CLV-402 CAMERA LINK™ VIDEO SPLITTER

# User's Manual

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# 1. Introduction

## 1.1. Overview

The CLV-402 Camera Link™[1] Video Splitter interfaces one Camera Link™ camera to two frame grabbers using standard Camera Link™ cables. This arrangement enables the addition of a second frame grabber for functions such as camera setup, secondary/parallel processing, and monitoring.

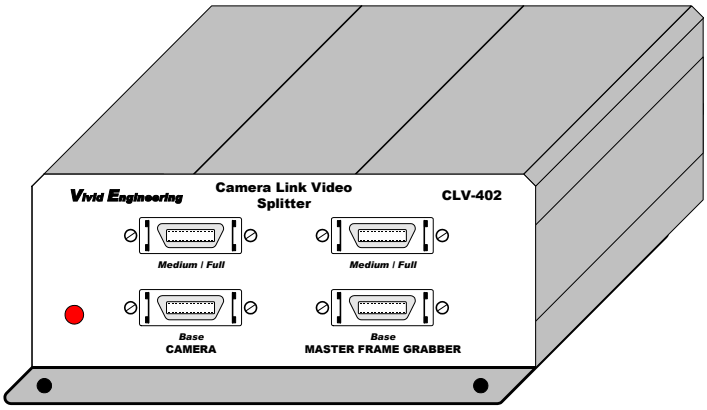
One frame grabber acts as master (primary) and provides control and communications to the camera. The secondary (slave) frame grabber receives camera video data only. The CLV-402 incorporates high-speed 85 MHz interfaces and supports all Camera Link™ configurations (base/medium/full). Multiple CLV-402s may be cascaded to support 4 or 8 frame grabbers.

The CLV-402 may also be used as a high-speed (85 MHz) repeater, doubling the maximum distance between camera and frame grabber.

The CLV-402 Camera Link™ 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

- Interfaces one camera to two frame grabbers
- Second frame grabber can be used for camera setup, processing, monitoring, etc
- Uses standard Camera Link™ cables (not included)
- Supports all Camera Link™ configurations (base/medium/full)
- High-speed 85 MHz interface chipset
- Also acts as a high-speed (85 MHz) repeater, doubling max distance between camera and frame grabber
- May be cascaded to support 4 or 8 frame grabbers
- Sturdy, compact aluminum enclosure w/ mounting flange
- Optional external power supply
- FCC compliant (Class A, pending)
- CE compliant (EN55024, pending)
- 3-year warrantee

## 1.3. Functional Description

A block diagram of the CLV-402 is provided in Figure 1-1. The CLV-402 interfaces one camera to two frame grabbers. One frame grabber is the master (primary), and one frame grabber is slave (secondary). All video interfaces incorporate high-speed (85 MHz) Channel Link devices.

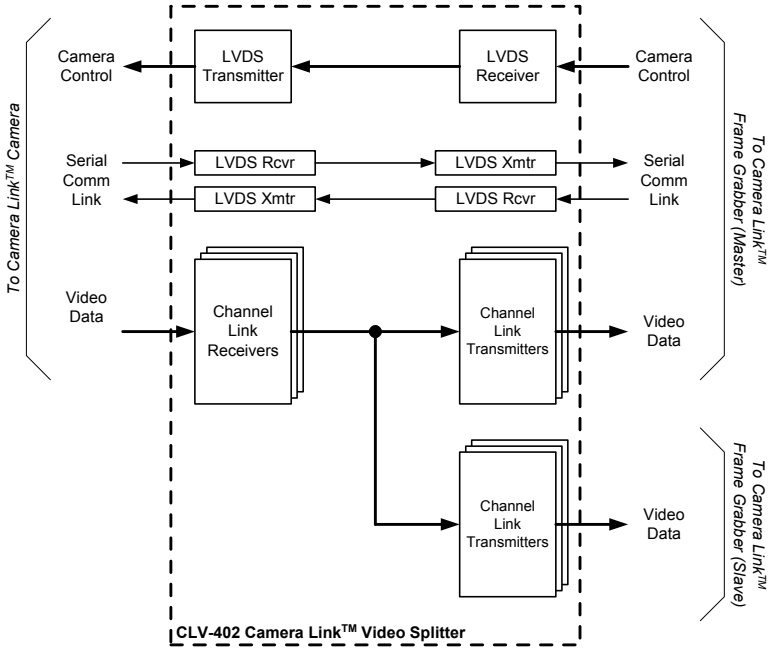



**Figure 1-1: CLV-402 Block Diagram**

The interface between the camera and the *master* frame grabber contains the entire Camera Link™ signal set defined in the Camera Link Specification for all configurations (base/medium/full). This consists of video data, camera control, and serial communications. The master frame grabber receives video data from the camera, and can also control and communicate with the camera.

The interface between the camera and the *slave* frame grabber contains only the video data signals. The slave frame grabber receives video data, but cannot control or communicate with the camera.

Since the CLV-402 regenerates all signals, it also acts as a high-speed (85 MHz) repeater and supports an additional 10 meters of separation between camera and frame grabbers(s) using standard Camera Link™ cables.

The CLV-402 is powered by an optional external wall plug-in power supply.

## 1.4. Typical Applications

### 1.4.1. Standard Application

A standard CLV-402 application is shown in Figure 1-2. In this Camera Link™ "full" configuration example, the camera is connected to a CLV-402 via a pair of standard Camera Link™ cables. Four additional Camera Link™ cables are then used to connect the CLV-402 to the master and slave Camera Link™ frame grabbers.

The master frame grabber provides camera control and communications, and performs the primary processing functions. The slave frame grabber cannot control or communicate with the camera, but may be used for parallel processing, secondary processing, camera setup, monitoring, etc.

"Medium" configuration applications use the same cable connections as shown for the full case.

"Base" configuration applications require just one cable between camera and CLV-402, and one cable from the CLV-402 to each of the frame grabbers. Only the connectors marked "base" are used, the "full" connectors are not used.

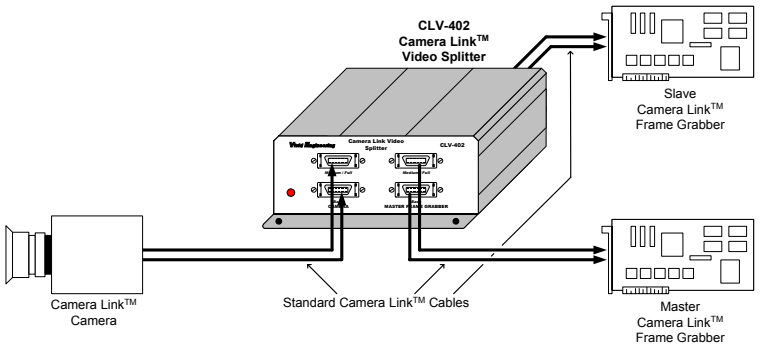



**Figure 1-2: CLV-402 Standard Application**

### 1.4.2. Cascaded Application

Multiple CLV-402s may be cascaded to support four or eight frame grabbers. An application in which three CLV-402s are cascaded to interface four frame grabbers to a Camera Link™ "full" configuration camera is shown in Figure 1-3. Fourteen standard Camera Link™ cables are used to interconnect the equipment. Note that one frame grabber is the master, and all remaining frame grabbers are slaves.

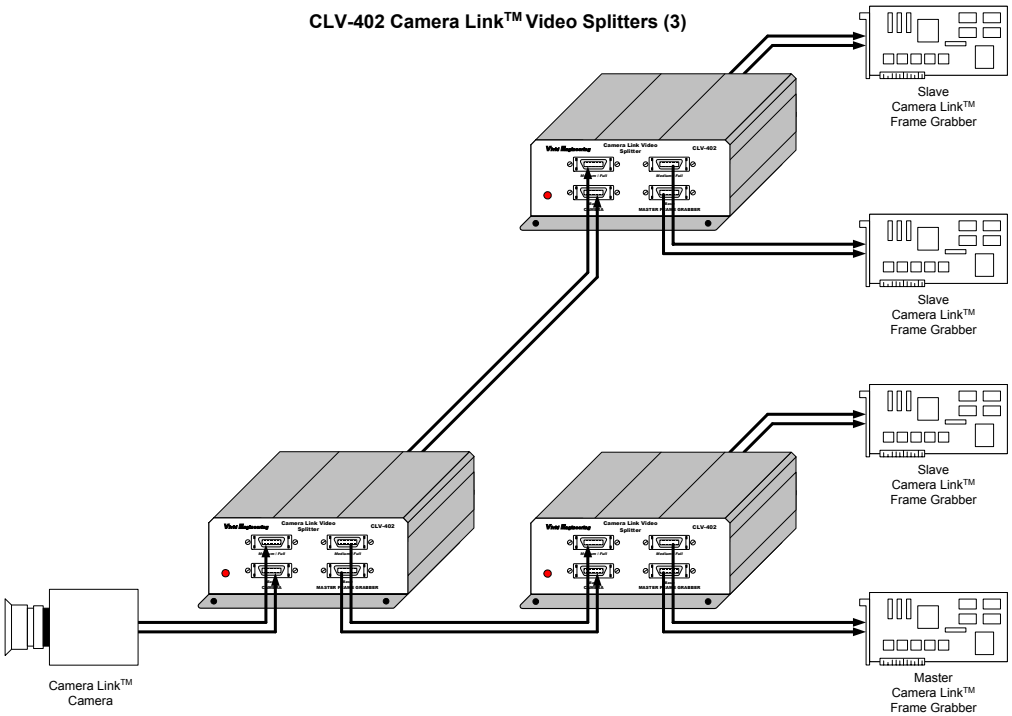



**Figure 1-3: CLV-402 Cascaded Application**

## 1.5. Specifications

**Table 1-1: CLV-402 Specifications**

| Feature | Specification |
|---|---|
| Video Interfaces | Camera Link Spec "full" configuration |
| Video Connectors | 26-pin MDR type |
| Frequency Range | 20 - 85 MHz[1] |
| Chipset | National Semi. DS90CR287 / DS90CR288A |
| Power Supply | Optional US/Europe Transformer w/ Outlet Plug Set |
| Power Jack | 2.1 x 5.5 mm, center-positive |
| Power Requirements | 5-7 VDC, 425 mA (typical) |
| Cabinet Dimensions | 5.28" (L) x 2.08" (H) 5.12" (D) |
| Weight | 18 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 & CE EN55024 **(Pending)** |

[1] Applies to current model. Initial units (serial # L050xxxxx & L06001-L06007) had frequency range of 20-66 MHz.

# 2. Interface

## 2.1. Front Panel Connections

The CLV-402 Camera Link™ Video Splitter front panel is shown in Figure 2-1. The front panel contains four 26-pin MDR video connectors; two for connecting to the camera and two for connecting to the master frame grabber. The MDR-26 connectors are 3M p/n 10226-55G3VC as specified in the Camera Link Spec. Figure 2-2 identifies the MDR-26 pin positions. The CLV-402 front panel includes a red power indicator LED.

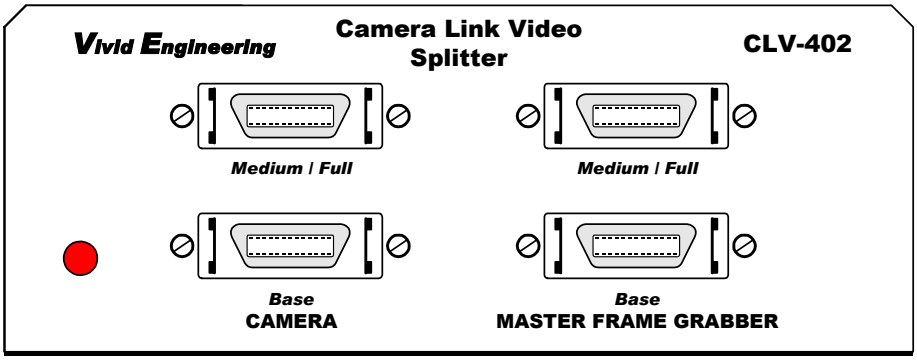



**Figure 2-1: CLV-402 Front Panel**

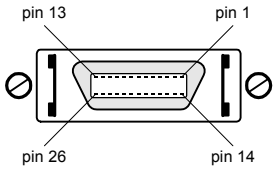



**Figure 2-2: MDR-26 Connector Pin Positions**

## 2.2. Rear Panel Connections

The CLV-402 Camera Link™ Video Splitter rear panel is shown in Figure 2-3. The rear panel contains two 26-pin MDR video connectors for the slave frame grabber, and the DC power jack. DC power jack accepts 5-7 volts DC. Polarity is center-positive.

The MDR-26 connector is 3M p/n 10226-55G3VC as specified in the Camera Link Spec. Figure 2-2 identifies the MDR-26 pin positions.

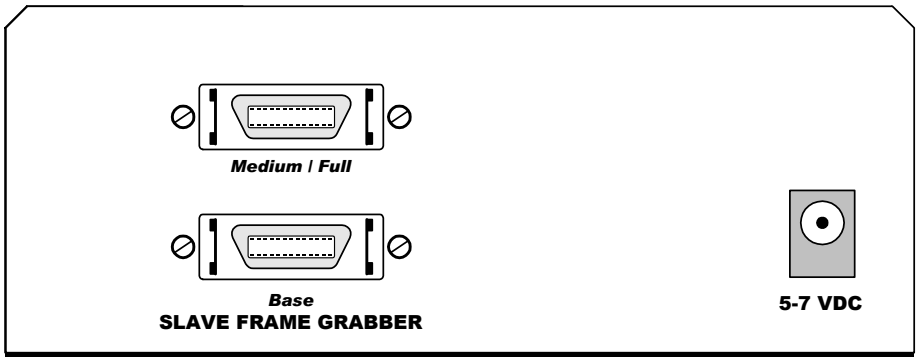



**Figure 2-3: CLV-402 Rear Panel**

## 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 CLV-402 "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 CLV-402 aluminum case. The case is isolated from the CLV-402 circuitry and the cable "inner" shields.

The frame grabber cable "inner" shield connects to circuit digital ground, maintaining signal reference levels between the CLV-402 and the frame grabber.

The Camera Link™ Specification recommends that a provision be incorporated into frame grabbers that enable the inner shields be tied to digital ground either directly, or through a parallel R/C network. In CLV-402, the *camera connector* represents the Camera Link™ frame grabber interface. To incorporate this flexibility, the CLV-402 ties the inner shields from the camera connector to digital ground through 0-ohm resistors. If necessary, the 0-ohm resistors may be replaced with a parallel RC network.

## 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[1] |
| SerTC- | 7 | 20 | FG → CAM[1] |
| SerTFG- | 19 | 8 | CAM → FG[2] |
| SerTFG+ | 6 | 21 | CAM → FG[2] |
| CC1- | 18 | 9 | FG → CAM[1] |
| CC1+ | 5 | 22 | FG → CAM[1] |
| CC2+ | 17 | 10 | FG → CAM[1] |
| CC2- | 4 | 23 | FG → CAM[1] |
| CC3- | 16 | 11 | FG → CAM[1] |
| CC3+ | 3 | 24 | FG → CAM[1] |
| CC4+ | 15 | 12 | FG → CAM[1] |
| CC4- | 2 | 25 | FG → CAM[1] |
| Inner shield | 13 | 13 | N/A |
| Inner shield | 26 | 26 | N/A |

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

[1] Unused input on *slave* interface, 100-ohm signal termination provided

[2] Unused output on *slave* interface, no internal connection

**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 CLV-402 Camera Link™ Video splitter cabinet dimensions are shown in Figure 3-1.

The CLV-402 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 hole template drawing is provided in Figure 3-2.

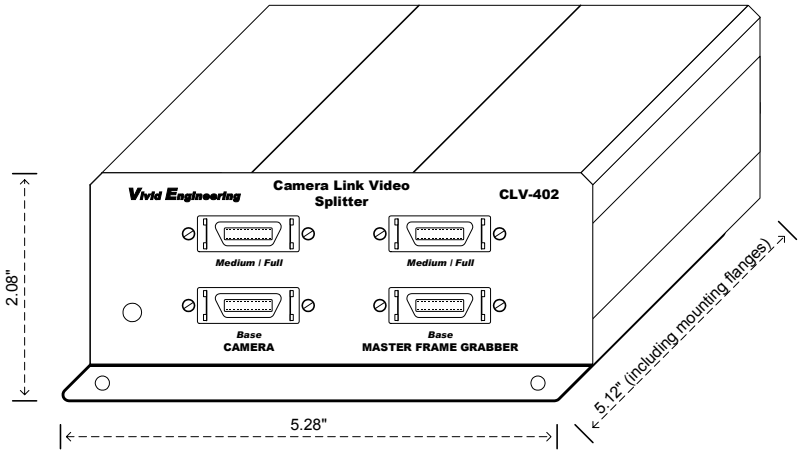



**Figure 3-1: CLV-402 Cabinet Dimensions**

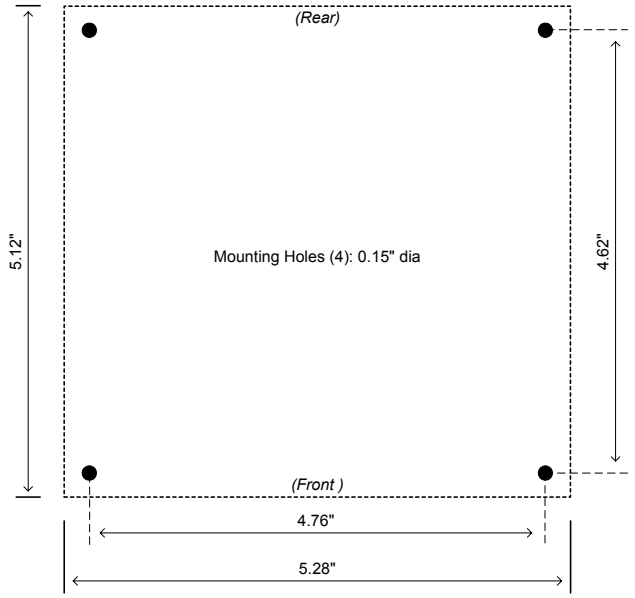



**Figure 3-2: Mounting Hole Template**

## 3.2. External Power Supply

The CLV-402 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 optional multi-nation wall-mount power supply 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 CLV-402 is protected by internal resettable fuses.

# 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: CLV-402 User's Manual Revision History**

| Document ID # | Date | Changes |
|---|---|---|
| 200419-1.0 | 2/3/2005 | Initial release of manual |
| 200419-1.1 | 6/8/2005 | Adds high-speed (85 MHz) interfaces |
| 200419-1.2 | 9/20/2006 | Adds regulatory statements |
| | | |