

CLR-102 CAMERA LINK REPEATER

User's Manual

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1. Introduction

1.1. Overview

The CLR-102 Camera Link¹ Repeater supports Power over Camera Link (PoCL) applications requiring separation between camera and frame grabber in excess of the maximum Camera Link cable length (10 meters).

One Camera Link cable connects the camera to the repeater, and a second cable connects the repeater to the frame grabber. This solution provides a 20 meter reach between camera and frame grabber using a pair of 10m Camera Link cables. Several repeaters and cables may be cascaded to support greater distances.

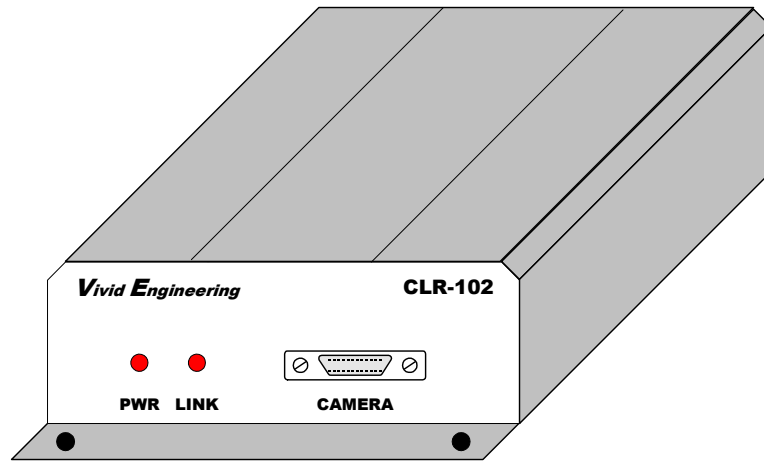
The CLR-102 powers PoCL cameras and incorporates the PoCL SafePower feature. The CLR-102 is also an adapter; enabling the use of PoCL cameras with either PoCL or standard (non-PoCL) Camera Link frame grabbers. **PoCL frame grabbers used with the CLR-102 must have the SafePower feature.**

CLR-102 incorporates high-speed 85MHz interfaces and is compatible with both PoCL and standard (non-PoCL) "base" configuration cameras. The CLR-102 incorporates the Miniature Camera Link (miniCL) connector popular with PoCL devices.

The CLR-102 is housed in a sturdy, compact aluminum enclosure.

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

Camera Link is a trademark of the Automated Imaging Association



1.2. Features

- Doubles max distance between PoCL camera and frame grabber
- Enables use of PoCL cameras with standard (non-PoCL) frame grabbers
- Powers PoCL cameras
- Incorporates PoCL SafePower feature
- Miniature Camera Link (miniCL) connectors
- Supports Camera Link “base” configuration
- High-speed 85 MHz interface chipset
- Also works with standard (non-PoCL) cameras
- Minimal video data pass-through latency: 3 camera pixel clocks
- Minimal control/communication pass-through latency: under 5 nS
- Front-panel power and link status indicators
- Flow-through connector positioning
- Multi-nation power supply with locking connector included
- Sturdy, compact aluminum enclosure w/ mounting flange
- 3-year warrantee

1.3. Functional Description

A block diagram of the CLR-102 is provided in Figure 1-1. The CLR-102 regenerates the “base” configuration signal set defined in the Camera Link Specification for Power over Camera Link (PoCL) applications. The regenerated signals may then be transmitted an additional distance up-to 10 meters over Camera Link cables. The CLR-102 incorporates the Miniature Camera Link (miniCL) connector widely used in PoCL devices.

The CLR-102 incorporates the connectors, signals, pinouts, and chipset in compliance with the PoCL section of the Camera Link specification. The CLR-102 regenerates all the “base” configuration signals, consisting of video data, camera control, and serial communications. A front-panel link status indicator identifies an active camera connection.

The Camera Link Specification requires that repeater devices used in PoCL applications “power” the camera, not simply pass-through power from the frame grabber to the camera. To meet this requirement, The CLR-102 incorporates the 12V powering circuitry specified. The 12V powering circuitry includes filtering as well as over current protection. The over current protection is in the form of an automatically resettable fuse.

The CLR-102 incorporates the SafePower feature defined in the PoCL section of the Camera Link Specification. The SafePower feature allows the CLR-102 to safely interoperate with either PoCL or standard (non-PoCL) cameras and cables by first sensing and identifying the attached camera type (PoCL or standard), and then only providing power to PoCL cameras. This avoids excessive current draw and possible damage to the CLR-102 caused when attempting power a standard (non-PoCL) camera and/or cable.

Since the CLR-102 provides power to PoCL cameras, it is not required that the frame grabber connected to the CLR-102 be PoCL. Therefore, the CLR-102 acts as both a *repeater* (for increasing distance between PoCL camera and frame grabber), and an *adapter* (for enabling the use of PoCL cameras with standard non-PoCL Camera Link frame grabbers).

PoCL frame grabbers used with the CLR-102 must have the SafePower feature.

The CLR-102 incorporates the Miniature Camera Link (miniCL) connector widely used in PoCL cameras and frame grabbers. miniCL cables as well as adapting cables (i.e. one end standard MDR style, one end miniCL) are readily available from Camera Link cable suppliers.

The CLR-102 adds minimal delay (i.e. latency) to the video data path. This is an important criterion for time-critical applications. The latency through the CLR-102 is a fixed 3 pixel-clock delay. The pixel clock is established by the camera and can range from 20-85 MHz. Therefore, the CLR-102 fixed delay can range from 35 to 150 nS, depending on camera. The delay added by the CLR-102 for the camera control and serial communication signals is under 5 nS.

The CLR-102 detects the presence of an active Camera Link camera. When an active (i.e. powered) camera is detected, the front-panel “link” indicator illuminates. The front panel also includes a power indicator to show that the CLR-102 is powered.

The CLR-102 is powered by an external multi-national wall plug-in power supply. The locking power supply connector reduces the risk of an accidental disconnect.

For information about PoCL and SafePower, please see the Camera Link Specification.

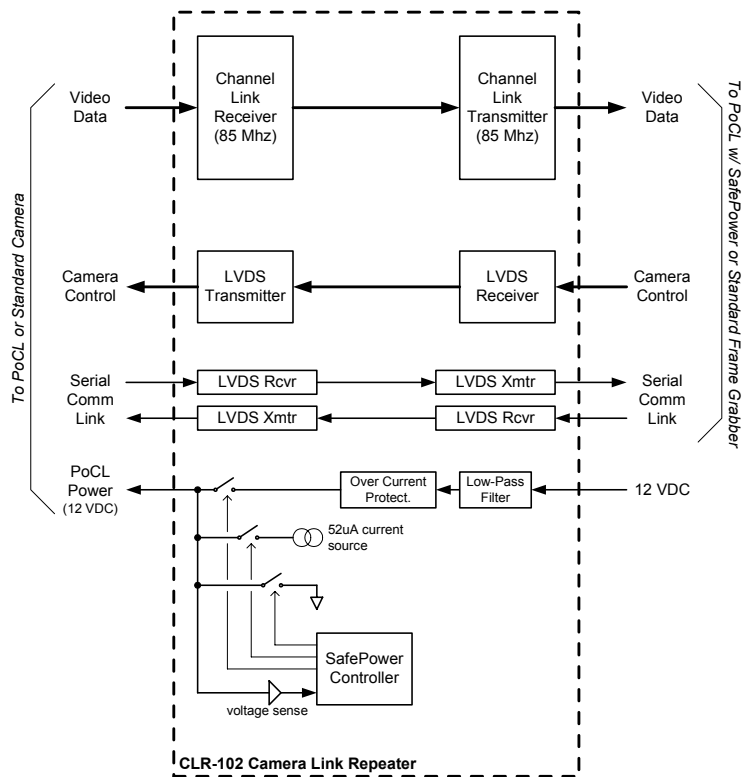


Figure 1-1: CLR-102 Block Diagram

1.4. Typical Applications

1.4.1. PoCL Repeater Application

A typical CLR-102 *repeater* application is shown in Figure 1-2. A PoCL camera is connected to the CLR-102 using a PoCL-compatible Camera Link cable. The connectors on the CLR-102 are miniCL type. If the camera has a miniCL connector, then a PoCL cable with miniCL connectors at both ends is used. If the camera uses the larger MDR connector, then a PoCL cable with one end miniCL and one end MDR is used. Similarly, the appropriate cable is used to connect the *PoCL* frame grabber to the CLR-102. Note that the cable between the CLR-102 and the frame grabber can be either standard camera link or PoCL type, although the standard type is recommended. **The PoCL frame grabber must have the SafePower feature.**

Camera power is provided by the CLR-102. If 10m cable lengths are used, then this solution provides a 20 meter reach between camera and frame grabber.

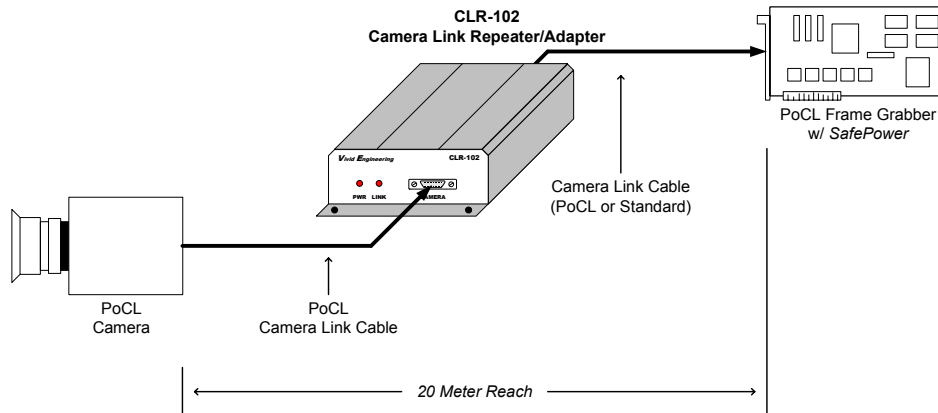


Figure 1-2: CLR-102 Repeater Application

1.4.2. PoCL Adapter Application

A typical CLR-102 *adapter* application is shown in Figure 1-3. A PoCL camera is connected to the CLR-102 using a PoCL-compatible Camera Link cable. The connectors on the CLR-102 are miniCL type. If the camera has a miniCL connector, then a PoCL cable with miniCL connectors at both ends is used. If the camera uses the larger MDR connector, then a PoCL cable with one end miniCL and one end MDR is used. Similarly, the appropriate cable is used to connect the *standard* (non-PoCL) frame grabber to the CLR-102. Note that the cable between the CLR-102 and the frame grabber can be either standard camera link or PoCL type, although the standard type is recommended.

Camera power is provided by the CLR-102. If 10m cable lengths are used, then this solution provides a 20 meter reach between camera and frame grabber.

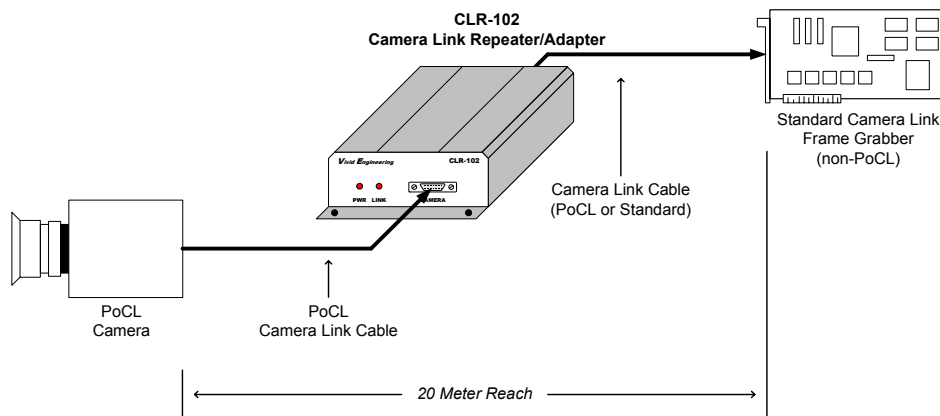


Figure 1-3: CLR-102 Adapter Application

1.5. Specifications

Table 1-1: CLR-102 Specifications

Feature	Specification
Video Interfaces	Camera: Camera Link Spec "base" configuration w/ PoCL Frame Grabber: Camera Link Spec "base" configuration
Video Connectors	26-pin Miniature Camera Link (miniCL) type
Frequency Range	20 - 85 MHz
Latency	Video path: 3 camera pixel clock cycles Control & communication: 5ns max
Chipset	National Semiconductor DS90CR287 / 288A
Power Supply	Universal wall style w/ outlet plug set
Power Jack	Circular locking, Switchcraft p/n TRASM3MX
Power Plug	Circular locking, Switchcraft p/n TA3FX
Power Requirements	Regulated 12 VDC, 65 mA (typical) + Camera Power
Cabinet Dimensions	3.28" (L) x 1.14" (H) x 4.87" (D), including mounting flange
Weight	8 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

The CLR-102 Camera Link Repeater front panel is shown in Figure 2-1. The front panel contains a 26-pin Miniature Camera Link (miniCL) video connector for connecting to the camera, an LED power indicator, and an LED link indicator. The miniCL connector is a 3M device as specified in the Camera Link Spec. Figure 2-2 identifies the miniCL pin positions.

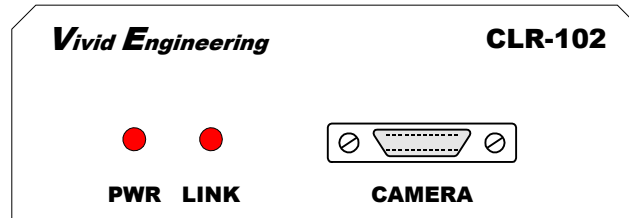


Figure 2-1: CLR-102 Front Panel

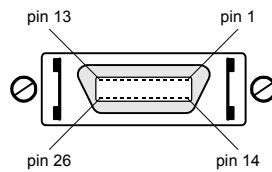


Figure 2-2: MiniCL Connector Pin Positions

2.2. Rear Panel Connections

The CLR-102 Camera Link Repeater rear panel is shown in Figure 2-3. The rear panel contains a 26-pin miniCL video connector for connecting to the frame grabber and a DC power jack. The miniCL connector is a 3M device as specified in the Camera Link Spec.

The DC power jack is a circular locking type, Switchcraft p/n TRASM3MX. The DC power jack accepts regulated 12 volts DC. Power jack pin assignments are shown in Figure 2-4. The mating DC power plug is Switchcraft p/n TA3FX.

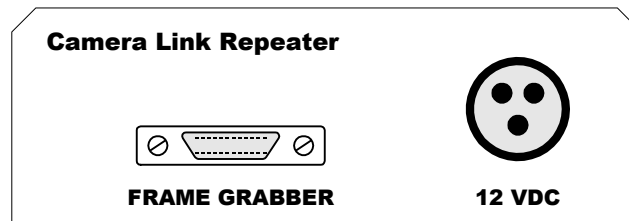


Figure 2-3: CLR-102 Rear Panel

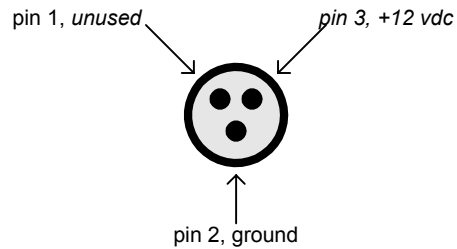


Figure 2-4: Power Jack Pins

2.2.1. Video Connector Signals

The miniCL video connector signal assignments comply with the Camera Link “base” configuration. The *camera* connector signal assignments correspond to the frame grabber interface defined in the Camera Link Specification for *PoCL* applications. The *frame grabber* connector assignments are as defined for the camera interface in the Camera Link Specification for *standard* (non-PoCL) applications. This arrangement provides compatibility with standard Camera Link cables.

Table 2-1 identifies the signal assignments for the miniCL video connectors.

2.2.2. Cable Shield Grounding

Camera and frame grabber cable “outer” shields are connected to the CLR-102 aluminum case. Case and endplate contacting surfaces are unpainted, providing a Faraday cage to shield internal circuitry. The case is isolated from the CLR-102 circuitry and the cable “inner” shields, avoiding possible safety concerns.

The frame grabber cable “inner” shield connects to circuit digital ground, maintaining signal reference levels between the CLR-102 and the frame grabber.

Table 2-1: MiniCL Connector Assignments

Camera Link Signal Name	Camera Connector Pin # (frame grab. pinout)	Frame Grabber Connector Pin # (camera pinout)	Signal Direction
Power Line (12V+)	1		N/A
Inner shield		1	N/A
Power Line -	14		N/A
Inner shield		14	N/A
X0-	25	2	CAM → FG
X0+	12	15	CAM → FG
X1-	24	3	CAM → FG
X1+	11	16	CAM → FG
X2-	23	4	CAM → FG
X2+	10	17	CAM → FG
Xclk-	22	5	CAM → FG
Xclk+	9	18	CAM → FG
X3-	21	6	CAM → FG
X3+	8	19	CAM → FG
SerTC+	20	7	FG → CAM
SerTC-	7	20	FG → CAM
SerTFG-	19	8	CAM → FG
SerTFG+	6	21	CAM → FG
CC1-	18	9	FG → CAM
CC1+	5	22	FG → CAM
CC2+	17	10	FG → CAM
CC2-	4	23	FG → CAM
CC3-	16	11	FG → CAM
CC3+	3	24	FG → CAM
CC4+	15	12	FG → CAM
CC4-	2	25	FG → CAM
Power Line -	13		N/A
Inner shield		13	N/A
Power Line (12V+)	26		N/A
Inner shield		26	N/A

"FG" = Frame Grabber

"CAM" = Camera

3. Mechanical

3.1. Dimensions

The CLR-102 Camera Link Repeater cabinet dimensions are shown in Figure 3-1.

The CLR-102 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.

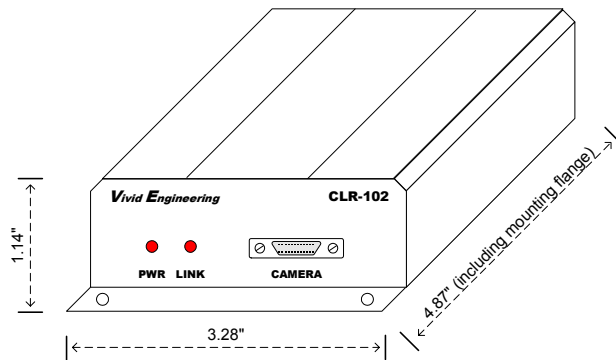


Figure 3-1: CLR-102 Cabinet Dimensions

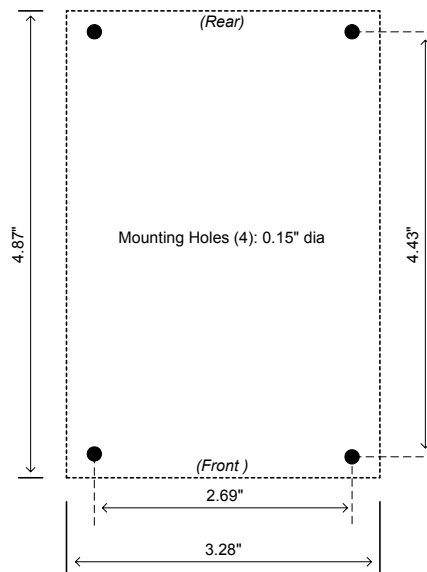


Figure 3-2: Mounting Footprint Drawing

3.2. External Power Supply

The CLR-102 is powered by regulated 12 VDC. The circular power jack is a locking type to prevent accidental disconnection. The mating power plug is Switchcraft p/n TA3FX. Power jack/plug pin assignments are specified in Section 2.2.

The CLR-102 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 CLR-102 may also be purchased without a power supply.

The CLR-102 is protected by an internal resettable fuse.

4. Revision History

Table 5-1: CLR-102 User's Manual Revision History

Document ID #	Date	Changes
200709-0.1	11/26/2010	Preliminary release of manual