CLR-111A CAMERA LINK™ REPEATER

User's Manual

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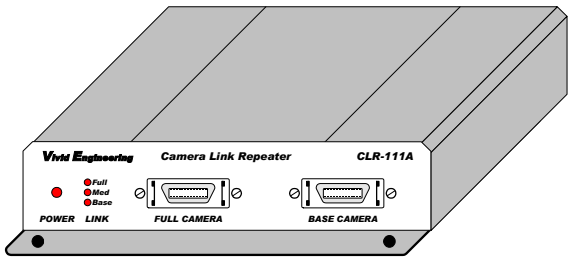
1. Introduction

1.1. Overview

The CLR-111A Camera Link™[1] Repeater supports applications requiring separation between camera and frame grabber in excess of the maximum Camera Link™ cable length (10 meters).

One Camera Link™ cable pair connects the camera to the CLR-111A, and a second cable pair connects the CLR-111A to the frame grabber. This solution provides a 20 meter reach between camera and frame grabber using standard 10m Camera Link™ cables. Up-to three repeaters may be cascaded to support greater distances. The CLR-111A incorporates high-speed 85 MHz interfaces and supports all Camera Link™ configurations (base/medium/full). The CLR-111A also supports 80-bit extended applications.

The CLR-111A is housed in a sturdy, compact aluminum enclosure and is well suited for industrial environments.



[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 camera and frame grabber
- Uses standard Camera Link™ cables (not included)
- Supports all Camera Link™ configurations (base/medium/full)
- High-speed 85 MHz interface chipset
- Front-panel link status indicator detects camera input and identifies configuration
- Supports 80-bit extended Camera Link applications
- Up-to three CLR-111A's may be cascaded, supporting a 40m reach
- Flow-through connector positioning (front-panel camera connectors, rear-panel frame grabber connectors)
- Sturdy, compact aluminum enclosure w/ mounting flange
- 3-year warrantee
- Cost-effective solution
- Well suited for industrial and OEM applications

1.3. Functional Description

A block diagram of the CLR-111A is provided in Figure 1-1. The CLR-111A regenerates the entire "full" configuration signal set as defined in the Camera Link Specification. The regenerated signals may then be transmitted an additional distance up-to 10 meters over standard Camera Link™ cables.

The CLR-111A incorporates the connectors, signals, pinout, and chipset in compliance with the Camera Link™ specification. The CLR-111A regenerates all the "full" configuration signals, consisting of video data, camera control, and serial communications. The video interfaces utilize high-speed (85 MHz) Channel Link devices.

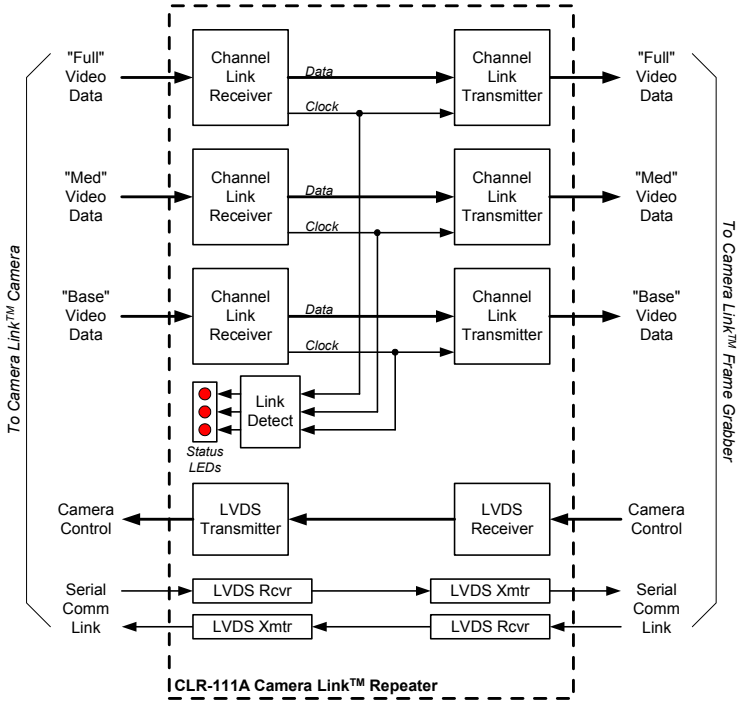


Figure 1-1: CLR-111A Block Diagram

The CLR-111A connects all signals between the Channel Link receivers and their corresponding transmitter devices. This arrangement supports the 80-bit (i.e. 10 8-bit taps or 8 10-bit taps) extended Camera Link configuration used with some high-performance cameras.

The CLR-111A incorporates a link status indicator that detects the input video signal and identifies the Camera Link configuration (base, medium, or full).

The CLR-111A is powered by an external wall plug-in power supply.

1.3.1. Link Status Indicator

The CLR-111A detects the input signal from the camera and determines the corresponding Camera Link configuration (base, medium, full). This information is presented on the front panel via a 3-LED link status indicator.

Figure 1-5 shows the four valid states for the link status indicator. When no camera is connected to the CLR-111A, none of the three LEDs are illuminated. This is also the state when the camera is not powered. When a powered "base" configuration camera is connected to the CLR-111A, the Base (bottom) LED will illuminate. When a powered "medium" configuration camera is connected to the CLR-111A, the Base (bottom) and Medium (middle) LEDs will illuminate. When a powered "full" configuration camera is connected to the CLR-111A, the Base (bottom), Medium (middle), and Full (top) LED positions will illuminate.

Note that the above four states are the only valid combinations for the link status indicator . Any other combination is invalid and suggests a faulty camera, cable, or an incorrect (i.e. reversed) cable connection to the CLR-111A.

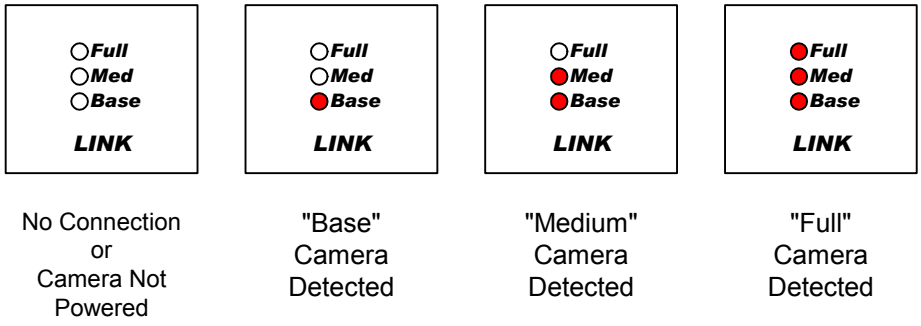


Figure 1-5: Link Status Indicator

1.4. Typical Applications

1.4.1. Standard Application

A typical CLR-111A application is shown in Figure 1-6. A Camera Link™ "medium" or "full" configuration camera is connected to the CLR-111A via a pair of standard 10m Camera Link™ cables. A second 10m Camera Link™ cable pair is then connected from the CLR-111A to a Camera Link™ frame grabber. This provides a 20 meter reach between camera and frame grabber

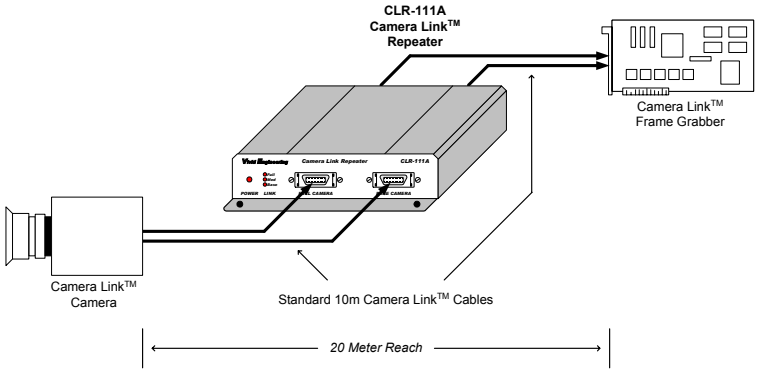


Figure 1-6: CLR-111A Standard Application

1.4.2. 30 Meter Application

Figure 1-7 shows an application in which two CLR-111A's and standard cables are cascaded to provide a 30 meter separation between "medium" or "full" camera and frame grabber. In this example, a 30 meter reach is achieved using two CLR-111A's and six standard 10m Camera Link™ cables.

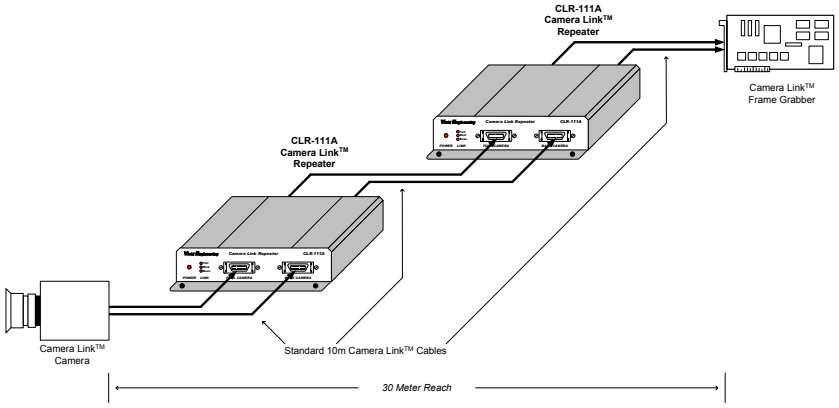


Figure 1-7: CLR-111A 30m Application

1.4.3. Base-Only Application

A base-only CLR-111A application is shown in Figure 1-8. A Camera Link™ "base" configuration camera is connected to the CLR-111A via a standard 10m Camera Link™ cables. A second 10m Camera Link™ cable is then connected from the CLR-111A to a Camera Link™ frame grabber. This provides a 20 meter reach between camera and frame grabber.

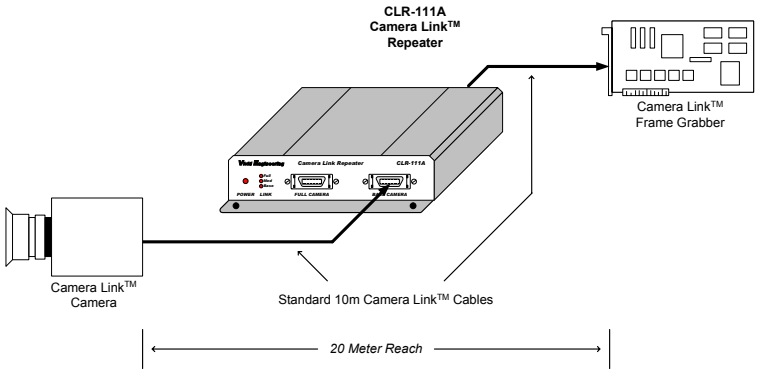


Figure 1-8: CLR-111A Base-Only Application

1.5. Specifications

Table 1-1: CLR-111A Specifications

Feature	Specification
Video Interfaces	Camera Link Spec “full” configuration (includes 80-bit)
Video Connectors	26-pin MDR type
Frequency Range	20 - 85 MHz
Chipset	National Semi. DS90CR287 / DS90CR288A
Power Supply	Universal wall style w/ US & Europe outlet plugs
Power Jack	2.1 x 5.5 mm, center-positive
Power Requirements	5-7 VDC, 320 mA (typical)
Cabinet Dimensions	5.28” (L) x 1.18” (H) 6.12” (D)
Weight	13 oz
Operating Temperature Range	0 to 50° C
Storage Temperature Range	-25 to 75° C
Relative Humidity	0 to 90%, non-condensing
Compliance	FCC Class A, ROHS, CE EN55024 (pending)

2. Interface

2.1. Front Panel Connections

The CLR-111A Camera Link™ Repeater front panel is shown in Figure 2-1. The front panel contains two 26-pin MDR video connectors; one for connecting to the camera "base" connector, and one for connecting to the camera "medium/full" connector. The MDR-26 connectors are 3M devices as specified in the Camera Link Spec. Figure 2-2 identifies the MDR-26 pin positions.

The front panel also contains a 3-LED link status indicator described in Section 1.3.1 and an LED power indicator.

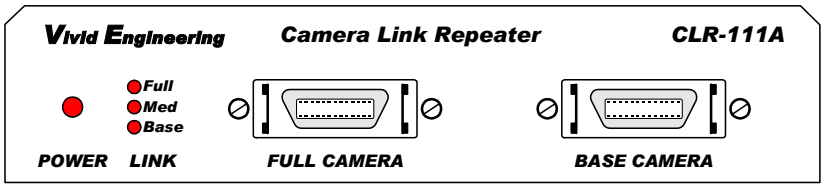


Figure 2-1: CLR-111A Front Panel

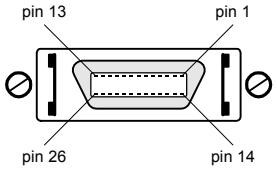


Figure 2-2: MDR-26 Connector Pin Positions

2.2. Rear Panel Connections

The CLR-111A Camera Link™ Repeater rear panel is shown in Figure 2-3. The rear panel contains two 26-pin MDR video connectors; one for connecting to the frame grabber "base" connector, and one for connecting to the frame grabber "medium/full" connector. The MDR-26 connectors are 3M devices as specified in the Camera Link Spec. The rear panel also contains the DC power jack. DC power jack accepts 5-7 volts DC. Polarity is center-positive.

The MDR-26 connectors are 3M devices as specified in the Camera Link Spec.

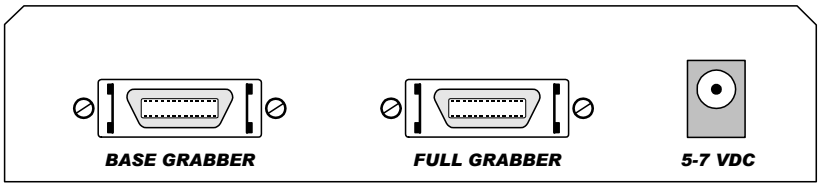


Figure 2-3: CLR-111A Rear Panel

2.3. Video Connector Signals

The MDR-26 video connector signal assignments comply with the Camera Link™ "full" configuration, providing compatibility with all Camera Link cameras and frame grabbers (base, medium, and full). The *camera* connector signal assignments correspond to the frame grabber interface defined in the Camera Link Specification. Conversely, the *frame grabber* connector assignments are as defined for the camera interface in the Camera Link Specification. This arrangement provides compatibility with standard Camera Link™ cables.

Tables 2-1 and 2-2 identify the signal assignments for the CLR-111A "Base" and "Medium/Full" MDR-26 video connectors, respectively.

2.4. Cable Shield Grounding

Camera and frame grabber cable "outer" shields are connected to the CLR-111A aluminum case. The case is isolated from the CLR-111A circuitry and the cable "inner" shields.

The frame grabber cable "inner" shield connects to circuit digital ground, maintaining signal reference levels between the CLR-111A and the frame grabber.

Table 2-1: MDR-26 "Base" Connector Assignments

Camera Link Signal Name	Camera Connector Pin # (frame grabber pinout)	Frame Grabber Connectors Pin # (camera pinout)	Signal Direction
Inner shield	1	1	N/A
Inner shield	14	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
Inner shield	13	13	N/A
Inner shield	26	26	N/A

"FG" = Frame Grabber, "CAM" = Camera

Table 2-2: MDR-26 "Medium/Full" Connector Assignments

Camera Link Signal Name	Camera Connector Pin # (frame grabber pinout)	Frame Grabber Connectors Pin # (camera pinout)	Signal Direction
Inner shield	1	1	N/A
Inner shield	14	14	N/A
Y0-	25	2	CAM → FG
Y0+	12	15	CAM → FG
Y1-	24	3	CAM → FG
Y1+	11	16	CAM → FG
Y2-	23	4	CAM → FG
Y2+	10	17	CAM → FG
Yclk-	22	5	CAM → FG
Yclk+	9	18	CAM → FG
Y3-	21	6	CAM → FG
Y3+	8	19	CAM → FG
100 Ω	20	7	N/A
terminated	7	20	N/A
Z0-	19	8	CAM → FG
Z0+	6	21	CAM → FG
Z1-	18	9	CAM → FG
Z1+	5	22	CAM → FG
Z2-	17	10	CAM → FG
Z2+	4	23	CAM → FG
Zclk-	16	11	CAM → FG
Zclk+	3	24	CAM → FG
Z3-	15	12	CAM → FG
Z3+	2	25	CAM → FG
Inner shield	13	13	N/A
Inner shield	26	26	N/A

"FG" = Frame Grabber, "CAM" = Camera

3. Mechanical

3.1. Dimensions

The CLR-111A Camera Link™ Repeater cabinet dimensions are shown in Figure 3-1.

The CLR-111A 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 template drawing is provided in Figure 3-2.

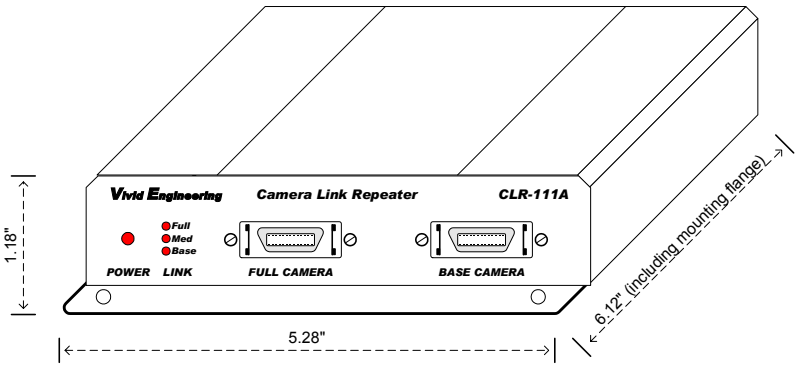


Figure 3-1: CLR-111A Cabinet Dimensions

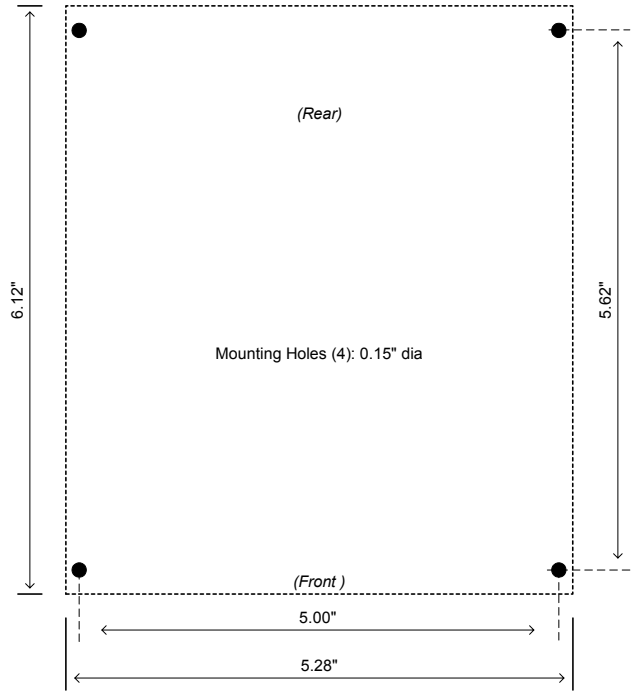


Figure 3-2: Mounting Hole Template

3.2. External Power Supply

The CLR-111A is powered by 5-7 VDC and incorporates a standard 2.1 x 5.5 mm DC power jack. Power plug polarity is center-positive.

The CLR-111A 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-111A may also be purchased without the power supply.

The CLR-111A is protected by an internal resetable fuse.

4. Regulatory Compliance

4.1. FCC Compliance Statement

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide a reasonable protection against harmful interference when the equipment is operated in a commercial environment. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

4.2. Canadian Compliance Statement

This digital apparatus does not exceed the Class A limits for radio noise emissions from digital apparatus set out in the Radio Interference Regulations of the Canadian Department of Communications.

5. Revision History

Table 5-1: CLR-111A User's Manual Revision History

Document ID #	Date	Changes
200568-0.1	1/8/2009	Preliminary release of manual
200568-1.0	1/20/2009	Initial release of manual