

CLT-353R & CLT-353L CAMERA LINK
TRANSLATOR

User's Manual

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1. Introduction

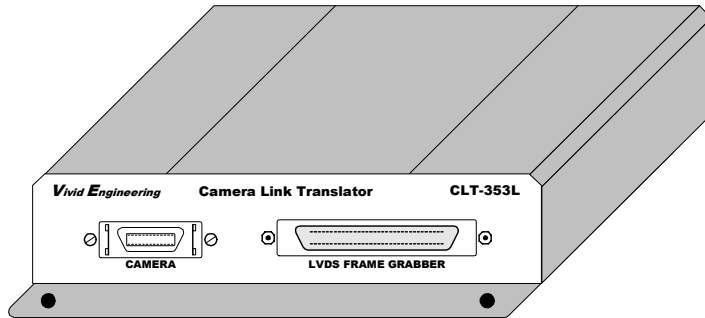
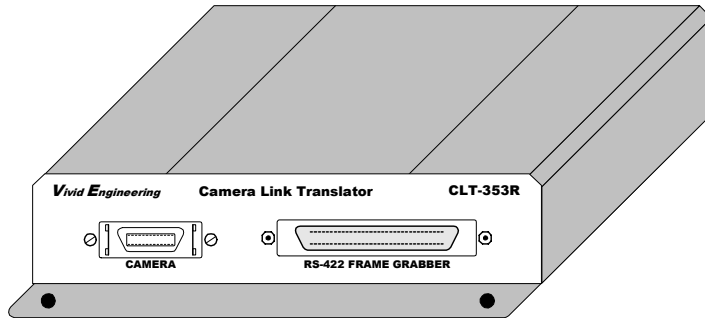
1.1. Overview

The CLT-353R and CLT-353L Camera Link ¹ Translators enable the use of Camera Link cameras with frame grabbers incorporating RS-422 and LVDS parallel digital interfaces. The “R” and “L” versions support RS-422 and LVDS frame grabbers, respectively.

The CLT-353’s are extremely flexible and can translate a wide range of single-channel, dual-channel, and color “base” configuration Camera Link cameras to parallel digital format.

The CLT-353R/L translators are housed in sturdy, compact aluminum enclosures.

¹ The Camera Link interface standard enables the interoperability of cameras and frame grabbers, regardless of vendor. The Automated Imaging Association (AIA) sponsors the Camera Link program including the oversight Camera Link Committee, the self-certification program, and the product registry. The Camera Link specification may be downloaded from the AIA website, found at www.machinevisiononline.org



1.2. Features

- Enable use of Camera Link cameras with RS-422 and LVDS frame grabbers
- Interfaces to a wide range of single-channel, dual-channel, and color Camera Link cameras.
- “R” version supports RS-422 frame grabbers
- “L” version supports LVDS frame grabbers
- 85 MHz max pixel clock rate for “L” version
- 32 MHz max pixel clock rate for “R” version
- Camera serial communication via frame grabber interface or via rear-panel RS-232 port
- Selectable frame grabber timing signal polarity and clock phase
- Minimal data pass-through latency
- Isolated DC power input
- Multi-nation power supply included, locking-plug power supply optional
- Sturdy, compact aluminum enclosure w/ mounting flange
- 3-year warrantee

1.3. Functional Description

The CLT-353R/L Camera Link Translators enable the use of Camera Link cameras with frame grabbers incorporating parallel RS-422 and LVDS digital interfaces. Block diagrams of the CLT-353L and CLT-353R are provided in Figures 1-1 and 1-2, respectively. The CLT-353R is intended for use with RS-422 frame grabbers, and the CLT-353L for use with LVDS (EIA-644) frame grabbers.

The CLT-353R/L camera interface incorporates the connector, signals, pinout, and chipset in compliance with the Camera Link specification. The CLT-353R/L incorporates the “base” configuration signal set, consisting of video data, camera control, and serial communications. The CLT-353R/L supports single-channel (monochrome) cameras with 8/10/12/14/16-bit pixels, dual-channel 8/10/12-bit cameras, and 8-bit color cameras.

The frame grabber interface outputs video data in parallel digital format using RS-422 or LVDS, depending on CLT-353 version. The interface incorporates a 68-pin SCSI-style connector.

The latency (i.e. delay) of the video, control, and communication signals passing through the CLT-353R/L is minimal. This is an important criteria in time-critical applications. See Table 1.1 for CLT-353R/L latency specifications.

Frame grabber clock and timing signal characteristics are selected using the rear-panel mode switch described in the next section. The switch also selects which serial port is used to communicate with the camera; the serial port from the frame grabber, or a standard RS-232 serial port accessed via the rear-panel DB-9 connector. Switch settings are defined in the following sections.

The CLT-353R/L receives two LVDS camera control signals from the frame grabber and retransmits them as CC1 and CC2 to the Camera Link camera. These signals are often used to externally synchronize the camera (i.e. EXSYNC).

The CLT-353L & CLT-353R *camera* interface incorporates LVDS devices for the serial communication signals (per Camera Link). The *frame grabber* interface serial signals are implemented using LVDS or RS-422 devices, depending on CLT-353 version.

The CLT-353 is powered by an external wall plug-in power supply. A multi-nation power supply is standard. Optionally, the CLT-353R/L is available with a locking-plug power supply. The locking plug reduces the risk of accidental disconnection from the rear-panel power jack. The CLT-353R/L is also available without power supply.

The CLT-353R/L DC power input is electrically isolated from the internal circuitry. This feature ensures compatibility with user power systems.

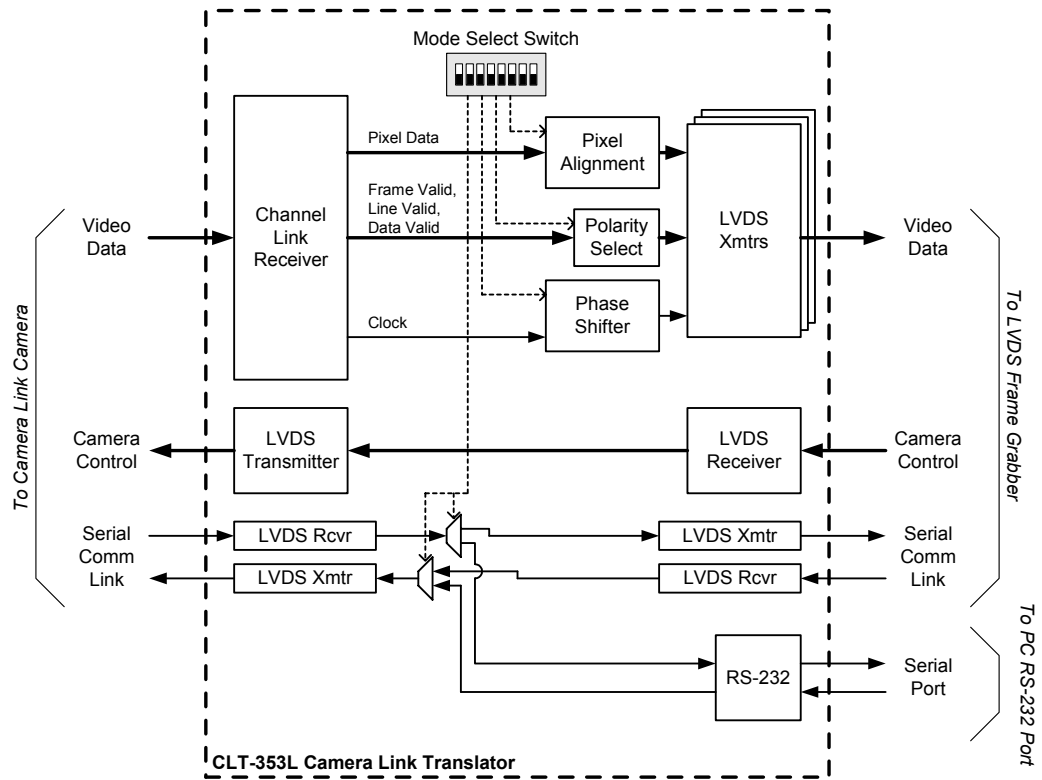


Figure 1-1: CLT-353L Block Diagram

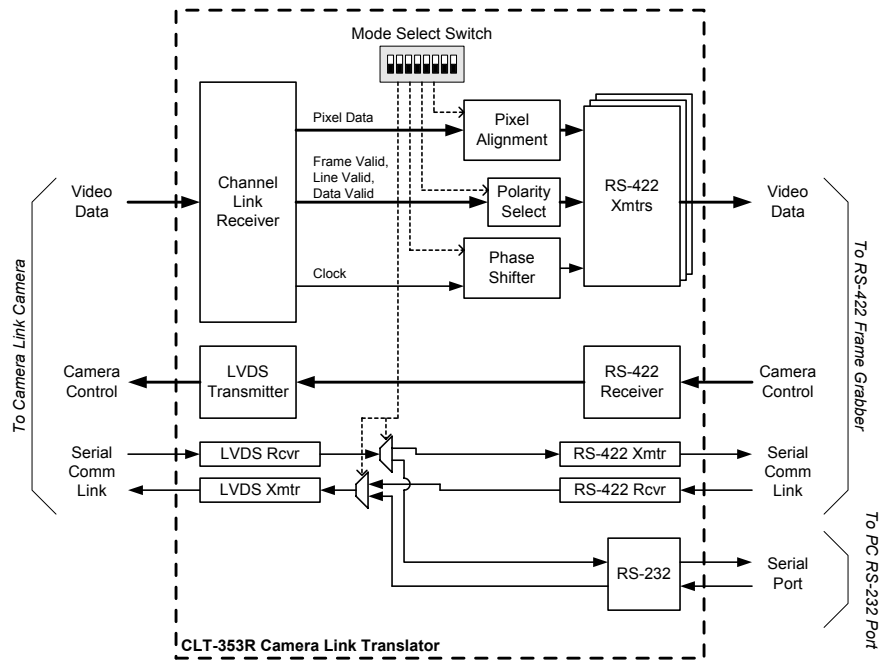
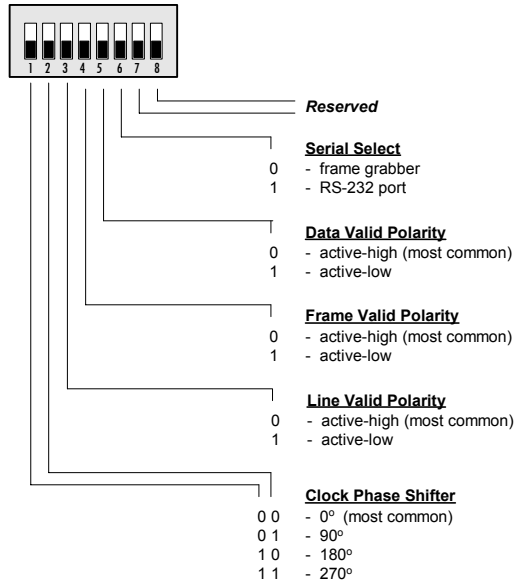


Figure 1-2: CLT-353R Block Diagram

1.3.1. Rear-Panel Mode Switch Settings

The CLT-353R/L incorporates a rear-panel mode select switch. The switch allows the user to specify timing signal polarities, clock characteristics, and serial port selection. The mode switch has eight positions. Two positions are reserved for future use. The functional assignments are defined in Figure 1-3



0 = "down" switch position
1 = "up" switch position

Figure 1-3: Rear-Panel Mode Switch Definition

1.3.2. Frame Grabber Clock Phase

The CLT-353R/L incorporates a phase shifter to optimize the clock /data timing relationship for the frame grabber. Positions 1&2 on the external mode select switch are used to select pixel clock phase shift. In most cases, the 0 degree phase shift setting is used which centers the rising edge of the pixel clock within the valid pixel/timing data interval. Alternatively, clock phase shifts of 90, 180, and 270 degrees are supported. The pixel clock phase shifter characteristics are illustrated in Figure 1-4.

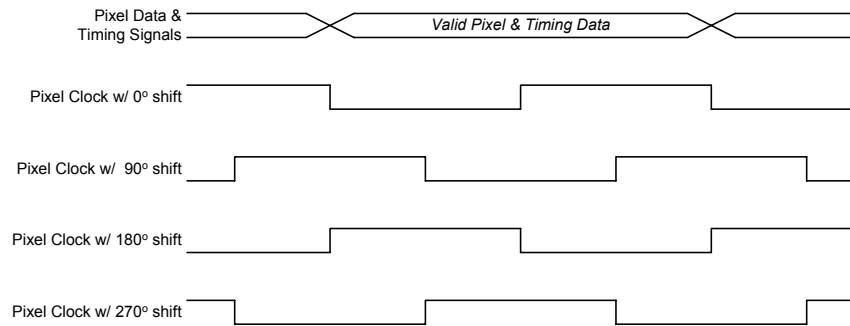


Figure 1-4: Pixel Clock Phase Options

1.3.3. Frame Grabber Timing Signal Polarity

Frame grabber timing signal polarity characteristics are selected using the mode select switch. Position 3 is used to select the polarity of the line valid signal, position 4 is used to select the polarity of the frame valid signal, and position 5 is used to select the polarity of the data valid signal.

In most cases, a “high” state on the line enable and frame enable signals is used to envelope valid lines and frames of video data, respectively. The settings enable the user to select either active-high or active-low polarities for each timing signal.

The Camera Link interface includes a data valid signal to qualify the video signals coming from the camera. In most cases. This camera signal is held high as the video signals coming from the camera are always valid. In most cases the frame grabber can ignore the data valid signal.

1.3.4. Camera Serial Port Access

The CLT-353R/L incorporates a provision that enables the user to communicate with the Camera Link camera via either the serial port that is part of the frame grabber interface, or via the rear-panel RS-232 port. The selection is made via switch position 6.

The RS-232 serial port incorporates a standard 9-pin D-Sub (DB9) connector. A null modem cable is required for connecting the CLT-353R/L to a PC serial port, USB adapter, etc.

1.4. Typical Application

A typical CLT-353R/L application is shown in Figure 1-5. The Camera Link camera is connected to the CLT-353L using a standard Camera Link cable. The CLT-353L is then connected to an LVDS frame grabber using a custom cable incorporating a 68-pin SCSI-style connector at the CLT-353R/L end.

Rear-panel modes switch settings are shown in Figure 1-6. The clock phase shifter is set for standard 0^0 . The line valid, frame valid, and data valid polarities are set for the most common active-high polarities.

Camera serial communication selection is via the frame grabber serial port. Therefore, no connection to the rear-panel RS-232 DB-9 connector is needed.

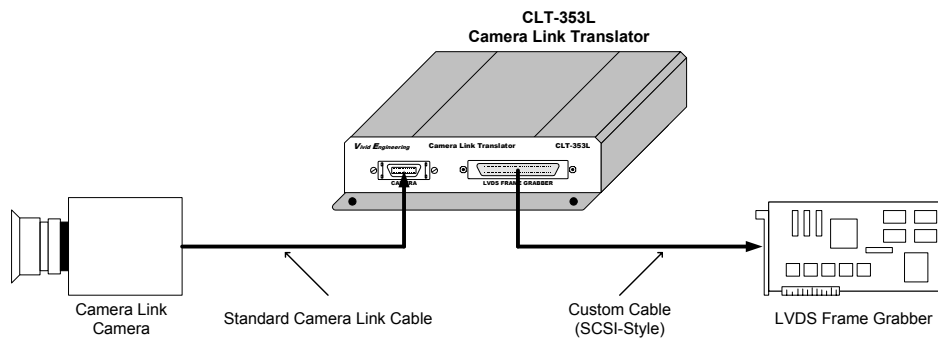
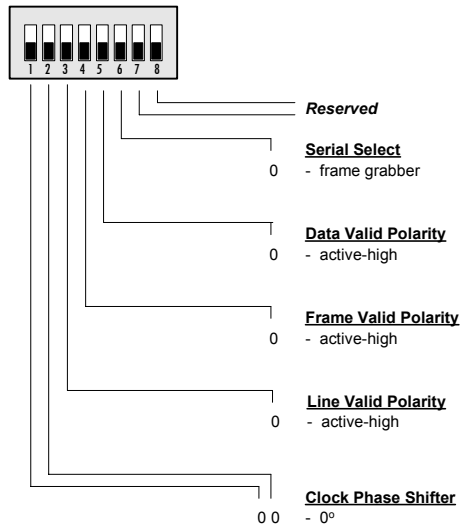


Figure 1-5: CLT-353R/L Typical Application



0 = "down" switch position
 1 = "up" switch position

Figure 1-6: Example Mode Settings

1.5. Specifications

Table 1-1: CLT-353R/L Specifications

Feature	Specification
Camera Interface	Camera Link "base" configuration.
Camera Connector	26-pin MDR type
Frame Grabber Interface	Parallel differential data format - "R" version = RS-422 - "L" version = LVDS (EIA-644)
Frame Grabber Connector	68-pin HD type (SCSI-3)
Frequency Range	20 - 85 MHz ("L" version) 20 - 32 MHz ("R" version)
Mode Selection	Rear-panel 8-position DIP switch
Serial Port	Standard RS-232 w/ 9-pin male D-Sub connector (DB9)
Latency	Video path: 3 camera pixel clock cycles Control signals: 20 ns max
Power Supply	Universal wall style w/ outlet plug set
Power Plug	2.1 x 5.5 mm, center-positive. Locking style optional
Power Requirements	4.5 – 9.0 VDC, internally isolated - "R" version = TBD mA at 5 VDC (typical) - "L" version = 340 mA at 5 VDC (typical)
Cabinet Dimensions	5.28" (L) x 1.18" (H) x 7.12" (D)
Weight	TBD oz
Operating Temperature Range	0 to 50° C
Storage Temperature Range	-25 to 75° C
Relative Humidity	0 to 90%, non-condensing

2. Interface

2.1. Front Panel Connections

A CLT-353R/L Camera Link Translator front panel is shown in Figure 2-1 (CLT-353R shown). The front panel contains two video connectors; one for connecting to the camera and one for connecting to the frame grabber.

The camera connector is a 26-pin MDR type (MDR-26).

The frame grabber connector is a 68-pin HD68 SCSI-3 type (TE Connectivity p/n 5787170-7) with 2-56 jackscrew sockets (TE Connectivity p/n 749087-2). Figure 2-2 identifies the pin positions.

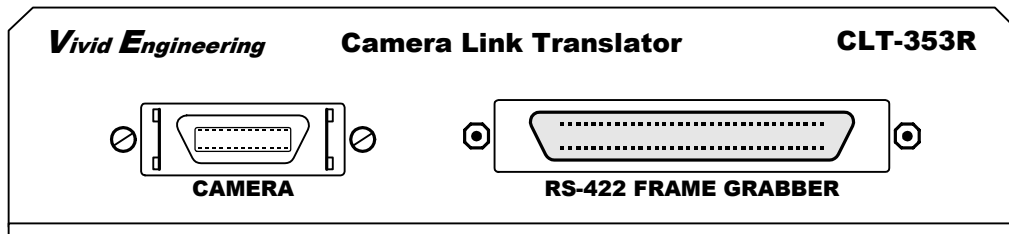


Figure 2-1: CLT-353R/L Front Panel

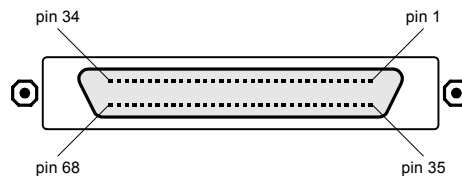


Figure 2-2: HD68 Connector Pin Positions

2.1.1. Camera Connector Signals

The MDR-26 video connector signal assignments comply with the Camera Link “base” configuration. The connector signal assignments correspond to the *frame grabber* interface defined in the Camera Link Specification. This provides compatibility with standard Camera Link cables.

2.1.2. Frame Grabber Connector Signals

Tables 2-1 through 2-5 identify the 68-pin frame grabber connector signal assignments for single-channel pixel data modes (1x8, 1x10, 1x12, 1x14, and 1x16). Tables 2-6 through 2-8 identify the signal assignment for dual-channel modes (2x8, 2x10, 2x12), and Table 2-9 identifies the signal assignment for color mode (3x8). **The appropriate table must be used when making a camera cable for use with the CLT-353R/L.**

2.1.3. Cable Shield Grounding

Camera and frame grabber cable “outer” shields are connected to the CLT-353R/L aluminum case. Case and endplate contacting surfaces are unpainted, providing a Faraday cage to shield internal circuitry. The case is isolated from the CLT-353R/L circuitry and the Camera Link cable “inner” shield.

2.1.4. Recommended Cable Connectors

The following is a list of recommended CLT-353R/L mating connectors (plugs) and housings (backshells) for use in cables that connect the CLT-353R/L to the frame grabber:

Plug, TE Connectivity p/n 1-5750913-7

Plug, TE Connectivity p/n 5750913-7

Plug, TE Connectivity p/n 5749111-6

Plug, TE Connectivity p/n 5749621-7

Backshell, TE Connectivity p/n 5786152-3

Backshell, TE Connectivity p/n 5750752-1

Backshell, TE Connectivity p/n 5750752-3

Other suitable connector manufacturers include NorComp, Acon, and Harting.

Table 2-1: Frame Grabber Connector, 8-bit Single-Channel Mode

Camera Interface Signal Name	Camera Interface Connector Pin	Signal Direction	Notes
A0 +	1	CLT-353 → FG	
A0 -	35	CLT-353 → FG	
A1 +	2	CLT-353 → FG	
A1 -	36	CLT-353 → FG	
A2 +	3	CLT-353 → FG	
A2 -	37	CLT-353 → FG	
A3 +	4	CLT-353 → FG	
A3 -	38	CLT-353 → FG	
A4 +	5	CLT-353 → FG	
A4 -	39	CLT-353 → FG	
A5 +	6	CLT-353 → FG	
A5 -	40	CLT-353 → FG	
A6 +	7	CLT-353 → FG	
A6 -	41	CLT-353 → FG	
A7 + ¹	8	CLT-353 → FG	
A7 - ¹	42	CLT-353 → FG	
<i>Unused Output</i>	9	CLT-353 → FG	
<i>Unused Output</i>	43	CLT-353 → FG	
<i>Unused Output</i>	10	CLT-353 → FG	
<i>Unused Output</i>	44	CLT-353 → FG	
<i>Unused Output</i>	11	CLT-353 → FG	
<i>Unused Output</i>	45	CLT-353 → FG	
<i>Unused Output</i>	12	CLT-353 → FG	
<i>Unused Output</i>	46	CLT-353 → FG	
<i>Unused Output</i>	13	CLT-353 → FG	
<i>Unused Output</i>	47	CLT-353 → FG	
<i>Unused Output</i>	14	CLT-353 → FG	
<i>Unused Output</i>	48	CLT-353 → FG	
<i>Unused Output</i>	15	CLT-353 → FG	
<i>Unused Output</i>	49	CLT-353 → FG	

<i>Unused Output</i>	16	CLT-353 → FG	
<i>Unused Output</i>	50	CLT-353 → FG	
<i>Unused Output</i>	17	CLT-353 → FG	
<i>Unused Output</i>	51	CLT-353 → FG	
<i>Unused Output</i>	18	CLT-353 → FG	
<i>Unused Output</i>	52	CLT-353 → FG	
<i>Unused Output</i>	19	CLT-353 → FG	
<i>Unused Output</i>	53	CLT-353 → FG	
<i>Unused Output</i>	20	CLT-353 → FG	
<i>Unused Output</i>	54	CLT-353 → FG	
<i>Unused Output</i>	21	CLT-353 → FG	
<i>Unused Output</i>	55	CLT-353 → FG	
<i>Unused Output</i>	22	CLT-353 → FG	
<i>Unused Output</i>	56	CLT-353 → FG	
<i>Unused Output</i>	23	CLT-353 → FG	
<i>Unused Output</i>	57	CLT-353 → FG	
<i>Unused Output</i>	24	CLT-353 → FG	
<i>Unused Output</i>	58	CLT-353 → FG	
Mode Control 1 +	25	FG → CLT-353	<i>CC1 from FG</i>
Mode Control 1 -	59	FG → CLT-353	"
Mode Control 2 +	26	FG → CLT-353	<i>CC2 from FG</i>
Mode Control 2 -	60	FG → CLT-353	"
Serial Control In +	27	FG → CLT-353	<i>serial comm, FG to cam</i>
Serial Control In -	61	FG → CLT-353	"
Serial Control Out +	28	CLT-353 → FG	<i>serial comm, cam to FG</i>
Serial Control Out -	62	CLT-353 → FG	"
<i>reserved</i>	29		
<i>reserved</i>	63		
Frame Enable +	30	CLT-353 → FG	<i>"frame valid"</i>
Frame Enable -	64	CLT-353 → FG	"
Line Enable +	31	CLT-353 → FG	<i>"line valid"</i>
Line Enable -	65	CLT-353 → FG	"
Data Valid +	32	CLT-353 → FG	<i>"data valid"</i>
Data Valid -	66	CLT-353 → FG	"
Pixel Strobe +	33	CLT-353 → FG	<i>"pixel clock"</i>
Pixel Strobe -	67	CLT-353 → FG	"

Ground	34	N/A	<i>tied to digital ground</i>
Ground	68	N/A	<i>tied to digital ground</i>

[†] Pixel "A" MSB
"FG" = Frame Grabber
"cam" = Camera

Table 2-2: Frame Grabber Connector, 10-bit Single-Channel Mode

Camera Interface Signal Name	Camera Interface Connector Pin	Signal Direction	Notes
A0 +	1	CLT-353 → FG	
A0 -	35	CLT-353 → FG	
A1 +	2	CLT-353 → FG	
A1 -	36	CLT-353 → FG	
A2 +	3	CLT-353 → FG	
A2 -	37	CLT-353 → FG	
A3 +	4	CLT-353 → FG	
A3 -	38	CLT-353 → FG	
A4 +	5	CLT-353 → FG	
A4 -	39	CLT-353 → FG	
A5 +	6	CLT-353 → FG	
A5 -	40	CLT-353 → FG	
A6 +	7	CLT-353 → FG	
A6 -	41	CLT-353 → FG	
A7 +	8	CLT-353 → FG	
A7 -	42	CLT-353 → FG	
A8 +	9	CLT-353 → FG	
A8 -	43	CLT-353 → FG	
A9 + ¹	10	CLT-353 → FG	
A9 - ¹	44	CLT-353 → FG	
<i>Unused Output</i>	11	CLT-353 → FG	
<i>Unused Output</i>	45	CLT-353 → FG	
<i>Unused Output</i>	12	CLT-353 → FG	
<i>Unused Output</i>	46	CLT-353 → FG	
<i>Unused Output</i>	13	CLT-353 → FG	
<i>Unused Output</i>	47	CLT-353 → FG	
<i>Unused Output</i>	14	CLT-353 → FG	
<i>Unused Output</i>	48	CLT-353 → FG	
<i>Unused Output</i>	15	CLT-353 → FG	
<i>Unused Output</i>	49	CLT-353 → FG	

<i>Unused Output</i>	16	CLT-353 → FG	
<i>Unused Output</i>	50	CLT-353 → FG	
<i>Unused Output</i>	17	CLT-353 → FG	
<i>Unused Output</i>	51	CLT-353 → FG	
<i>Unused Output</i>	18	CLT-353 → FG	
<i>Unused Output</i>	52	CLT-353 → FG	
<i>Unused Output</i>	19	CLT-353 → FG	
<i>Unused Output</i>	53	CLT-353 → FG	
<i>Unused Output</i>	20	CLT-353 → FG	
<i>Unused Output</i>	54	CLT-353 → FG	
<i>Unused Output</i>	21	CLT-353 → FG	
<i>Unused Output</i>	55	CLT-353 → FG	
<i>Unused Output</i>	22	CLT-353 → FG	
<i>Unused Output</i>	56	CLT-353 → FG	
<i>Unused Output</i>	23	CLT-353 → FG	
<i>Unused Output</i>	57	CLT-353 → FG	
<i>Unused Output</i>	24	CLT-353 → FG	
<i>Unused Output</i>	58	CLT-353 → FG	
Mode Control 1 +	25	FG → CLT-353	<i>CC1 from FG</i>
Mode Control 1 -	59	FG → CLT-353	"
Mode Control 2 +	26	FG → CLT-353	<i>CC2 from FG</i>
Mode Control 2 -	60	FG → CLT-353	"
Serial Control In +	27	FG → CLT-353	<i>serial comm, FG to cam</i>
Serial Control In -	61	FG → CLT-353	"
Serial Control Out +	28	CLT-353 → FG	<i>serial comm, cam to FG</i>
Serial Control Out -	62	CLT-353 → FG	"
<i>reserved</i>	29		
<i>reserved</i>	63		
Frame Enable +	30	CLT-353 → FG	<i>"frame valid"</i>
Frame Enable -	64	CLT-353 → FG	"
Line Enable +	31	CLT-353 → FG	<i>"line valid"</i>
Line Enable -	65	CLT-353 → FG	"
Data Valid +	32	CLT-353 → FG	<i>"data valid"</i>
Data Valid -	66	CLT-353 → FG	"
Pixel Strobe +	33	CLT-353 → FG	<i>"pixel clock"</i>
Pixel Strobe -	67	CLT-353 → FG	"

Ground	34	N/A	<i>tied to digital ground</i>
Ground	68	N/A	<i>tied to digital ground</i>

[†] Pixel "A" MSB
"FG" = Frame Grabber
"cam" = Camera

Table 2-3: Frame Grabber Connector, 12-bit Single-Channel Mode

Camera Interface Signal Name	Camera Interface Connector Pin	Signal Direction	Notes
A0 +	1	CLT-353 → FG	
A0 -	35	CLT-353 → FG	
A1 +	2	CLT-353 → FG	
A1 -	36	CLT-353 → FG	
A2 +	3	CLT-353 → FG	
A2 -	37	CLT-353 → FG	
A3 +	4	CLT-353 → FG	
A3 -	38	CLT-353 → FG	
A4 +	5	CLT-353 → FG	
A4 -	39	CLT-353 → FG	
A5 +	6	CLT-353 → FG	
A5 -	40	CLT-353 → FG	
A6 +	7	CLT-353 → FG	
A6 -	41	CLT-353 → FG	
A7 +	8	CLT-353 → FG	
A7 -	42	CLT-353 → FG	
A8 +	9	CLT-353 → FG	
A8 -	43	CLT-353 → FG	
A9 +	10	CLT-353 → FG	
A9 -	44	CLT-353 → FG	
A10 +	11	CLT-353 → FG	
A10 -	45	CLT-353 → FG	
A11 + ¹	12	CLT-353 → FG	
A11 - ¹	46	CLT-353 → FG	
<i>Unused Output</i>	13	CLT-353 → FG	
<i>Unused Output</i>	47	CLT-353 → FG	
<i>Unused Output</i>	14	CLT-353 → FG	
<i>Unused Output</i>	48	CLT-353 → FG	
<i>Unused Output</i>	15	CLT-353 → FG	
<i>Unused Output</i>	49	CLT-353 → FG	

<i>Unused Output</i>	16	CLT-353 → FG	
<i>Unused Output</i>	50	CLT-353 → FG	
<i>Unused Output</i>	17	CLT-353 → FG	
<i>Unused Output</i>	51	CLT-353 → FG	
<i>Unused Output</i>	18	CLT-353 → FG	
<i>Unused Output</i>	52	CLT-353 → FG	
<i>Unused Output</i>	19	CLT-353 → FG	
<i>Unused Output</i>	53	CLT-353 → FG	
<i>Unused Output</i>	20	CLT-353 → FG	
<i>Unused Output</i>	54	CLT-353 → FG	
<i>Unused Output</i>	21	CLT-353 → FG	
<i>Unused Output</i>	55	CLT-353 → FG	
<i>Unused Output</i>	22	CLT-353 → FG	
<i>Unused Output</i>	56	CLT-353 → FG	
<i>Unused Output</i>	23	CLT-353 → FG	
<i>Unused Output</i>	57	CLT-353 → FG	
<i>Unused Output</i>	24	CLT-353 → FG	
<i>Unused Output</i>	58	CLT-353 → FG	
Mode Control 1 +	25	FG → CLT-353	<i>CC1 from FG</i>
Mode Control 1 -	59	FG → CLT-353	"
Mode Control 2 +	26	FG → CLT-353	<i>CC2 from FG</i>
Mode Control 2 -	60	FG → CLT-353	"
Serial Control In +	27	FG → CLT-353	<i>serial comm, FG to cam</i>
Serial Control In -	61	FG → CLT-353	"
Serial Control Out +	28	CLT-353 → FG	<i>serial comm, cam to FG</i>
Serial Control Out -	62	CLT-353 → FG	"
<i>reserved</i>	29		
<i>reserved</i>	63		
Frame Enable +	30	CLT-353 → FG	<i>"frame valid"</i>
Frame Enable -	64	CLT-353 → FG	"
Line Enable +	31	CLT-353 → FG	<i>"line valid"</i>
Line Enable -	65	CLT-353 → FG	"
Data Valid +	32	CLT-353 → FG	<i>"data valid"</i>
Data Valid -	66	CLT-353 → FG	"
Pixel Strobe +	33	CLT-353 → FG	<i>"pixel clock"</i>
Pixel Strobe -	67	CLT-353 → FG	"

Ground	34	N/A	<i>tied to digital ground</i>
Ground	68	N/A	<i>tied to digital ground</i>

[†] Pixel "A" MSB
"FG" = Frame Grabber
"cam" = Camera

Table 2-4: Frame Grabber Connector, 14-bit Single-Channel Mode

Camera Interface Signal Name	Camera Interface Connector Pin	Signal Direction	Notes
A0 +	1	CLT-353 → FG	
A0 -	35	CLT-353 → FG	
A1 +	2	CLT-353 → FG	
A1 -	36	CLT-353 → FG	
A2 +	3	CLT-353 → FG	
A2 -	37	CLT-353 → FG	
A3 +	4	CLT-353 → FG	
A3 -	38	CLT-353 → FG	
A4 +	5	CLT-353 → FG	
A4 -	39	CLT-353 → FG	
A5 +	6	CLT-353 → FG	
A5 -	40	CLT-353 → FG	
A6 +	7	CLT-353 → FG	
A6 -	41	CLT-353 → FG	
A7 +	8	CLT-353 → FG	
A7 -	42	CLT-353 → FG	
A8 +	9	CLT-353 → FG	
A8 -	43	CLT-353 → FG	
A9 +	10	CLT-353 → FG	
A9 -	44	CLT-353 → FG	
A10 +	11	CLT-353 → FG	
A10 -	45	CLT-353 → FG	
A11 +	12	CLT-353 → FG	
A11 -	46	CLT-353 → FG	
A12 +	13	CLT-353 → FG	
A12 -	47	CLT-353 → FG	
A13 + ¹	14	CLT-353 → FG	
A13 - ¹	48	CLT-353 → FG	
<i>Unused Output</i>	15	CLT-353 → FG	
<i>Unused Output</i>	49	CLT-353 → FG	

<i>Unused Output</i>	16	CLT-353 → FG	
<i>Unused Output</i>	50	CLT-353 → FG	
<i>Unused Output</i>	17	CLT-353 → FG	
<i>Unused Output</i>	51	CLT-353 → FG	
<i>Unused Output</i>	18	CLT-353 → FG	
<i>Unused Output</i>	52	CLT-353 → FG	
<i>Unused Output</i>	19	CLT-353 → FG	
<i>Unused Output</i>	53	CLT-353 → FG	
<i>Unused Output</i>	20	CLT-353 → FG	
<i>Unused Output</i>	54	CLT-353 → FG	
<i>Unused Output</i>	21	CLT-353 → FG	
<i>Unused Output</i>	55	CLT-353 → FG	
<i>Unused Output</i>	22	CLT-353 → FG	
<i>Unused Output</i>	56	CLT-353 → FG	
<i>Unused Output</i>	23	CLT-353 → FG	
<i>Unused Output</i>	57	CLT-353 → FG	
<i>Unused Output</i>	24	CLT-353 → FG	
<i>Unused Output</i>	58	CLT-353 → FG	
Mode Control 1 +	25	FG → CLT-353	<i>CC1 from FG</i>
Mode Control 1 -	59	FG → CLT-353	"
Mode Control 2 +	26	FG → CLT-353	<i>CC2 from FG</i>
Mode Control 2 -	60	FG → CLT-353	"
Serial Control In +	27	FG → CLT-353	<i>serial comm, FG to cam</i>
Serial Control In -	61	FG → CLT-353	"
Serial Control Out +	28	CLT-353 → FG	<i>serial comm, cam to FG</i>
Serial Control Out -	62	CLT-353 → FG	"
<i>reserved</i>	29		
<i>reserved</i>	63		
Frame Enable +	30	CLT-353 → FG	<i>"frame valid"</i>
Frame Enable -	64	CLT-353 → FG	"
Line Enable +	31	CLT-353 → FG	<i>"line valid"</i>
Line Enable -	65	CLT-353 → FG	"
Data Valid +	32	CLT-353 → FG	<i>"data valid"</i>
Data Valid -	66	CLT-353 → FG	"
Pixel Strobe +	33	CLT-353 → FG	<i>"pixel clock"</i>
Pixel Strobe -	67	CLT-353 → FG	"

Ground	34	N/A	<i>tied to digital ground</i>
Ground	68	N/A	<i>tied to digital ground</i>

[†] Pixel "A" MSB
"FG" = Frame Grabber
"cam" = Camera

Table 2-5: Frame Grabber Connector, 16-bit Single-Channel Mode

Camera Interface Signal Name	Camera Interface Connector Pin	Signal Direction	Notes
A0 +	1	CLT-353 → FG	
A0 -	35	CLT-353 → FG	
A1 +	2	CLT-353 → FG	
A1 -	36	CLT-353 → FG	
A2 +	3	CLT-353 → FG	
A2 -	37	CLT-353 → FG	
A3 +	4	CLT-353 → FG	
A3 -	38	CLT-353 → FG	
A4 +	5	CLT-353 → FG	
A4 -	39	CLT-353 → FG	
A5 +	6	CLT-353 → FG	
A5 -	40	CLT-353 → FG	
A6 +	7	CLT-353 → FG	
A6 -	41	CLT-353 → FG	
A7 +	8	CLT-353 → FG	
A7 -	42	CLT-353 → FG	
A8 +	9	CLT-353 → FG	
A8 -	43	CLT-353 → FG	
A9 +	10	CLT-353 → FG	
A9 -	44	CLT-353 → FG	
A10 +	11	CLT-353 → FG	
A10 -	45	CLT-353 → FG	
A11 +	12	CLT-353 → FG	
A11 -	46	CLT-353 → FG	
A12 +	13	CLT-353 → FG	
A12 -	47	CLT-353 → FG	
A13 +	14	CLT-353 → FG	
A13 -	48	CLT-353 → FG	
A14 +	15	CLT-353 → FG	
A14 -	49	CLT-353 → FG	

A15 + ¹	16	CLT-353 → FG	
A15 - ¹	50	CLT-353 → FG	
<i>Unused Output</i>	17	CLT-353 → FG	
<i>Unused Output</i>	51	CLT-353 → FG	
<i>Unused Output</i>	18	CLT-353 → FG	
<i>Unused Output</i>	52	CLT-353 → FG	
<i>Unused Output</i>	19	CLT-353 → FG	
<i>Unused Output</i>	53	CLT-353 → FG	
<i>Unused Output</i>	20	CLT-353 → FG	
<i>Unused Output</i>	54	CLT-353 → FG	
<i>Unused Output</i>	21	CLT-353 → FG	
<i>Unused Output</i>	55	CLT-353 → FG	
<i>Unused Output</i>	22	CLT-353 → FG	
<i>Unused Output</i>	56	CLT-353 → FG	
<i>Unused Output</i>	23	CLT-353 → FG	
<i>Unused Output</i>	57	CLT-353 → FG	
<i>Unused Output</i>	24	CLT-353 → FG	
<i>Unused Output</i>	58	CLT-353 → FG	
Mode Control 1 +	25	FG → CLT-353	<i>CC1 from FG</i>
Mode Control 1 -	59	FG → CLT-353	"
Mode Control 2 +	26	FG → CLT-353	<i>CC2 from FG</i>
Mode Control 2 -	60	FG → CLT-353	"
Serial Control In +	27	FG → CLT-353	<i>serial comm, FG to cam</i>
Serial Control In -	61	FG → CLT-353	"
Serial Control Out +	28	CLT-353 → FG	<i>serial comm, cam to FG</i>
Serial Control Out -	62	CLT-353 → FG	"
<i>reserved</i>	29		
<i>reserved</i>	63		
Frame Enable +	30	CLT-353 → FG	<i>"frame valid"</i>
Frame Enable -	64	CLT-353 → FG	"
Line Enable +	31	CLT-353 → FG	<i>"line valid"</i>
Line Enable -	65	CLT-353 → FG	"
Data Valid +	32	CLT-353 → FG	<i>"data valid"</i>
Data Valid -	66	CLT-353 → FG	"
Pixel Strobe +	33	CLT-353 → FG	<i>"pixel clock"</i>
Pixel Strobe -	67	CLT-353 → FG	"

Ground	34	N/A	<i>tied to digital ground</i>
Ground	68	N/A	<i>tied to digital ground</i>

[†] Pixel "A" MSB
"FG" = Frame Grabber
"cam" = Camera

Table 2-6: Frame Grabber Connector, 8-bit Dual-Channel Mode

Camera Interface Signal Name	Camera Interface Connector Pin	Signal Direction	Notes
A0 +	1	CLT-353 → FG	
A0 -	35	CLT-353 → FG	
A1 +	2	CLT-353 → FG	
A1 -	36	CLT-353 → FG	
A2 +	3	CLT-353 → FG	
A2 -	37	CLT-353 → FG	
A3 +	4	CLT-353 → FG	
A3 -	38	CLT-353 → FG	
A4 +	5	CLT-353 → FG	
A4 -	39	CLT-353 → FG	
A5 +	6	CLT-353 → FG	
A5 -	40	CLT-353 → FG	
A6 +	7	CLT-353 → FG	
A6 -	41	CLT-353 → FG	
A7 + ¹	8	CLT-353 → FG	
A7 - ¹	42	CLT-353 → FG	
B0 +	9	CLT-353 → FG	
B0 -	43	CLT-353 → FG	
B1 +	10	CLT-353 → FG	
B1 -	44	CLT-353 → FG	
B2 +	11	CLT-353 → FG	
B2 -	45	CLT-353 → FG	
B3 +	12	CLT-353 → FG	
B3 -	46	CLT-353 → FG	
B4 +	13	CLT-353 → FG	
B4 -	47	CLT-353 → FG	
B5 +	14	CLT-353 → FG	
B5 -	48	CLT-353 → FG	
B6 +	15	CLT-353 → FG	
B6 -	49	CLT-353 → FG	

B7 + ²	16	CLT-353 → FG	
B7 - ²	50	CLT-353 → FG	
<i>Unused Output</i>	17	CLT-353 → FG	
<i>Unused Output</i>	51	CLT-353 → FG	
<i>Unused Output</i>	18	CLT-353 → FG	
<i>Unused Output</i>	52	CLT-353 → FG	
<i>Unused Output</i>	19	CLT-353 → FG	
<i>Unused Output</i>	53	CLT-353 → FG	
<i>Unused Output</i>	20	CLT-353 → FG	
<i>Unused Output</i>	54	CLT-353 → FG	
<i>Unused Output</i>	21	CLT-353 → FG	
<i>Unused Output</i>	55	CLT-353 → FG	
<i>Unused Output</i>	22	CLT-353 → FG	
<i>Unused Output</i>	56	CLT-353 → FG	
<i>Unused Output</i>	23	CLT-353 → FG	
<i>Unused Output</i>	57	CLT-353 → FG	
<i>Unused Output</i>	24	CLT-353 → FG	
<i>Unused Output</i>	58	CLT-353 → FG	
Mode Control 1 +	25	FG → CLT-353	<i>CC1 from FG</i>
Mode Control 1 -	59	FG → CLT-353	"
Mode Control 2 +	26	FG → CLT-353	<i>CC2 from FG</i>
Mode Control 2 -	60	FG → CLT-353	"
Serial Control In +	27	FG → CLT-353	<i>serial comm, FG to cam</i>
Serial Control In -	61	FG → CLT-353	"
Serial Control Out +	28	CLT-353 → FG	<i>serial comm, cam to FG</i>
Serial Control Out -	62	CLT-353 → FG	"
<i>reserved</i>	29		
<i>reserved</i>	63		
Frame Enable +	30	CLT-353 → FG	<i>"frame valid"</i>
Frame Enable -	64	CLT-353 → FG	"
Line Enable +	31	CLT-353 → FG	<i>"line valid"</i>
Line Enable -	65	CLT-353 → FG	"
Data Valid +	32	CLT-353 → FG	<i>"data valid"</i>
Data Valid -	66	CLT-353 → FG	"
Pixel Strobe +	33	CLT-353 → FG	<i>"pixel clock"</i>
Pixel Strobe -	67	CLT-353 → FG	"

Ground	34	N/A	<i>tied to digital ground</i>
Ground	68	N/A	<i>tied to digital ground</i>

¹ Pixel "A" MSB

² Pixel "B" MSB

"FG" = Frame Grabber

"cam" = Camera

Table 2-7: Frame Grabber Connector, 10-bit Dual-Channel Mode

Camera Interface Signal Name	Camera Interface Connector Pin	Signal Direction	Notes
A0 +	1	CLT-353 → FG	
A0 -	35	CLT-353 → FG	
A1 +	2	CLT-353 → FG	
A1 -	36	CLT-353 → FG	
A2 +	3	CLT-353 → FG	
A2 -	37	CLT-353 → FG	
A3 +	4	CLT-353 → FG	
A3 -	38	CLT-353 → FG	
A4 +	5	CLT-353 → FG	
A4 -	39	CLT-353 → FG	
A5 +	6	CLT-353 → FG	
A5 -	40	CLT-353 → FG	
A6 +	7	CLT-353 → FG	
A6 -	41	CLT-353 → FG	
A7 +	8	CLT-353 → FG	
A7 -	42	CLT-353 → FG	
A8 +	9	CLT-353 → FG	
A8 -	43	CLT-353 → FG	
A9 + ¹	10	CLT-353 → FG	
A9 - ¹	44	CLT-353 → FG	
<i>Unused Output</i>	11	CLT-353 → FG	
<i>Unused Output</i>	45	CLT-353 → FG	
<i>Unused Output</i>	12	CLT-353 → FG	
<i>Unused Output</i>	46	CLT-353 → FG	
B8 +	13	CLT-353 → FG	
B8 -	47	CLT-353 → FG	
B9 + ²	14	CLT-353 → FG	
B9 - ²	48	CLT-353 → FG	
<i>Unused Output</i>	15	CLT-353 → FG	
<i>Unused Output</i>	49	CLT-353 → FG	

<i>Unused Output</i>	16	CLT-353 → FG	
<i>Unused Output</i>	50	CLT-353 → FG	
B0 +	17	CLT-353 → FG	
B0 -	51	CLT-353 → FG	
B1 +	18	CLT-353 → FG	
B1 -	52	CLT-353 → FG	
B2 +	19	CLT-353 → FG	
B2 -	53	CLT-353 → FG	
B3 +	20	CLT-353 → FG	
B3 -	54	CLT-353 → FG	
B4 +	21	CLT-353 → FG	
B4 -	55	CLT-353 → FG	
B5 +	22	CLT-353 → FG	
B5 -	56	CLT-353 → FG	
B6 +	23	CLT-353 → FG	
B6 -	57	CLT-353 → FG	
B7 +	24	CLT-353 → FG	
B7 -	58	CLT-353 → FG	
Mode Control 1 +	25	FG → CLT-353	<i>CC1 from FG</i>
Mode Control 1 -	59	FG → CLT-353	"
Mode Control 2 +	26	FG → CLT-353	<i>CC2 from FG</i>
Mode Control 2 -	60	FG → CLT-353	"
Serial Control In +	27	FG → CLT-353	<i>serial comm, FG to cam</i>
Serial Control In -	61	FG → CLT-353	"
Serial Control Out +	28	CLT-353 → FG	<i>serial comm, cam to FG</i>
Serial Control Out -	62	CLT-353 → FG	"
<i>reserved</i>	29		
<i>reserved</i>	63		
Frame Enable +	30	CLT-353 → FG	<i>"frame valid"</i>
Frame Enable -	64	CLT-353 → FG	"
Line Enable +	31	CLT-353 → FG	<i>"line valid"</i>
Line Enable -	65	CLT-353 → FG	"
Data Valid +	32	CLT-353 → FG	<i>"data valid"</i>
Data Valid -	66	CLT-353 → FG	"
Pixel Strobe +	33	CLT-353 → FG	<i>"pixel clock"</i>
Pixel Strobe -	67	CLT-353 → FG	"

Ground	34	N/A	<i>tied to digital ground</i>
Ground	68	N/A	<i>tied to digital ground</i>

¹ Pixel "A" MSB

² Pixel "B" MSB

"FG" = Frame Grabber

"cam" = Camera

Table 2-8: Frame Grabber Connector, 12-bit Dual-Channel Mode

Camera Interface Signal Name	Camera Interface Connector Pin	Signal Direction	Notes
A0 +	1	CLT-353 → FG	
A0 -	35	CLT-353 → FG	
A1 +	2	CLT-353 → FG	
A1 -	36	CLT-353 → FG	
A2 +	3	CLT-353 → FG	
A2 -	37	CLT-353 → FG	
A3 +	4	CLT-353 → FG	
A3 -	38	CLT-353 → FG	
A4 +	5	CLT-353 → FG	
A4 -	39	CLT-353 → FG	
A5 +	6	CLT-353 → FG	
A5 -	40	CLT-353 → FG	
A6 +	7	CLT-353 → FG	
A6 -	41	CLT-353 → FG	
A7 +	8	CLT-353 → FG	
A7 -	42	CLT-353 → FG	
A8 +	9	CLT-353 → FG	
A8 -	43	CLT-353 → FG	
A9 +	10	CLT-353 → FG	
A9 -	44	CLT-353 → FG	
A10 +	11	CLT-353 → FG	
A10 -	45	CLT-353 → FG	
A11 + ¹	12	CLT-353 → FG	
A11 - ¹	46	CLT-353 → FG	
B8 +	13	CLT-353 → FG	
B8 -	47	CLT-353 → FG	
B9 +	14	CLT-353 → FG	
B9 -	48	CLT-353 → FG	
B10 +	15	CLT-353 → FG	
B10 -	49	CLT-353 → FG	

B11 + ²	16	CLT-353 → FG	
B11 - ²	50	CLT-353 → FG	
B0 +	17	CLT-353 → FG	
B0 -	51	CLT-353 → FG	
B1 +	18	CLT-353 → FG	
B1 -	52	CLT-353 → FG	
B2 +	19	CLT-353 → FG	
B2 -	53	CLT-353 → FG	
B3 +	20	CLT-353 → FG	
B3 -	54	CLT-353 → FG	
B4 +	21	CLT-353 → FG	
B4 -	55	CLT-353 → FG	
B5 +	22	CLT-353 → FG	
B5 -	56	CLT-353 → FG	
B6 +	23	CLT-353 → FG	
B6 -	57	CLT-353 → FG	
B7 +	24	CLT-353 → FG	
B7 -	58	CLT-353 → FG	
Mode Control 1 +	25	FG → CLT-353	<i>CC1 from FG</i>
Mode Control 1 -	59	FG → CLT-353	"
Mode Control 2 +	26	FG → CLT-353	<i>CC2 from FG</i>
Mode Control 2 -	60	FG → CLT-353	"
Serial Control In +	27	FG → CLT-353	<i>serial comm, FG to cam</i>
Serial Control In -	61	FG → CLT-353	"
Serial Control Out +	28	CLT-353 → FG	<i>serial comm, cam to FG</i>
Serial Control Out -	62	CLT-353 → FG	"
<i>reserved</i>	29		
<i>reserved</i>	63		
Frame Enable +	30	CLT-353 → FG	<i>"frame valid"</i>
Frame Enable -	64	CLT-353 → FG	"
Line Enable +	31	CLT-353 → FG	<i>"line valid"</i>
Line Enable -	65	CLT-353 → FG	"
Data Valid +	32	CLT-353 → FG	<i>"data valid"</i>
Data Valid -	66	CLT-353 → FG	"
Pixel Strobe +	33	CLT-353 → FG	<i>"pixel clock"</i>
Pixel Strobe -	67	CLT-353 → FG	"

Ground	34	N/A	<i>tied to digital ground</i>
Ground	68	N/A	<i>tied to digital ground</i>

¹ Pixel "A" MSB

² Pixel "B" MSB

"FG" = Frame Grabber

"cam" = Camera

Table 2-9: Frame Grabber Connector, Color Mode

Camera Interface Signal Name	Camera Interface Connector Pin	Signal Direction	Notes
R0 +	1	CLT-353 → FG	
R0 -	35	CLT-353 → FG	
R1 +	2	CLT-353 → FG	
R1 -	36	CLT-353 → FG	
R2 +	3	CLT-353 → FG	
R2 -	37	CLT-353 → FG	
R3 +	4	CLT-353 → FG	
R3 -	38	CLT-353 → FG	
R4 +	5	CLT-353 → FG	
R4 -	39	CLT-353 → FG	
R5 +	6	CLT-353 → FG	
R5 -	40	CLT-353 → FG	
R6 +	7	CLT-353 → FG	
R6 -	41	CLT-353 → FG	
R7 + ¹	8	CLT-353 → FG	
R7 - ¹	42	CLT-353 → FG	
G0 +	9	CLT-353 → FG	
G0 -	43	CLT-353 → FG	
G1 +	10	CLT-353 → FG	
G1 -	44	CLT-353 → FG	
G2 +	11	CLT-353 → FG	
G2 -	45	CLT-353 → FG	
G3 +	12	CLT-353 → FG	
G3 -	46	CLT-353 → FG	
G4 +	13	CLT-353 → FG	
G4 -	47	CLT-353 → FG	
G5 +	14	CLT-353 → FG	
G5 -	48	CLT-353 → FG	
G6 +	15	CLT-353 → FG	
G6 -	49	CLT-353 → FG	

G7 + ²	16	CLT-353 → FG	
G7 - ²	50	CLT-353 → FG	
B0 +	17	CLT-353 → FG	
B0 -	51	CLT-353 → FG	
B1 +	18	CLT-353 → FG	
B1 -	52	CLT-353 → FG	
B2 +	19	CLT-353 → FG	
B2 -	53	CLT-353 → FG	
B3 +	20	CLT-353 → FG	
B3 -	54	CLT-353 → FG	
B4 +	21	CLT-353 → FG	
B4 -	55	CLT-353 → FG	
B5 +	22	CLT-353 → FG	
B5 -	56	CLT-353 → FG	
B6 +	23	CLT-353 → FG	
B6 -	57	CLT-353 → FG	
B7 + ³	24	CLT-353 → FG	
B7 - ³	58	CLT-353 → FG	
Mode Control 1 +	25	FG → CLT-353	<i>CC1 from FG</i>
Mode Control 1 -	59	FG → CLT-353	"
Mode Control 2 +	26	FG → CLT-353	<i>CC2 from FG</i>
Mode Control 2 -	60	FG → CLT-353	"
Serial Control In +	27	FG → CLT-353	<i>serial comm, FG to cam</i>
Serial Control In -	61	FG → CLT-353	"
Serial Control Out +	28	CLT-353 → FG	<i>serial comm, cam to FG</i>
Serial Control Out -	62	CLT-353 → FG	"
<i>reserved</i>	29		
<i>reserved</i>	63		
Frame Enable +	30	CLT-353 → FG	<i>"frame valid"</i>
Frame Enable -	64	CLT-353 → FG	"
Line Enable +	31	CLT-353 → FG	<i>"line valid"</i>
Line Enable -	65	CLT-353 → FG	"
Data Valid +	32	CLT-353 → FG	<i>"data valid"</i>
Data Valid -	66	CLT-353 → FG	"
Pixel Strobe +	33	CLT-353 → FG	<i>"pixel clock"</i>
Pixel Strobe -	67	CLT-353 → FG	"

Ground	34	N/A	<i>tied to digital ground</i>
Ground	68	N/A	<i>tied to digital ground</i>

- ¹ Pixel "R" MSB (red)
- ² Pixel "G" MSB (green)
- ³ Pixel "B" MSB (blue)
- "FG" = Frame Grabber
- "cam" = Camera

2.2. Rear Panel

The CLT-353R/L Camera Link Translator rear panel is shown in Figure 2-3. The rear panel contains an 8-position mode select DIP switch, power on indicator, DC power jack, and RS-232 port connector.

The DC power jack accepts either a standard 2.1 x 5.5 mm barrel-style power plug, or a special locking version plug. The locking plug has bayonet-style “ears” on the barrel. Once inserted, the barrel may be turned ¼ turn clockwise. This locks the connector in place and provides retention. The locking plug is removed by first turning the barrel ¼ turn counterclockwise, and then pulling out the plug from the unit. Plug polarity is center-positive. The recommended locking power plug for use with the CLT-353R/L is Philmore p/n 2150.

The RS-232 serial port connector is a standard 9-pin male D-Sub type (DB9). Figure 2-4 identifies the DB9 pin positions.

The DB9 connector signal assignments are compliant with the RS-232 serial interface standard. Table 2-3 identifies the DB9 signal assignments.

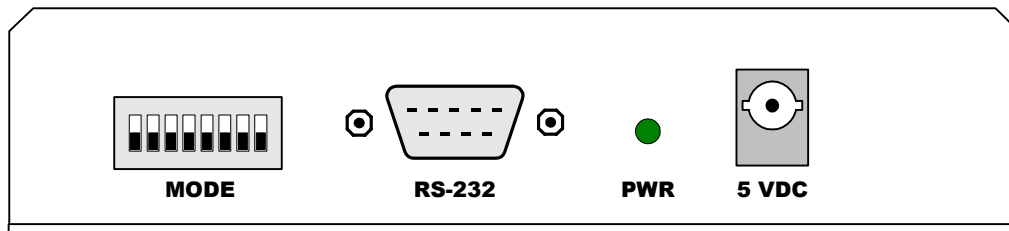


Figure 2-3: CLT-353R/L Rear Panel

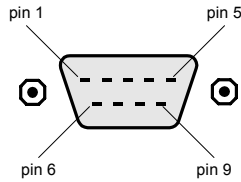


Figure 2-4: DB9 Connector Pin Positions

Table 2-3: DB9 Connector

RS-232 Signal Name	DB9 Pin#	Signal Direction	Notes
Received Line Signal Detect	1	N/A	<i>tied to pins 4 & 6</i>
Received Data	2	PC → CLT-353	
Transmitted Data	3	CLT-353 → PC	
Data Terminal Ready	4	N/A	<i>tied to pins 1 & 6</i>
Signal Ground (common)	5	N/A	<i>tied to digital ground</i>
DCE Ready	6	N/A	<i>tied to pins 1 & 4</i>
Request To Send	7	N/A	<i>tied to pin 8</i>
Clear To Send	8	N/A	<i>tied to pin 7</i>
Ring Indicator	9	N/A	<i>no connection</i>

"PC" = Control PC

3. Mechanical

3.1. Dimensions

The CLT-353R/L Camera Link Translator cabinet dimensions are shown in Figure 3-1 (CLT-353R shown).

The CLT-353R/L is housed in a sturdy aluminum enclosure. The body is extruded aluminum, with detachable front and rear endplates. The enclosure incorporates a mounting flange. The flange contains four predrilled holes (0.15" diameter) for convenient equipment mounting. A mounting footprint drawing is provided in Figure 3-2.

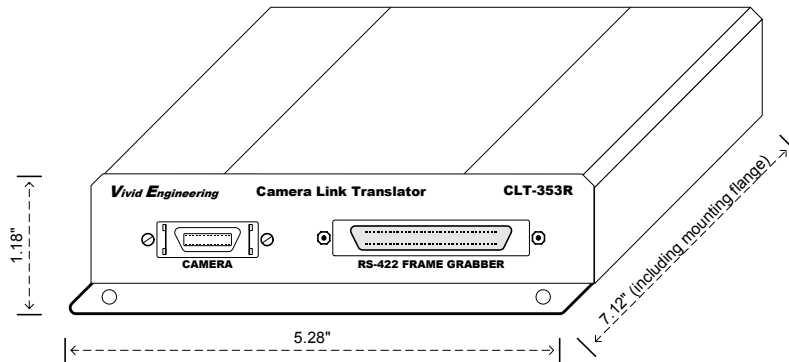


Figure 3-1: CLT-353R/L Cabinet Dimensions

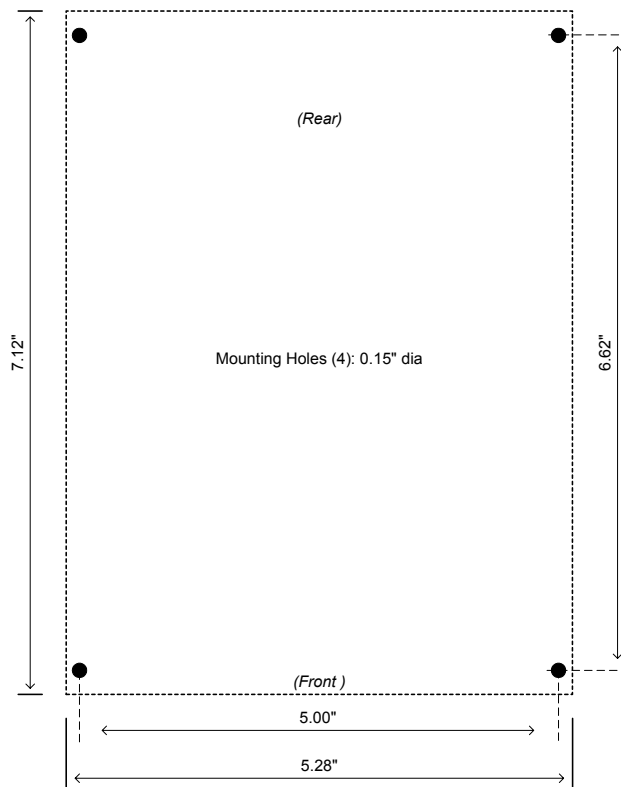


Figure 3-2: Mounting Footprint Drawing

3.2. External Power Supply

The CLT-353R/L is powered by 4.5 – 9.0 VDC and incorporates a 2.1 x 5.5 mm DC power jack that accepts either a standard barrel-style power plug, or a special locking version (see Section 2.2). Power plug polarity is center-positive.

The CLT-353R/L includes a multi-nation wall-mount power supply that handles a wide power range (90-264 VAC, 47-63 Hz) and comes with a set of outlet plugs suitable for most countries (US, Europe, UK, etc). The CLT-353R/L may also be purchased with a locking-plug power supply, or without power supply.

4. Revision History

Table 4-1: CLT-353R & CLT-353L User's Manual Revision History

Document ID #	Date	Changes
201201-0.1	4/19/2013	Preliminary release of manual