	>			

Leave the installation folder as the deafualt or browse to the a specific location. Select who the tool is to be installed for and click the next button to continue:



Click the next button to start the installation (click yes to allow Windows to install the software):

🕞 CSI Protocol Suite			—		×			
Installation Complete								
CSI Protocol Suite has been successfully	installed.							
Click "Close" to exit.								
Please use Windows Update to check for any critical updates to the .NET Framework.								
	Cancel	< Back		Cla	ise			

Click close to exit.

Once the software is installed the Envision X84 CSI-2 Protocol Suite can be accessed from the standard Window menus at: Start/AllPrograms/CSITool.exe

By default, the CSI Analyzer software is located at:

C:\Program Files (x86)\Teledyne LeCroy\CSITool

The following folders and files are created during the installation:

Bin directory - Contains executables and DLL used to control the Analyzer Envision X84 CSI-2 Protocol Suite.exe - Tool to control the CSI 2.0 Analyzer. TevCsi.dll - 'C' DLL. TevCsi.lib – 'C' Library. NewtonSoft.Json.dll – Utility DLL CsiConfig.json – Configuration file. Plugins Directory – Directory containing optional tool plugins

Include directory – Contains 'C' header files TevCsi.h – CSI Analyzer API header file TevCsiTypes.h – CSI Analyzer Data Types header file

4.2 Setting up the Envision X84 Protocol Analyzer

Follow the steps below to setup the Envision X84 Protocol Analyzer:

- 1. Connect the AC Power Cord to the Analyzer
- 2. Setup host PC Ethernet Port
 - a. Use a unused Ethernet Adapter on the host PC or use a USB 3.0 to Gigabit Ethernet Adapter
 - b. Set the IP address of the Ethernet Adapter to 192.168.137.1
- 3. Connect a Ethernet cable from the host PC to the Analyzer
- a. The IP address of the Analyzer is 192.168.137.1004. Connect the CSI DUT to the lane inputs using MMCX connectors
- 5. Power on the Analyzer.

The Analyzer Status LED has three states;

- RED Power applied internal processor not booted
- YELLOW Internal processor booted, waiting for Tool connection

GREEN - Tool connected

Once power is applied and the internal processor boots, launch the Envision X84 CSI-2 Protocol Suite and connect to the Analyzer using the Connect menu.

5 Envision X84 CSI-2 Protocol Suite

The Envision X84 CSI-2 Protocol Suite is used to configure and start captures of CSI 2.0 Protocol Events from the Device Under Test. Using the Envision X84 CSI-2 Protocol Suite GUI users setup the number of events to be captured, view and analyze the captured events, view and analyze any video frames that have been captured.

🔤 CSI Prot	tocol Tool					- 🗆 X
File Co	nnect Mode	Find Mar	rk Events Loop	Options Help		
C-Phy		Event Filters		Capture Setup	Event Statistics	
TEL	EDYNE LECROY	All Ever	nts	: Start on Events		
	1	Show F	itors	Stop on Events		
Lanes:	1 ~		ackets	Trigger on Events		
LP Frequence	y: 10 MHz 🗸	Short P	ackets	Timeout		
US Sample Bate (Maps):			ents	In 100 seconds		
HS Sample F	Rate (Msps):	Exclude	e Low Level			
Detect			s			
		L				
PL 🔍 P 🔍	🖲 S 🔍 WC 🜑	Edit	Disable All	Loop Enable Start Capture		
Evente						
Events	Capture	Setup	Video	CTS Video Analysis GPIO	Timing Analysis	
Index	Time	Delta Time	Event Code	Event		-
397	171.565 uS	17.500 nS	0x02	Line Start (Line 14)		
401	171.632 uS	67.500 nS	Ox48	HS Burst End		
407	172.003 uS	370.000 nS	0c47	Start of HS Burst		
408	172.022 uS	20.000 nS	0x24	RGB888 Data Payload Size: 2160 bytes		
412	181.565 uS	9.543 uS	0x48	HS Burst End		
418	181.933 uS	367.500 nS	0c47	Start of HS Burst		
419	181.950 uS	17.500 nS	0x03	Line End (Line 14)		
422	182.015/05	55.000 nS	0x48	HS Burst End		
429	183.653.05	1.638 05	0.02	Start of HS Burst		
430	183.67343	20.000 n5	UXU2	Line Statt (Line 15)		
433	104 1000	979 600 eP	0.45	Clast of US Durant		
440	104.10003	372.300 h3	0.24	DCD000 Date: Destand Cree 2100 leater		
441	109.127.03	20.000 no	0.49	Histopo Data Fayload Size: 2160 bytes		
451	194 0395	320,000 pS	0~47	Start of US Puret		
452	194.055.05	17.500 aS	0x03	Lina End (Lina 15)		
456	194.123.05	67 500 nS	0c48	HS Burst Ford		
462	195.758 uS	1.635 uS	0x47	Start of HS Burst		
463	195.778 uS	20.000 nS	0x02	Line Start (Line 16)		
466	195.840 uS	62.500 nS	0x48	HS Bunst End		+
<u> </u>						
No Instrume	ent Connected				Offline	

Figure 4 - Envision X84 CSI-2 Protocol Suite

The Envision X84 CSI-2 Protocol Suite GUI is split into halves, the top half, the Control Panel, is used to setup and control the Analyzer and the bottom half, the Analyze Panel, has multiple tabs to analyze and view the captured events and images

5.1 Envision X84 CSI-2 Protocol Suite Control Panel

The Envision X84 CSI-2 Protocol Suite Control Panel is shown in Figure 5, it allows the user to setup the capture criteria and initiate captures. The Control Panel is broken into different sections. The Control Section, the Event Filter Section, the Capture Setup Section and the Statistics Section. Each of thee sections are explain in detail below.

CSI Protocol Tool		—	×
File Connect Mode Find M C-Phy Event Filters Evenythereyoutock Image: Im	Iark Events Loop Options Help rents Capture Setup Event Statistics rents Start on Events Start on Events packets Tigger on Events Packets Timeout Event Statistics Disable All Loop Enable		

Figure 5 - Control Panel

5.1.1 Control Section

The Control section is used to select the number of lanes to capture using the lanes dropdown Lanes: 3 Changing lanes reconfigures the Analyzer to operate on that many lanes. The LP Frequency control is used to set the LP Frequency used during LP Read Responses. The HS Sample Rate displays the HS Sample Rate that the HS data was transmitter in the CPHY Physical Layer and is used to program the HS Sample Rate for the DPHY Physical Layer. The Status Lights display error conditions of the Payload Memory Overflow (PL), Packet Memory Overflow (P), State Memory Overflow (S) and Lane Word Count Mismatch error (WC).



Figure 6 - Control Section

5.1.2 Event Filters Section

The Event Filters section is used filter Events in the Event Viewer. The built-in filters are shown in Figure 7. Selecting any of the filters will display only the selected Events. Selecting the 'Exclude Low Level Events' filter will exclude all Low-Level State events except for the Start of HS Burst (0x47) and HS Burst End (0x48) events from the Events Display. Clicking the Disable All button will de-select all the filters and display all the events. The user can add their own custom event filters by click Edit button. This will display the Event Code Filter Dialog.

Event Filters							
····· 🔽 All Events							
Show Errors							
Phy Events							
Exclude Low Level Ever							
Triggers							
• الله الله الله الله الله الله الله الل							
Edit Disable All							

Figure 7 - Filters Section

Event Code Filters							
0x1: V Sync Start							
Filter Name*	Included Codes	Excluded Codes					
Show Errors	All events with errors						
Long Packets	0x19,0x0B,0x29,0x39,0x09,0x0A,0x3D,0x0E,0x2C,0x1E,0x3E,0x						
Short Packets	0x02,0x12,0x06,0x15,0x05,0x13,0x23,0x03,0x31,0x21,0x14,0x2						
Phy Events	0x4C,0x5D,0x68,0x73,0x4E,0x5F,0x6A,0x75,0x4D,0x5E,0x69,0x						
Exclude Low Level Events		0x4C,0x5D,0x68,0x73,0x4E,0x5F,0x6A,0x75,0x4D,0x5E,0x69,0x					
Triggers	0xA1,0xA2,0xA3						
Add Dele	te	Ok					

Figure 8 - Event Code Filters Dialog

The Event Code Filters Dialog displays the current Event Filters. The user can add or delete any custom event filters. Filters can include event code and/or exclude events codes from the event display. Included code will be displayed if the filter is selected, while excluded codes will not be displayed. To create a custom filter, click the

Add button to add a row to the filter table. Enter the name of the filter, and then add codes to the Included Codes by selected the Event Code from the code dropdown

list	0x01: V Sync Start 🔹	and click the	Include	button. use the	Exclude	to exclude
the	code.			,		

5.1.3 Setup Section

The Setup section is used display the current protocol capture criteria setup. The capture criteria is set in the Capture Setup Tab (explained below in Section 5.2.2), the user can specify what specific event can Start and Stop the protocol capture along with specifying what event can cause an external trigger pulse. A Wait time (if no events are

specified) or timeout can be set to stop the capture after a specific amount of time.

The	Start Capture	button	in	used	to	initiate a	F
				uscu	ιU		

capture of the CSI traffic. The Loop Enable checkbox is used enable the Loop Capture option. While looping the Envision X84 CSI-2 Protocol Suite can check for event and/or video errors. (See the Loop explanation below) If more than one event criteria are set the capture starts or completes on the first occurrence to meet the criteria.

S f Loop Enable Start Capture St

Capture Setup

Right-Clicking in the Capture Setup window will display one of the two context-sensitive pop-up menus that allows for the adding to, clearing, editing or deleting from the setup criteria without having to go to the Capture Setup Tab. Selecting Clear or Delete will delete the selected setup criteria, while selecting Add or Edit menu options will display the Criteria Setup Dialog, where the Event and/or Count can be changed. Double-Clicking on an Event will directly bring up the Edit Event Dialog

Figure 9 - Setup Section



Figure 10 - Setup Popup Menus

Edit Stop on Event		Martines
Event User 1 Code	•	Count
l I	User Code	
0x00: Frame Start		-
Save Event		Cancel

Figure 11 - Criteria Setup Dialog

5.1.4 Looping Captures

The Envision X84 CSI-2 Protocol Suite can loop captures and check for event errors and/or video errors in each looped capture. The Envision X84 CSI-2 Protocol Suite can step looping on any of the errors so the faulty event capture.

Loop Options Help	can be further analyzed.
Enable	Use the Enable menu option or click Loop Enable to
Stop On Error	Chat Casture
Check Video Errors	enable the Loop Capture feature. The start capture button
Check Event Errors	will change to Start Loop to signify the tool is in loop

mode. To check for Video Errors or Event Errors select the appropriate menu option. Select Stop On Error to have the tool stop if an error occurs.

Checking for video errors will compare the captured video to the golden frame as long

as the ^{Compare Frames} option on the Video Tab is checked. See the Video Tab section below. Otherwise the video frames will be display but not checked.

Once looping is started by clicking the <u>Start Loop</u> button capturing will be started, the button will change to 'Stop Loop' and when a capture is completed the captured will be re-started until the 'Stop Loop' button is clicked, which will stop the looping after the current capture is complete. Once the 'Stop Loop' button is clicked, the button will change to 'Abort Loop', which allows the user to abort the current capture instead of waiting for it to be completed.

5.1.5 Event Statistics Section

The Event Statistics Section displays the statistics captured during event capture. It displays the number of Short and Long Packets, the Total Packets captured, along with the number of Bursts captured. It also displays any errors that are captured if there are any errors. There are also real time hardware counters for these statistics, the real time statistics can be displayed by selecting **Real Time Statistics** from the Options Menu.

Event Statistics	
Short Packets	20103
Long Packets	134115
Total Packets	154218
Bursts	9901

Figure 12 - Statistics Section

5.2 Envision X84 CSI-2 Protocol Suite Analyzer Panel

The Envision X84 CSI-2 Protocol Suite Analyzer Panel is shown in Figure 13, it is where the captured events and payload data is displayed and analyzed. The Analyzer Panel has multiple Tabs for different functions. The Events Tab is used to view the time stamped events. The Capture Setup Tab is used to set the capture start and stop criteria. The Video Tab is used to display and compare captured image data. The PRBS Tab is used to view PRBS mode word count and error counts. The CTS Tab is used to process the events as they pertain to the CSI-2 Conformance Test Specification and displays the results. The Timing Analysis Tab is used to obtain detailed timing information between different events captured. The Video Analysis Tab is used to obtain the Analyzer Panel are explained in detail below.

Event	s Captur	re Setup	Video	CTS	GPIO	Timing Analysis		
Index	Time	Delta Time	Event Code	Event				*
397	171.565 uS	17.500 nS	0x02	Line Start	: (Line 14)			
401	171.632 uS	67.500 nS	0x48	HS Burst	End			
407	172.003 uS	370.000 nS	0x47	Start of H	S Burst			
408	172.022 uS	20.000 nS	0x24	RGB888	Data Payload Size:	2160 bytes		
412	181.565 uS	9.543 uS	0x48	HS Burst	End			
418	181.933 uS	367.500 nS	0x47	Start of H	S Burst			
419	181.950 uS	17.500 nS	0x03	Line End	(Line 14)			
422	182.015 uS	65.000 nS	0x48	HS Burst	End			
429	183.653 uS	1.638 uS	0x47	Start of H	S Burst			
430	183.673 uS	20.000 nS	0x02	Line Start	: (Line 15)			
433	183.735 uS	62.500 nS	0x48	HS Burst	End			
440	184.108 uS	372.500 nS	0x47	Start of H	S Burst			
441	184.127 uS	20.000 nS	0x24	RGB888	Data Payload Size:	2160 bytes		
444	193.667 uS	9.540 uS	0x48	HS Burst	End			
451	194.038 uS	370.000 nS	0x47	Start of H	S Burst			
452	194.055 uS	17.500 nS	0x03	Line End	(Line 15)			
456	194.123 uS	67.500 nS	0x48	HS Burst	End			
462	195.758 uS	1.635 uS	0x47	Start of H	S Burst			
463	195.778 uS	20.000 nS	0x02	Line Start	(Line 16)			
466	195.840 uS	62.500 nS	0x48	HS Burst	End			Ŧ
						Update Time: 0.2 sec	s Offline	

Figure 13 - Analyzer Panel

5.2.1 Event Tab

The Events Tab is where all the captured events are displayed. There are several columns in the Event Table.

- Index Column Displays the Index of the Event.
- Time Column Displays the Time Stamp of the Event.
 - To display the time in all in us select Uniform Time from the Options Menu.
- Delta Time Column Displays the time delta from the event displayed before the event.
- Event Code Column Displays the event code of the Event.

• Event Column – Displays the description of the Event.

The events in the Event Table are color coded.

- Yellow Low-Level State Events. These are the per lane low-level events explained in **Error! Reference source not found.**. These events can be filter with the Exclude Low Level Events Filter.
- Blue Low-Level Burst State Events. These are the burst events explained in **Error! Reference source not found.** Also Low Power State Events and Trigger Events are displayed in blue.
- Green CSI Protocol Long Packet Events.
- Dark Green CSI Protocol Short Packet Events.
- Pink All events that have will be displayed in pink.

CSI Protocol Packet events will display any parameters (commands and data) in the Event description. Also Low Power Packets will be marked as such in the description as shown below in Figure 14.

Index	Time	Delta Time	Event Code	Event
1	0.000 uS	0.000 pS	0x50	Low Power Data Receive Mode Lane 0
2	3.405 uS	3.405 uS	0x15	DCS Short Write 0xFF 1 Parameter 0xD0 Low Power Packet
5	35.725 uS	32.320 uS	0x50	Low Power Data Receive Mode Lane 0
6	39.130 uS	3.405 uS	0x15	DCS Short Write 0xFB 1 Parameter 0x1 Low Power Packet
9	67.178 uS	28.047 uS	0x50	Low Power Data Receive Mode Lane 0
10	70.588 uS	3.410 uS	0x15	DCS Short Write 0xAB 1 Parameter 0x70 Low Power Packet
13	96.603 uS	26.015 uS	0x50	Low Power Data Receive Mode Lane 0
14	100.010 uS	3.408 uS	0x15	DCS Short Write 0xC0 1 Parameter 0x70 Low Power Packet

Figure 14 - Low Power Packets

Detailed Event Information – Right-Clicking on an event row in the Event Table will display a pop-up with the Detailed Event Information for the event. Along with the information in the event row, the pop-up contains the Count of the specific event along with the Average Time Interval between the specific events. If the event contains payload data the bytes of the payload data is also displayed (up to 80 bytes). This is shown below in Figure 15.

Event	ts Captu	re Setup	Video	CTS	GPIO	Timing Analysis	
Index	Time	Delta Time	Event Cod	le Event			A
3	5.000 nS	5.000 nS	0x48	HS Burst	End		
10	377.500 nS	372.500 nS	0x47	Start of H	S Burst		
11	395.000 nS	17.500 nS	0x03	Line End	(Line 489)		
14	455.000 nS	60.000 nS	0x48	HS Burst	End		
21	825.000 nS	370.000 nS	0x47	Start of H	S Burst		
22	842.500 nS	17.500 nS	0x01	Frame En	d (Frame 1)	nt Information	
23	885.000 nS	42.500 nS	0xA1	Start Trigg	ger Received		
26	907.500 nS	22.500 nS	0x48	HS Burst	End Cou	unt: 22	
33	2.093 uS	1.185 uS	0x47	Start of H	S Burst Ever	nt: Frame End (Frame 1)	
34	2.115 uS	22.500 nS	0x02	Line Start	(Line 490)		
37	2.175 uS	60.000 nS	0x48	HS Burst	End		
44	12 /00C	10.2050	0-47	Start of L	C Durent		

Figure 15 - Detailed Event Information Pop-up

Also, double-clicking on an event will bring up the Detailed Event Dialog with all of the payload data displayed.

Event D	Data								-		-	-				
Even Code	t: RG : 0x2	B888 4	Data	Paylo	ad Si	ze: 2	160 b	ytes								
PayLo	oad (2	2160 H	Sytes)	:												
0x8C	0x8E	0x88	0xDC	0xDF	0xD6	0xCE	0xD1	0xC8	0xCE	0xD1	0xC8	0xCE	0xD1	0xC8	0xCE	
0xD1	0xC8	0xCE	0xD1	0xC8	0xCE	0xD1	0xC8	0xCE	0xD1	0xC8	0xCE	0xD1	0xC8	0xCE	0xD1	
0xC8	0xCE	0xD1	0xC8	0xCE	0xD1	0xC8	0xCE	0xD1	0xC8	0xCE	0xD1	0xC8	0xCF	0xD2	0xC9	=
0xCF	0xD2	0xC9	0xCF	0xD2	0xC9	0xCF	0xD2	0xC9	0xCE	0xD1	0xC8	0xCF	0xD2	0xC9	0xCF	
0xD2	0xC9	0xD0	0xD2	0xCB	0xCF	0xD1	0xCC	0xCF	0xD1	0xCA	0xCF	0xD2	0xC9	0xCF	0xD0	
0xCB	0xCF	0xD0	0xCC	0xCF	0xD0	0xCC	0xD0	0xD1	0xCD	0xD0	0xD1	0xCC	0xCF	0xD1	0xCB	-
0xCF	0xD2	0xCA	0xCF	0xD1	0xCB	0xCF	0xD1	0xCB	0xCF	0xD0	0xCC	0xCF	0xD0	0xCC	0xD0	
0xD1	0xCD	0xD0	0xD2	0xCC	0xD0	0xD2	0xCC	0xD0	0xD2	0xCC	0xD0	0xD3	0xCA	0xD0	0xD2	
0xCB	0xD0	0xD2	0xCC	0xD0	0xD2	0xCC	0xD0	0xD2	0xCC	0xD0	0xD2	0xCC	0xD0	0xD2	0xCC	
0xD0	0xD2	0xCC	0xD0	0xD2	0xCC	0xD1	0xD3	0xCD	0xD1	0xD2	0xCE	0xD1	0xD2	0xCE	0xD1	
0xD2	0xCE	0xD0	0xD2	0xCD	0xD0	0xD2	0xCC	0xD2	0xD4	0xCD	0xD1	0xD3	0xCD	0xD1	0xD3	
0xCD	0xD1	0xD3	0xCD	0xD1	0xD3	0xCD	0xD2	0xD4	0xCE	0xD1	0xD3	0xCD	0xD1	0xD3	0xCD	
0xD1	0xD3	0xCD	0xD1	0xD3	0xCD	0xD1	0xD3	0xCD	0xD1	0xD3	0xCD	0xD1	0xD3	0xCD	0xD1	
0xD3	0xCD	0xD1	0xD3	0xCD	0xD1	0xD3	0xCD	0xD1	0xD3	0xCD	0xD0	0xD2	0xCC	0xD0	0xD2	
0xCC	0xD0	0xD2	0xCC	0xD1	0xD3	0xCD	0xD1	0xD3	0xCD	0xD2	0xD4	0xCE	0xD2	0xD4	0xCE	
0xD2	0xD4	0xCE	0xD1	0xD3	0xCD	0xD1	0xD3	0xCD	0xD2	0xD4	0xCE	0xD1	0xD4	0xCC	0xD1	
0xD4	0xCC	0xD2	0xD3	0xCE	0xD2	0xD3	0xCF	0xD1	0xD2	0xCE	0xD2	0xD3	0xCF	0xD1	0xD2	
0xCE	0xD2	0xD3	0xCF	0xD3	0xD4	0xD0	0xD3	0xD4	0xD0	0xD3	0xD4	0xD0	0xD3	0xD4	0xD0	
0xD3	0xD4	0xCF	0xD2	0xD4	0xCE	0xD2	0xD4	0xCE	0xD2	0xD4	0xCE	0xD3	0xD5	0xCF	0xD3	
0xD5	0xCF	0xD3	0xD5	0xCF	0xD3	0xD5	0xCF	0xD3	0xD5	0xCF	0xD4	0xD6	0xD0	0xD4	0xD6	
0xD0	0xD4	0xD6	0xD0	0xD4	0xD6	0xD0	0xD4	0xD6	0xD0	0xD4	0xD6	0xD0	0xD4	0xD6	0xD0	
0xD4	0xD6	0xD0	0xD4	0xD6	0xD0	0xD4	0xD6	0xD0	0xD4	0xD6	0xD0	0xD3	0xD5	0xCF	0xD4	
0xD6	0xD0	0xD4	0xD6	0xD0	0xD4	0xD6	0xD0	0xD4	0xD6	0xD0	0xD4	0xD6	0xD0	0xD4	0xD6	
0xD0	0xD4	0xD6	0xD0	0xD4	0xD6	0xD0	0xD4	0xD6	0xD0	0xD5	0xD7	0xD1	0xD4	0xD6	0xD0	
0xD4	0xD6	0xD0	0xD5	0xD7	0xD1	0xD5	0xD6	0xD2	0xD5	0xD6	0xD2	0xD5	0xD6	0xD2	0xD5	
0xD6	0xD2	0xD5	0xD6	0xD2	0xD5	0xD6	0xD2	0xD5	0xD6	0xD2	0xD5	0xD6	0xD2	0xD4	0xD5	
0xD3	0xD4	0xD5	0xD3	0xD5	0xD6	0xD3	0xD5	0xD6	0xD2	0xD6	0xD7	0xD3	0xD6	0xD7	0xD3	-
															Close)

Figure 16 - Event Data Dialog

Search Capabilities – The event table can be searched with commands in the Find Menu and the corresponding shortcuts:

Find	Mark Events	Options	
	Find Any	Ctrl+F	
	Find Field	Ctrl+Shift+F	
	Find Next	F3	
	Find Previous	Shift+F3	
	Go to Time	Ctrl+T	
	Go to Index	Ctrl+G	
	Go to Line	Ctrl+L	
	Next Error	Ctrl+E	
	Previous Error	Ctrl+Shift+E	

Figure 17 - Find Menu

- Find Any (Ctrl-F) –Allows the user to search the event table for any text pattern in the table. F3 and Shift-F3 can be used to find the next or previous occurrence.
- Find Field (Ctrl+Shift+F) Displays the Find Field Dialog that allow the user to search for a specific Category. Event Code or Event Description.
- Find Next (F3) Finds the next occurrence of the find criteria.

- Find Previous (Shift+F3) Finds the previous occurrence of the find criteria.
- Go to Index (Ctrl+G) –Allows the user to go to a specific index in the event table.
- Go to Time (Ctrl+T) Allows the user to go to a specific time in the event table.
- Next Error (Ctrl+E) Allows the user to go to the next error.
- Previous Error (Ctrl-Shift+E) Allows the user to go to the previous error.

Marking Events – The events in the event table can be marked with commands in the Mark Events Menu and the corresponding shortcuts:



Figure 18 - Mark Events Menu

- Mark New Block (Ctrl+N) Sets the start event of a new Marked Event Block.
- Mark End Block (Ctrl+M) Sets the end event of the Marked Event Block. The events between the marked start event and the marked end event will be highlighted as shown in Figure 19. The Statistics Section will display the statistics for the Marked Block instead of all the events and right clicking on an event in the Marked Block will display the count for the block instead of the entire events.
- Mark Clean (Ctrl+C) Will clear the Marked Block..
- Marking Events can also be done by clicking on an event to set the start of the marked events and then Shift-Clicking an event to set the end of the marked events

Ever	nts Captu	re Setup	Video	CTS	Video Analysis	Timing Analysis
Index	Time	Delta Time	Event Code	Event		
13	747.500 nS	45.000 nS	0x09	Null Pac	ket	
14	845.000 nS	97.500 nS	0x09	Null Pac	ket	
15	895.000 nS	50.000 nS	0x09	Null Pac	ket	
16	987.500 nS	92.500 nS	0x09	Null Pac	ket	
17	1.035 uS	47.500 nS	0x09	Null Pac	ket	
	1.275 uS	240.000 nS	0x01	V Sync :	Start	
	1.325 uS	50.000 nS	0x31	H Sync	End	
20	1.325 uS	0.000 pS	0xA1	Start Tri	ger Received	
	1.372 uS	47.500 nS	0x08	End of 1	ransmission	
		37.500 nS			op State Lane 0	
	1.412 uS	2.500 nS	0x48	HS Burs	t End	
		2.500 nS			Mode Lane 0	
	32.658 uS	10.000 nS	0x47	Start of	HS Burst	
	32.675 uS	17.500 nS	0x09	Null Pac	ket	
	32.772 uS	97.500 nS	0x09	Null Pac	ket	
	32.820 uS	47.500 nS	0x09	Null Pac	ket	
	32.918 uS	97.500 nS	0x09	Null Pac	ket	
	32.967 uS	50.000 nS	0x09	Null Pac	ket	
34	33.107 uS	47.500 nS	0x09	Null Pac	ket	
35	33.202 uS	95.000 nS	0x09	Null Pac	ket	
36	33.255 uS	52.500 nS	0x09	Null Pac	ket	
37	33.348 uS	92.500 nS	0x09	Null Pac	ket	
38	33.397 uS	50.000 nS	0x09	Null Pac	ket	

Figure 19 - Marked Event Block

5.2.2 Capture Setup Tab

The Capture Setup Tab is used to set current protocol capture criteria setup. The user can specify what specific event can Start and Stop the protocol capture along with specifying what event can cause an external trigger pulse. A Wait time (if no events are specified) or timeout can be set to stop the capture after a specific amount of time.

Events	Capture Setup	Video	CTS	GPIO	Timing Analysis	
Start On		Stop On		Ext. Trigger Out On	User C	Codes
Short Packets	1 🚔	Short Packets 📃	1 🌲	Short Packets 📃 1	😫 User 1	0x00: Frame Start
Long Packets	1 🚔	Long Packets 📃	1 🌲	Long Packets 📃 1	🗧 User 2	0x01: Frame End 🗸
Total Packets	1 🊔	Total Packets 📃	1 🌲	Total Packets 📃 1	User 3	0x00: Frame Start
Bursts	1	Bursts 📃	1 🌲	Bursts 🔲 1	🕀 User 4	0x00: Frame Start
User 1 Code	1 🚔	User 1 Code 👿	10 🌲	User 1 Code 📃 1	×	
User 2 Code	🛛 1 🚔	User 2 Code 📃	1 🌲	User 2 Code 🔲 1	* *	Wait/Timeout (sec); 100.0
User 3 Code	1 🚔	User 3 Code 📃	1 🌲	User 3 Code 📃 1	* *	
User 4 Code	1 🚔	User 4 Code 📃	1 🌲	User 4 Code 📃 1	* *	
CRC 1 Errors	1 🌲	CRC 1 Errors	1 🌲	CRC 1 Errors 📃 1	* *	
CRC 2 Errors	1 🚔	CRC 2 Errors	1 🌲	CRC 2 Errors 🔲 1	<u>*</u>	
Payload Errors	1 🚔	Payload Errors 📃	1 🌲	Payload Errors 📃 1	* *	
ECC 1 Errors	1 🌲	ECC 1 Errors	1 🌲	ECC 1 Errors 🔲 1	-	
ECC 2 Errors	1 ≑	ECC 2 Errors	1 🌲	ECC 2 Errors 🔲 1	* *	
Ext. Trigger In	Low -	Ext. Trigger In 📃	Low 🔻	Pulse Width 0	ns	

Figure 20 - Capture Setup Tab

To specify an event to start or stop on check the appropriate check box for that specific event or error type and set the number of events to wait for before starting or stopping the capture. If no Start On criteria is set the capture will start immediately. If no Stop On criteria is set the capture will stop after the specifed Wait time. If more that one event criteria is set, the first critera met will start/stop the capture.

External Trigger Out

An external trigger can be pulsed on any event or error type. The pulse width is set with the pulse width control. The pulse width can be set from 1 to 714 ns

5.2.3 Video Tab

The Video Tab is where the capture images from a CSI Video Stream packet with image payload data are displayed. The raw payload data is read from the Analyzer and converted to a bitmap image and displayed. The Video Tab is hidden if the mode selected from the Mode Menu is PRBS.

	are Frames Ferrari.br	mp	B	rowse	Detected Image Format:	
					RGB 8-8-8	
					W: 720 x H: 48	80
			1000	Contraction of the second	Raw Format: BGGR	
				the second	Images: 20	
		1000			Frame Rate: 168.6 Hz	
	500	and the first	- carbo	C. P. S.	Frame 1: PASS	
	and a second second	A DECKER OF THE OWNER OF THE OWNE		100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100 - 100	Emma 2. DACC	
		and the second second	A State of the second	and the second	Frame 2: FASS	
and the second second	and an and		Jan Ba		Frame 2: PASS Frame 3: PASS	
	1 aler		-		Frame 2: PASS Frame 3: PASS Frame 4: PASS Frame 5: PASS	
-	a ser				Frame 2: PASS Frame 3: PASS Frame 4: PASS Frame 5: PASS Frame 6: PASS	
	-		7		Frame 3: PASS Frame 3: PASS Frame 4: PASS Frame 5: PASS Frame 6: PASS Frame 7: PASS	
					Frame 3: PASS Frame 3: PASS Frame 4: PASS Frame 5: PASS Frame 6: PASS Frame 7: PASS Frame 8: PASS	
			1		Frame 2: PASS Frame 3: PASS Frame 4: PASS Frame 5: PASS Frame 6: PASS Frame 7: PASS Frame 8: PASS Frame 9: PASS	
					Frame 2: PASS Frame 3: PASS Frame 4: PASS Frame 5: PASS Frame 5: PASS Frame 7: PASS Frame 8: PASS Frame 9: PASS Frame 10: PASS	
	Ø				Frame 3: PASS Frame 3: PASS Frame 4: PASS Frame 5: PASS Frame 6: PASS Frame 7: PASS Frame 8: PASS Frame 9: PASS Frame 10: PASS Frame 11: PASS	
		R			Frame 3: PASS Frame 3: PASS Frame 4: PASS Frame 5: PASS Frame 6: PASS Frame 7: PASS Frame 9: PASS Frame 9: PASS Frame 10: PASS Frame 11: PASS Frame 12: PASS	

Figure 21 - Video Tab

Clicking the Get Video Data button wi and convert the raw image data to a bitma	ill read in the raw image data p and will display the image.	Detected Imag RGB 8-8-8	je Format:	Ŧ
This will be done for all images capture button can by clicked to abort the proces	ed. The <u>Abort</u> s of reading and converting	W: 720 Raw Format:	x H: BGGR	480
images. Optionally, the bitmap image car	n be compared to a 'Golden'	lma Frame Ra	ges:20 ste:168.6	Hz
bitmap image by checking the	Browse	Frame 1: PASS Frame 2: PASS Frame 3: PASS		Â
display a file chooser dialog to allow the	e user to select the 'Golden'	Frame 4: PASS Frame 5: PASS Frame 6: PASS		Ξ
file. If the Compare Frames option is check	ed, when Get Video Data	Frame 7: PASS Frame 8: PASS Frame 9: PASS		
will also compare the converted bitma	p to the "Golden' bitmap.	Frame 10: PAS Frame 11: PAS Frame 12: PAS Frame 13: PAS	S S S	-

Pass: 20 Fail: 0

Figure 22 - Image Format

Any errors will be recorded in the images text box. If the *Wew Differences* checkbox is checked the any failed image will display an image of the differences between the captured image and the 'Golden' image with pixels that are the same white and different pixels black.

When an image is captured in video mode with pixel protocol packets the image format and width and height is determined from the protocol packets captured. The captured format, width and height are displayed in the controls shown in **Error! Reference source not found...** The Bayer raw format of the image should be selected from the

BGGR Raw Format dropdown control to properly convert the image. As images are compared the pass/fail information for each image is displayed in the image information textbox.

The Ignore Last Frame checkbox is used to have the instrument ignore incomplete frames at the end of the capture. If the capture is known to have a complete frame at the end of the capture, un-checking this control will have all captured frames displayed.

5.2.4 PRBS Tab

The PRBS Tab is used to perform PRBS testing. The seed for each lane can be set, and the when a PRBS capture is completed the number of PRBS words along with the number of errors for each lane is display. To put the Analyzer PRBS mode,

~ PRBS must be selected from the Mode menu. If PRBS Tab is hidden if the mode selected is not PRBS.

Once in PRBS mode click the	Start PRBS Capture	button to initiate a	PRBS capture	e. T	he
		Mode:	PRBS9	-	
			PRBS9	_	
			PRBS11		
PRRS mode can be selected fr	om the Mode dra	ndown box	PRBS18		

PRBS mode can be selected from the Mode dropdown box.

Events		Capt	ure Setup PRBS		CT	5	G	PIO	Timing Analysis
		Mode:	PRBS9	-					
		Seed		Words	Errors	Word	Errors	Total Erro	ors
Lane 0: (b x 1		* *	0	0				
Lane 1: 0	x 1		* *	0	0				
Lane 2: 0	x 1		×	0	0				
Lane 3: 0	x 1		*	0	0				

Figure 23 - PRBS Tab

5.3 CTS Tab

The Conformance Test functionality is an optionally available feature of the Envision X84 Protocol Analyzer. The CTS Tab is where the capture CSI Protocol traffic is analyzed for conformance to the CSI Conformance Specification. Once the CSI Protocol traffic is captured, the captured events and be processed for conformance to Process Events the CTS by clicking the button. The results are displayed in the CTS Test Result Table. This table display which Test Sections of the CTS the processed Protocol events pass or fail. The Event File tree displays the results of each individual captured event file, while the results table displays the results of all captured events



Events	Capture Setup V	ideo CTS	GPIO	Timing Analys	sis			
Process Ev	vents Clear Events	Event Files			C.	TS Test Re	esults	Save Results
Code Ev	rent	Lan 9.1.1 Long	Packet Data Types	*		Test	Test Name	Comments ^
Ox00 Fra	ame Start (Frame 9)	3 9.1.2 Long 9.1.3 Byte	Packet Format Ordering		Ø	9.1.1	Long Packet Data Types	9600 Long Packets Sent with no errors
0x01 Fra 0xA1 Sta	ame End (Frame 1) art Trigger Received	3	Packet Data Types Packet Format		Ø	9.1.2	Long Packet Format	9600 Long Packets Sent with no errors
0xA3 Sto 0x02 Lin	op Trigger Received ne Start (Line 490) ne Fad (Line 490)	3	Blanking ne Blanking		0	9.1.3	Byte Ordering	9600 Long Packets 19643 Short Packets Sent with no errors
0x24 RG	GB888 Data Payload Size: 2	3 9.11.1 Pac	ket Data Payload Size a Type Interleaving		Ø	9.1.4	Short Packet Data Types	19643 Short Packets Sent with no errors
0x47 Sta 0x48 H9	art of HS Burst 5 Burst End	3 9.3.1 Virtua 3 9.4.1 Data	al Channel Interleaving Type	E	۷	9.1.5	Short Packet Format	19643 Short Packets Sent with no errors
			ksum Calculation et Spacing hronization Short Packé	et Data Tvo	0	9.10.1	Line Blanking	19 Frame(s) with Ave. Line Blanking Time(s): 2.55 us;
			e Synchronization Pack e Number	kets	0	9.10.2	Frame Blanking	19 Frame(s) with Frame Blanking Time(s): 121.86 us;
<	11	▶ ₹ 111	Number Incrementing		0	9.11.1	Packet Data Payload Size	Payload Size Same Length and Multiple of 8 -

Figure 24 - CTS Tab

5.4 GPIO Tab

The GPIO Tab is to communicate with the camera over the CCI I2C bus or with GPIO pins. Also, macro files can be used to write command sequences to the camera.

Events	Capture Setup	Video	CT	S	GPIO Timing Analysis		
Read/Write		Macros					
CCI 12C	:		M	acro File			
0x 10 🚔	Set	CameraOpen.tx	t	•	Load Save Save As	New	
Target Address	Bytes	Command	Address	Data	Comment	A	Up
Ux INA 🕎	2	SLAVEADDR	0x10				lete All
Data	Bytes	GPIO_WRITE	0x01				
0x 2000 🛒	2 💌	DELAY	1000)elete
Read	Write	WRITE	0x0103	0x01	software reset		Down
		WRITE	0x0100	0x00	mode standby	Del	lav (ms)
		WRITE	0x6620	0x0101			0
GPIC	c	WRITE	0x6622	0x0101			
Data		WRITE	0x30EB	0x05	access command sequence	Ad	d Delay
0x 0 🚖	Write	WRITE	0x30EB	0x0C	access command sequence		
		WRITE	0x300A	0xFFFF	access command sequence	-	
			[Run Ma	сго	Ed	lit Macro

Figure 25 - GPIO Tab

To write or read registers on the camera use the Read/Write controls. Set the I2C slave



address. Use the Target Address and Data Controls to set the address and data values and number of bytes to be read or written. Click Read or Write to excute the command. **Camera Macro Files**

Macro files can be use to send multiple I2C writes to the camera to perform different

command sequences. To create a macro file click the button to bring up a dialog box to select the folder to save the new macro into and to name the macro file.

🔤 Open										×
← → ~ ↑ 📴 > PC > Desktop > Envision > Versio	on 3.	.5.3	34	120 > CameraMacros	ٽ ~		Searc	h CameraMacros		م
Organize 🔻 New folder										•
Price lists	*	^		Name	^			Date modified		Туре
Specs	π			🛃 AdjustMacro.txt				10/4/2018 5:14 P	м	TXT File
📙 Support	*			CameraOpen.txt				10/2/2018 8:45 A	M	TXT File
	*			🛃 CloseCamera.txt				9/18/2018 11:12	AM	TXT File
BOMs				🛃 ColorBars.txt				10/4/2018 5:14 P	М	TXT File
Documentation										
Eclipse T42 Pics										
Product Specifications										
💻 PC										
📃 Desktop		¥		<						>
File name: *.bd						~	Mac	ro Files (*.txt) Open	Can	~ cel

Mouse to the folder location and enter the filename for the new macro file. This will load the empty macro file into the tool and allow for commands to be added.

Click the <u>Edit Macro</u> button to put the tool into the macro editing mode. All commands will be added to the macro file and not written to the device whne in edit mode.

Execute any command or add a delay to the macro file by clicking the appropriate button.

For example the following actions will add commands to the macro file.

Set the Slave Address :	0x 10 🚔 Set									
	Target Address Bytes Data Bytes									
Write 0x2500 (2 Bytes) to 0x15A:	0x 15A 💭 2 💭 0x 2500 💭 2 💭 Write									
	Delay (ms)									
Add a 5ms delay:	5 🚔 Add Delay									

Write GPIO Bi	t 0 to a 1:		GPIO Data 0x 1 Write	
Write 0x1 (1 B	yte) to 0x	100:	Target Address Bytes Data Bytes 0x 100 ♀ 2 ♀ 0x 1 ♀ 1 ♥	
	M	acro File		
New Macro File.tx	t		Load Save Save As New	
Command SLAVEADDR WRITE DELAY GPIO_WRITE WRITE	Address 0x10 0x015A 5 0x01 0x0100	Data 0x2500 0x01	Comment Up Delete All Delete Down Delay (ms) 5 🚖 Add Delay	
Use the Save or deleted usir Comments car comment.	Save As	buttons Up d to the m x0100	to save the macro file. The commands can be red Down Delete and Delete All buttons. nacro file by in the Comment cell and added the 0x01 Comment added here	order
Macro files are be edit by han follow is that th digits in the ad fields of a write determines the are transmitted bus. The addre bytes, while th	e text files d, the 1 ru ne numbe ldress and e commar e number d over the ess can be e data fiel	that can le to r of hex l data of bytes l2C e 1 or 2 d can	NewMacroFile.txt - Notepad Eile Edit Format View Help SLAVEADDR 0x10 WRITE 0x015A 0x2500 DELAY 5 GPIO_WRITE 0x01 write 0x0100 0x01	re

Įl

be 1, 2, 3 or 4 bytes.

5.5 Timing Analysis Tab

The Timing Analysis Tab is where the capture CSI Protocol traffic is analyzed for timing between different events. This can provide detailed timing of the CSI waveform captured.

	Eve	ents	Capture Setup		Video	CTS		GPIO	Timing Anal	ysis		
	Analyze Event Timing			Setup File:				Save Timing Analysis				
L						Even	nt Tim	ning Pairs				
l	From				То			Min Time	Max Time	Count	Delete	
L		0x00: Fra	me Start	•	0x01: Frame	End	-	5.809 mS	5.809 mS	5.809 mS	20	Delete
	•	0x02: Line	e Start	•	0x03: Line Er	d	-	10.385 uS	10.382 uS	10.390 uS	9800	Delete
	*			•			•					

Figure 26 - Timing Analysis Tab

To add an analysis timing pair to the analysis table, click on the empty dropdown box to select an event from the dropdown box for the timing from column and timing to column.

Once the all timing pairs have been added to the timing tables click the Analyze Event Timing

button to calculated the timing for the timing pairs. Click the Save Timing Analysis button to save the timing analysis calculations to a file.

6 Envision X84 CSI-2 Protocol Suite Menu Options

6.1 File Menu

File	Connect Mode
	Load Events
	Save Events
	Save Frames
	Load Firmware
	Recent Event Files
	Exit

Load Event Files... The Load Event Files menu option is used to load previously captured event files for off-line analysis. Selecting this option will display the Load Event Files Dialog to select any one of the saved event files.

Save Events... The Save Event Files menu option is used to save the current captured event files to user named event files. Selecting this option will display the Copy Event Files dialog allowing the user to select which directory and base file name to copy the event files.

Figure 27 - File Menu

The event files are saved using the supplied base file name. For example, if the base name entered in the dialog is MyCapturedEvents then the files saved to the user selected directory are:

- MyCapturedEvents.events.bin
- MyCapturedEvents. packets.bin
- MyCapturedEvents. packet_data.0.bin
- MyCapturedEvents. sortedevents.bin
- MyCapturedEvents. sortedpackets.bin
- MyCapturedEvents.status.jsn
- MyCapturedEvents.status.txt

Save Frames... The Save Frames menu option allows the user to save the captured frame image files. The images have to be created with Get Video Data button in the Video tab to enable the menu option.

Load Firmware... The Load Firmware menu option is used to update the Analyzer firmware. A dialog will open to select the firmware file (.few file) to load. Once the firmware is updated the tool automatically disconnected and reconnected to the Analyzer.

Recent Event Files The Recent Event Files menu allows the user to load previously loaded event files.

Exit The Exit menu option will Exit the Envision X84 CSI-2 Protocol Suite. Upon exiting the Envision X84 CSI-2 Protocol Suite a configuration file will be saved. This saves the current state of the Envision X84 CSI-2 Protocol Suite and the configuration

file will be loaded the next time the tool is started. The configuration file is saved in the Envision X84 CSI-2 Protocol Suite ProgramData directory:

C:\ProgramData\Teledyne LeCroy\Csi-2 IA\Envision X84 CSI-2 Protocol Suite.config.xml

6.2 Connect Menu

Connect	Mode	Options							
Connect Instrument - C-Phy									
Disco	nnect Ins	trument							
Auto	-Connect								

Connect Instrument - C-Phy The Connect Instrument menu option will connect the Envision X84 CSI-2 Protocol Suite to the Envision X84 Protocol Analyzer in the current protocol mode. The protocol mode is selected in the Mode menu.

Figure 28 - Connect Menu

C-Phy

Disconnect Instrument The Disconnect Menu option will disconnect the Envision X84 CSI-2 Protocol Suite from the Analyzer.

Auto-Connect The Auto-Connect Menu option, if selected will have the Envision X84 CSI-2 Protocol Suite connect to the Analyzer on start-up.

6.3 Mode Menu



D-Phy Selecting one of the Physical Layer modes from the Mode Menu determines the mode the Analyzer will be connected in when the tool is connected.

Figure 29 - Mode Menu

Normal

PRBS The Normal/PRBS Menu options allow the user to set the capture mode of the Analyzer into the PRBS mode (for PRBS testing) or the Normal CSI Protocol capture mode. In Normal Mode the Video Tab is visible and the PRBS Tab is hidden. In PRBS mode the PRBS Tab is visible and the Video Tab is hidden.

6.4 Options Menu



Default IP Address

Custom IP Address The IP Address menu options are used to determine the IP address of the Analyzer. The default IP Address of the Analyzer is 192.168.137.100. If the IP Address is changed use the Custom IP Address Menu option to set the custom IP Address.

Figure 30 - Options Menu

Real Time Statistics The Real Time Statistics menu option is used to change the Statistics Section of the Control Panel from Events Statistics to Real Time Statistics. The event Statistics are calculated from the event file data while the Real Time Statistics are hardware counts of the packet data.

Uniform Time The Uniform Time menu option will change the time column in the Events table from formatted time (to best units) to uniform time (all times in usecs).

7 Envision X84 Protocol Analyzer APIs

The Envision X84 Protocol Analyzer also comes with 'C' and 'C#' APIs for use in different programming environments for the automation of test suites. Please refer to the Envision X84 Protocol Analyzer API Manual for more information on automating your test suites.

8 Envision X84 Protocol Analyzer C-Phy Timing Limitations

The Envision X84 Protocol Analyzer C-PHY clock recovery circuit requires the following setting in the C-Phy waveform for proper operation at high frequencies. For example to run at 2.5 Gsps the HS Prepare time should be at least 95ns, the HS Exit time should be at least 500ns and Preamble should be at least 34*7 UI. These settings decrease with decreasing sample rate. Please see the Envision X84 Protocol Analyzer Datasheet for more information.