

# Kaleido-Quad-Dual Multi-Image Display Processor Installation Manual

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## *Installation Manual*

### **Safety Compliance Information**

#### **Safety Compliance**

This equipment complies with:

- CSA C22.2 No. 60950-1-03 / Safety of Information Technology Equipment, Including Electrical Business Equipment.
- UL 60950-1 (1<sup>st</sup> Edition) / Safety of Information Technology Equipment, Including Electrical Business Equipment.
- IEC 60950-1 (1<sup>st</sup> Edition) Incorporating A1, A2, A3, A4, and A11/ Safety of Information Technology Equipment, Including Electrical Business Equipment.

#### **CAUTION**

These servicing instructions are for use by qualified service personnel only. To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so. Refer all servicing to qualified service personnel. Servicing should be done in a static-free environment.

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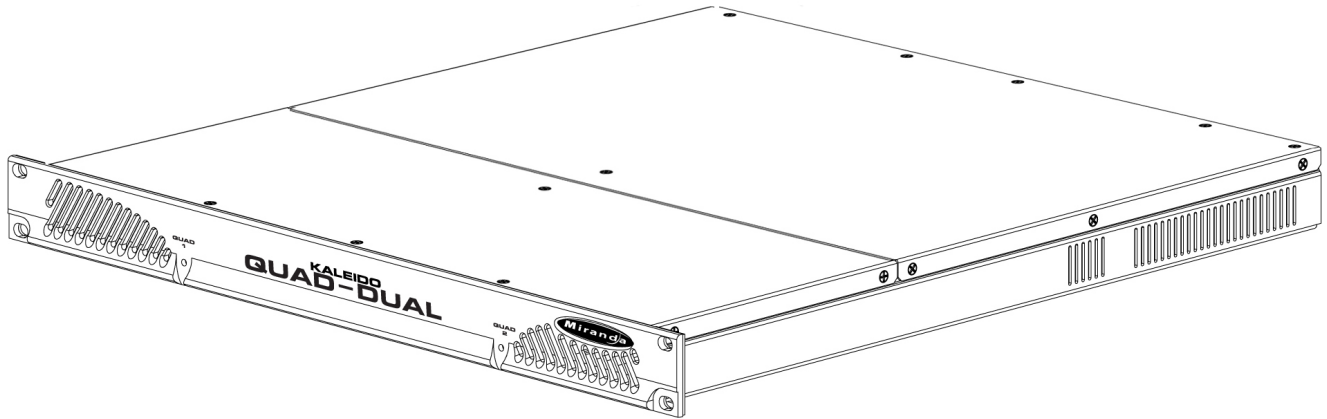
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# 1 Kaleido-Quad-Dual

## 1.1 Introduction

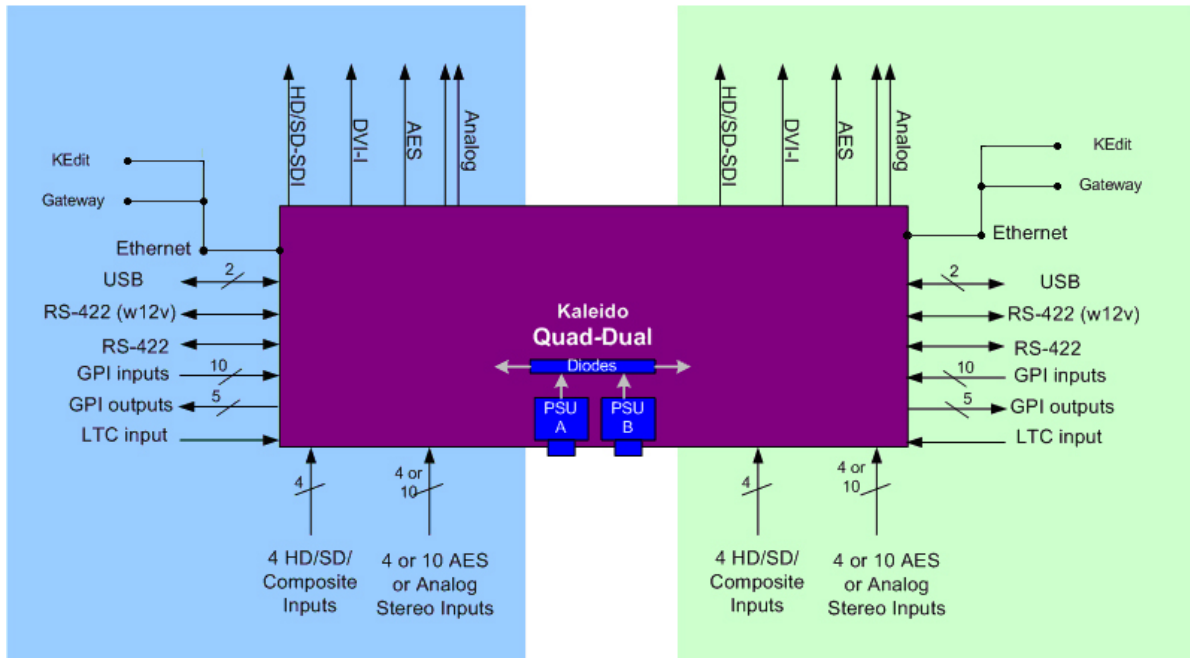
Kaleido-Quad-Dual multi-image processor incorporates two independent Kaleido-Quad processors in a single-RU package. Each processor in the Kaleido-Quad-Dual package can display up to 4 video inputs on a single high-resolution output. The Kaleido-Quad-Dual combines the display of video windows, audio level metering, text identification labeling, tallies and in-screen status indicators on a single high-resolution display. Four stereo audio level meters can be displayed inside or outside each video window. Audio sources can be extracted from the embedded audio inside the SDI signals, or input via optional audio mezzanines providing 4 or 10 AES or Analog stereo input signals. The layout can be created using the KEdit software and applied to the system afterward. Layouts and frequently-used functions can be operated via the Kaleido-RCP or via a mouse/pointer interface. The Kaleido-Quad-Dual is an ideal solution in areas where a limited number of signals need to be monitored with fine picture quality. Its compact 1RU frame with two independent multi-image processors is a real asset in areas where space is restricted.



## Kaleido-Quad-Dual Features

- Auto-sensing HD-SDI, SDI and Composite inputs (4)
- High quality DVI and RGBHV outputs with up to 1920 x 1080 pixel resolution
- Embedded, AES and Analog audio level metering with monitoring outputs
- Source IDs, tallies, clocks (time of day and up/down timers)
- Easy offline layout editing with full choice of window ratio (4:3 and 16:9) and position
- Aspect ratio markers
- Compact (1RU) frame
- Optional redundant power supply
- Optional, simple to use remote control panel

## 1.2 Block Diagram



## 2 Unpacking

Make sure the following items have been shipped with your Kaleido-Quad-Dual. If any of the following items are missing, contact your distributor or Miranda Technologies Inc.

- Kaleido-Quad-Dual unit
- USB mouse (1 or 2)
- AC power cords (1 or 2 depending on power supply option)
- CD-ROM with software
- DE-9S to RJ-45 adapter (1 or 2)

### 2.1 Mechanical Installation

Kaleido-Quad-Dual may be installed in a standard 19" rack, using the proper screws and washers (not included). The optional Kaleido-RCP Remote Control Panel may also be installed in a rack using the optional mounting kit (order part #1229-1100-100).

For proper ventilation, make sure the front and side panel air vents are not blocked and the air filter is clean.

### 2.2 Power Connection

The Kaleido-Quad-Dual may be purchased with either of two power supply options:

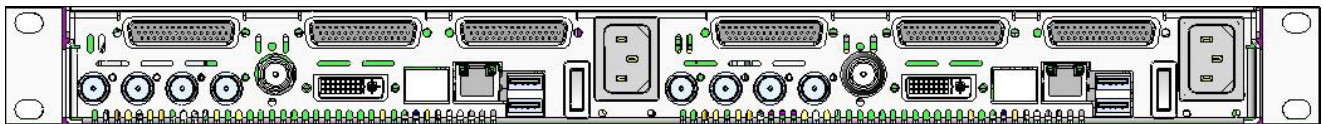
- A single supply for the two units
- Dual, redundant supplies

Connect the supplied AC power cord(s) to the rear-panel AC receptacles, and secure them with the retainer clips attached to the receptacles.

**Note:** In the case of the dual-supply option, the rear panel layout would suggest that each of the two Quad units has its own supply, but in fact the power supplies are common to both units, and form a redundant pair.

### 2.3 Signal and Control Connections

All inputs and outputs are located on the rear panel of the Kaleido-Quad-Dual. Signals and connector types are listed and described below. The rear panel labels indicate the appropriate connection point for each signal.



**Figure 2.1** Kaleido-Quad-Dual rear panel

The rear panel consists of two identical halves, labeled 1 and 2, one for each of the two Kaleido-Quad processors in the Kaleido-Quad-Dual. The connections for each half are the same.

The following chart summarizes the various inputs and outputs appearing on the rear panels of these units, and is followed by a discussion of each of the connections.

Connector		Signal connections & Function
Label	Type	
In 1 to In 4	BNC (4)	Video inputs (HD-SDI, SD-SDI, Composite)
AUDIO IN ANALOG 1-5 / AES 1-10	DB-44S	AES/EBU or stereo analog audio input (optional)
AUDIO IN ANALOG 6-10	DB-44S	AES/EBU or stereo analog audio input (optional)
MISC IN/OUT	DB-44S	GPI input & output, audio output (AES & analog), RS-422A input, LTC time code input (see table below for details)
DVI-I OUT	DVI-I	Video output (DVI and RGBHV)
SDI Out	BNC	SDI output for monitoring purposes (optional)
RS-422B	RJ-45	RS-422 B port
ETHERNET	RJ-45	Ethernet communication
USB	USB (2)	USB

**Table 1:** Signal connections

## 2.3.1 HD/SD-SDI and Composite Video Inputs (IN 1 to IN 4)

The Kaleido-Quad-Dual will auto-detect the type of video signal applied, and process it appropriately. The four video inputs accept and auto-detect multiple video formats, as follows.

### 2.3.1.1 HD-SDI

The serial digital video signal must comply with the SMPTE 292M standard. The following input formats are supported:

Format	Display Aspect Ratio	Active Pixel	Active Lines	Total Pixels	Total Lines	Pixel Aspect Ratio	Scan Form.	Frame Rate (Hz)	Line Rate (KHz)	Pixel Rate (MHz)	Std. (SMPTE)
1080i 59.94Hz	16:9	1920	1080i	2200	1125	SQR	2:1	29.97	33.72	74.18	274M
1080i 50Hz	16:9	1920	1080i	2376	1250	SQR	2:1	25	31.25	74.25	295M
720p 59.94Hz	16:9	1280	720	1650	750	SQR	1:1	59.94	44.96	74.18	296M
720p 50Hz	16:9	1280	720	1980	750	SQR	1:1	50	37.5	74.25	296M
1080p 29.97Hz	16:9	1920	1080	2200	1125	SQR	1:1	29.97	33.72	74.18	274M
1080p 23.98Hz	16:9	1920	1080	2750	1125	SQR	1:1	23.98	26.97	74.18	274M

Make sure the input cable has a maximum length of 100m (325') (Belden 1694) and that all serial digital video connections are point-to-point. For instance, there must be a point-to-point connection between the IN BNC and the source equipment. If a T-connector is used to connect other equipment, the maximum specified cable length is no longer valid.



### 2.3.1.2 SD-SDI

The 4:2:2 serial digital video signals must be in either 525 or 625-line format, and comply with the SMPTE 259M-C standard.

Make sure the input cable has a maximum length of 100m (325' using Belden 1694A), and that all serial digital video connections are point-to-point. For instance, there must be a point-to-point connection between the IN BNC and the source equipment. If a T-connector is used to connect other equipment, the maximum specified cable length is no longer valid.

### 2.3.1.3 Composite

The supported composite signals include NTSC, PAL, SECAM and monochrome (B&W) video signals. NTSC-M signals must comply with the SMPTE 170M standard. PAL (625/50) and PAL-M (525/60) signals must comply with the ITU-R BT.470-6 standard.

## 2.3.2 DVI Resolutions Supported with a KXI-DVI-Bridge Connected to the Kaleido's HD-SDI Input

With a KXI-DVI-Bridge device connected between a computer's DVI output and the Kaleido-Quad-Dual's HD-SDI input, the following resolutions are supported.

Without dongle:

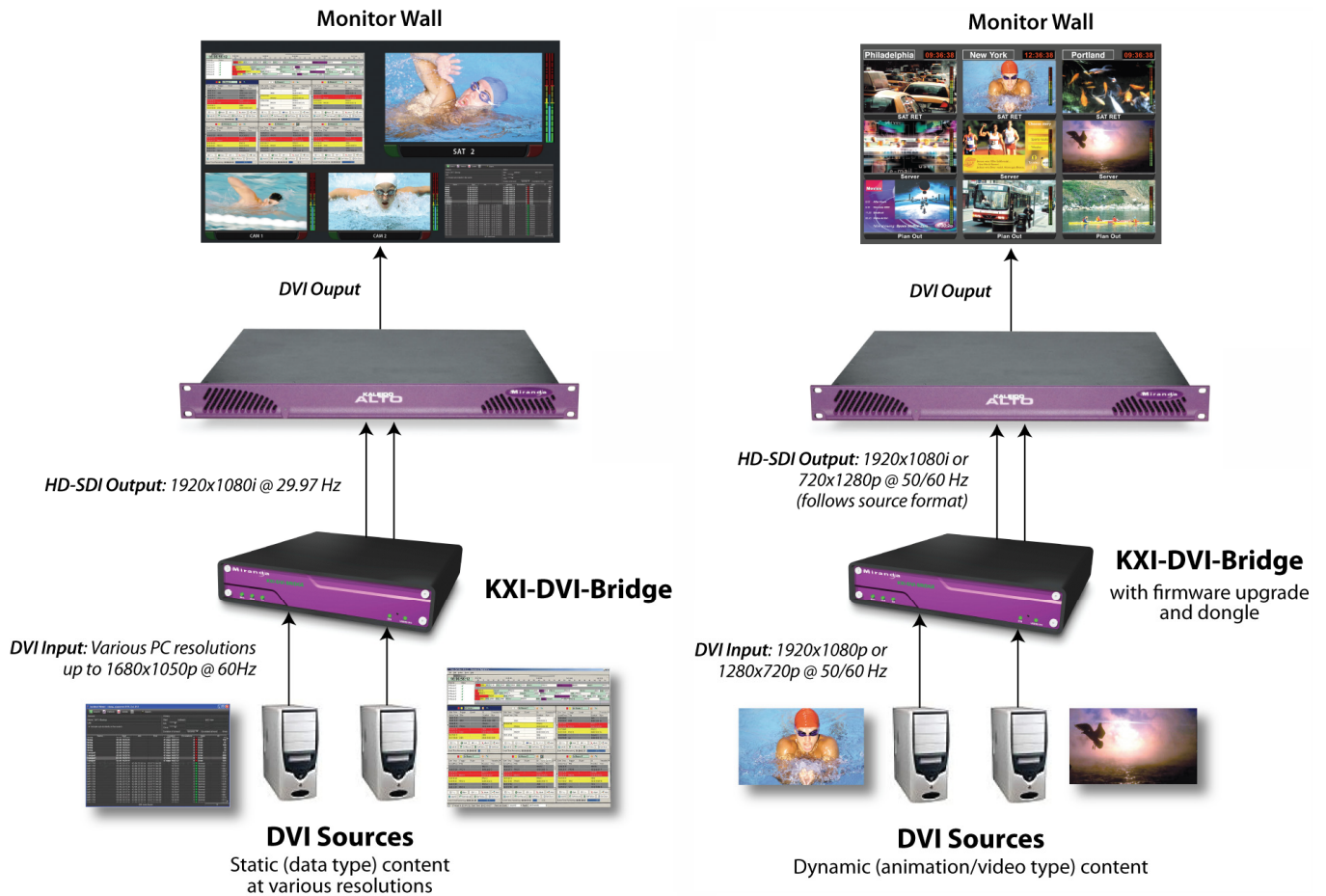
DVI resolution	HD-SDI output
1024x768 (XGA), 60 Hz	1080i @ 29.97 Hz
1280x1024 (SXGA), 60 Hz	
1366x768 (WXGA), 60 Hz	
1680x1050 (WSXGA+), 60 Hz	

*Suitable for graphic-type images with slow motion.*

With dongle:

DVI resolution	HD-SDI output
1280x720, 50 Hz	720p, 50 Hz
1280x720, 60 Hz	720p, 60 Hz
1920x1080, 50 Hz	1080i, 50 Hz
1920x1080, 60 Hz	1080i, 60 Hz

*Best-quality performance with video-type computer-generated content. No motion artifacts.*



**Note:** The KXI-DVI-Bridge's input can be static content (such as computer-generated text and static graphics) to be scaled and merged against the layout background on the Kaleido. In this case the dongle is generally not required. For the KXI-DVI-Bridge to process dynamic content (such as streaming video or computer-generated animations), the dongle is required. Please refer to your KXI-DVI-Bridge User's Manual for more information.

### 2.3.3 Audio Inputs (Analog or AES)

The audio input configuration depends on the audio options purchased with the system:

Rear Panel Connector	Audio Inputs			
	Analog		AES	
	4	10	4	10
Analog 1-5 / AES 1-10	x	x	x	x
Analog 6-10		x		

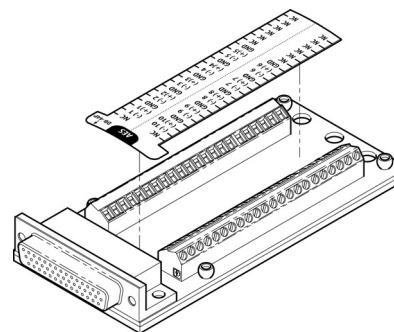
Audio input format: Analog Stereo or AES

Number of inputs: 4 or 10

- In the case of 10 analog inputs, two DB-44 connectors are used.
- In all other cases, only one DB-44 connector is used.

To facilitate cabling of the audio inputs, a terminal block adapter is available separately (Alto-TBA-AG). A Lexan plate is provided to identify the terminal assignment for the input connectors. The figure to the right shows the terminal block adapter and the positioning of the plate.

If you choose to wire connectors instead of using terminal block adapters, this table gives the pinout for the two audio input connectors on the rear panel.



Analog 1-5 / AES 1-10 Connector (function depends on audio format)				Analog 6-10 Connector	
signal	pin	signal	pin	signal	pin
Analog 1 R+	2	AES 1+	2	Analog 6 R+	2
Analog 1 R–	17	AES 1–	17	Analog 6 R–	17
Analog 1 L+	1	AES 2+	1	Analog 6 L+	1
Analog 1 L–	16	AES 2–	16	Analog 6 L–	16
Analog 2 R+	4	AES 3+	4	Analog 7 R+	4
Analog 2 R–	19	AES 3–	19	Analog 7 R–	19
Analog 2 L+	3	AES 4+	3	Analog 7 L+	3
Analog 2 L–	18	AES 4–	18	Analog 7 L–	18
Analog 3 R+	26	AES 5+	26	Analog 8 R+	26
Analog 3 R–	10	AES 5–	10	Analog 8 R–	10
Analog 3 L+	5	AES 6+	5	Analog 8 L+	5
Analog 3 L–	20	AES 6–	20	Analog 8 L–	20
Analog 4 R+	28	AES 7+	28	Analog 9 R+	28
Analog 4 R–	12	AES 7–	12	Analog 9 R–	12
Analog 4 L+	27	AES 8+	27	Analog 9 L+	27
Analog 4 L–	11	AES 8–	11	Analog 9 L–	11
Analog 5 R+	30	AES 9+	30	Analog 10 R+	30
Analog 5 R–	14	AES 9–	14	Analog 10 R–	14
Analog 5 L+	29	AES 10+	29	Analog 10 L+	29
Analog 5 L–	13	AES 10–	13	Analog 10 L–	13

**Note:** If you have purchased the 4-audio-input version, inputs 5-10 will not be supported, and should be ignored in the wiring table and on the terminal block adapter.

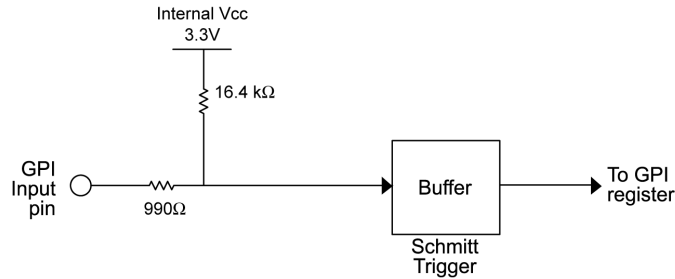
### 2.3.4 MISC IN/OUT Connector

This connector is home to four types of inputs and outputs:

- **GPI inputs /outputs**

The MISC IN/OUT connector provides interfaces and processing to support 10 contact closure GPI inputs and 5 GPI outputs.

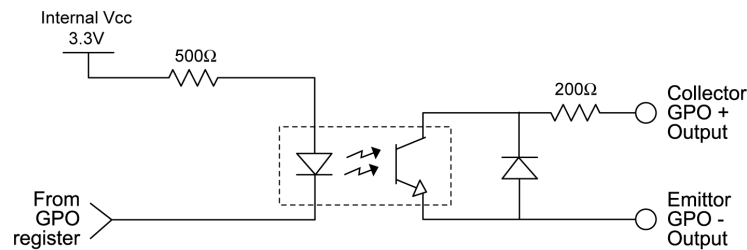
*GPI inputs:* 10 short-to-ground inputs



**Figure 2.2 (a) GPI input Characteristics**

*GPI outputs:* 5 opto-isolated contact closures

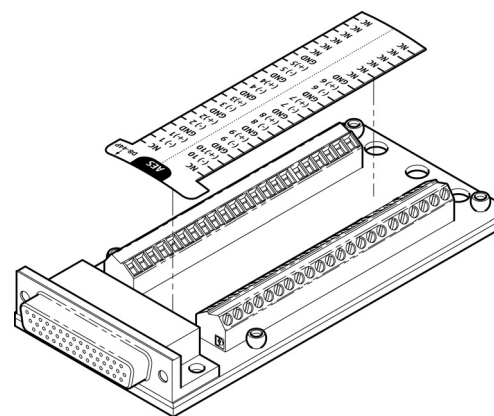
- Max differential voltage: 12 VDC
- Max sink current: 70 mA
- Isolation voltage: 2500 VRMS



**Figure 2.2 (b) GPI output Characteristics**

- RS422 A port
- Audio Outputs – Analog and AES
- Time code (LTC) input

To facilitate cabling to the MISC IN/OUT connector, a terminal block adapter is available separately (Alto-TBA-AG). A Lexan plate is provided to identify the terminal assignment for the MISC IN/OUT connector. The figure on the right shows the terminal block adapter and the positioning of the plate.



Should you choose to wire the MISC IN/OUT connector instead of using a terminal block adapter, the table below gives the pinout of the connector:

MISC IN/OUT Connector pinout							
GPI Inputs		GPI Outputs		RS-422A port		Audio Out	
signal	pin	signal	pin	signal	pin	signal	pin
GPI In 1	27	GPI Out C-1	4	RS-422 (Rx-)	17	AES Out (-)	12
GPI In 2	10	GPI Out E-1	19	RS-422 (Rx+)	2	AES Out (+)	28
GPI In 3	26	GPI Out C-2	5	RS-422 (Tx-)	18	Analog R (-)	13
GPI In 4	40	GPI Out E-2	20	RS-422 (Tx+)	3	Analog R (+)	29
GPI In 5	9	GPI Out C-3	6	RS-422 (+12v)	1	Analog L (-)	14
GPI In 6	39	GPI Out E-3	21	Time Code		Analog L (+)	30
GPI In 7	25	GPI Out C-4	22				
GPI In 8	8	GPI Out E-4	37				
GPI In 9	24	GPI Out C-5	23	signal	pin		
GPI In 10	38	GPI Out E-5	7	LTC In	42		

GND	11, 15, 31, 33, 34, 35, 36, 41, 43, 44
-----	--

### 2.3.5 DVI-I OUT Video Output

This connector carries both analog (RGBHV) and digital (DVI) progressive scan component outputs, with the following resolutions:

Resolution	Display mode
800 x 600, 50/60 Hz <sup>1</sup>	Full
1024 x 768, 50/60 Hz	Full
1280 x 768, 50/60 Hz	Full
1360 x 768, 50/60 Hz	Full
1280 x 1024, 50/60 Hz	Full
1920 x 1080, 50/60 Hz	w/letter boxes
1600 x 1200, 50/60 Hz	w/letter boxes

<sup>1</sup> The 800 x 60 resolutions are only supported in Standalone mode.

## Installation Manual

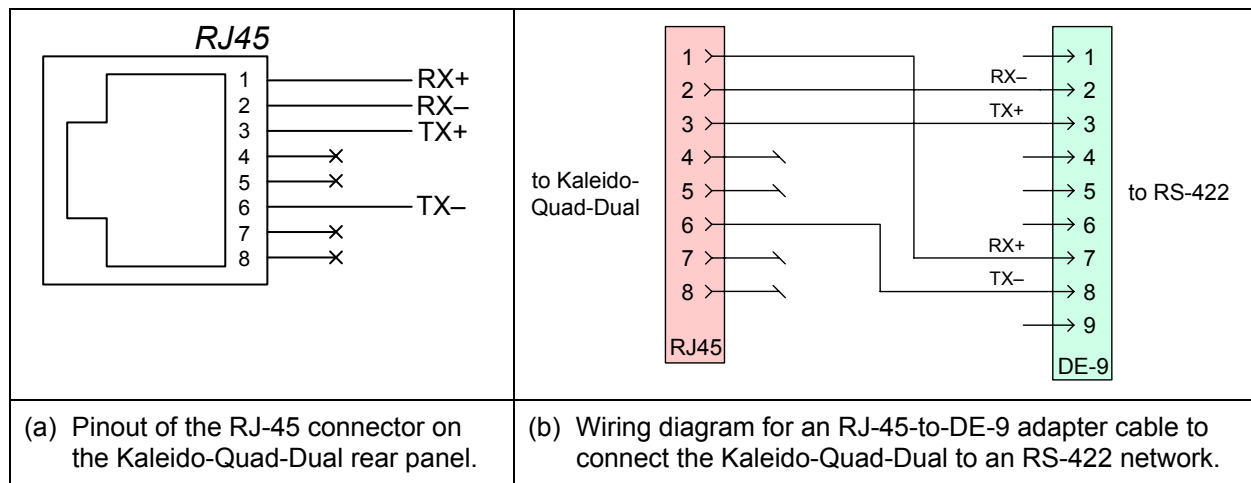
**Note:** If you want the digital and analog outputs on separate cables, you will need a splitter cable. One suggested model is the Gefen ADA-DVI-2-DVIVGA cable, available online at [www.gefen.com](http://www.gefen.com). For optimum performance, good DVI cables should be used. For instance, cable model D-766 from Cable4PC ([www.cable4pc.com](http://www.cable4pc.com)) is recommended.

### 2.3.6 RS-422 B

RJ-45 connector for connecting remote control devices such as routers using the RS422 protocol.

**Note:** The RJ-45 connector is used to preserve space on a busy panel. The RS-422 interface specifies a DE-9S connector, so if you are using this interface you will require a DE-9S-to-RJ-45 adapter cable. Miranda supplies such a cable, correctly wired for this application: Miranda part no. 1737-3000-102.

The pinout for the RS-422 signals on the Kaleido-Quad-Dual RJ-45 connector, and the wiring diagram for an RJ-45 to DE-9 adapter cable, are shown here:



**Figure 2.3** RS-422 B Connector pinout and adapter cable wiring diagram

### 2.3.7 Ethernet

An RJ-45 connector for 10/100 BASE-T Ethernet interface connection to LAN/WAN networks using TCP-IP.

### 2.3.8 USB

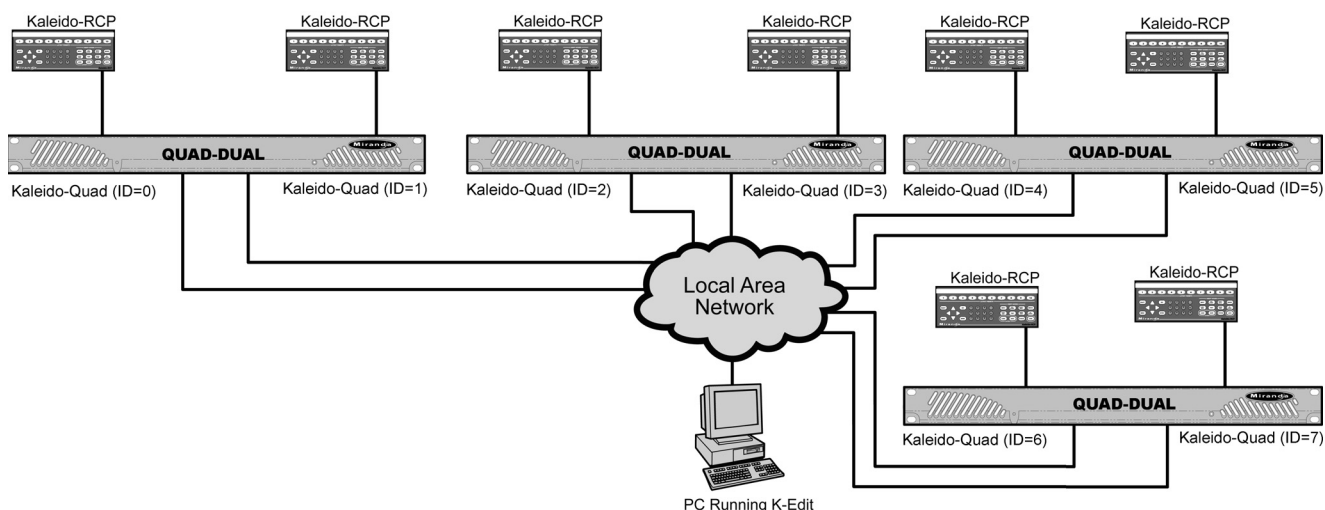
Dual USB 1.0 ports used to connect a mouse (supplied) and keyboard to allow the user to operate the Kaleido-Quad-Dual. The Kaleido-Quad-Dual will not work with a multi-function keyboard (i.e. with volume controls or internet, so make sure to use a simple, basic USB keyboard.

## 2.4 Multiple Kaleido-Quad-Dual Installations

Each Kaleido-Quad-Dual frame contains two fully-independent Kaleido-Quad units. Therefore, when configuring network connections, or when using Kaleido-RCP remote control panels, the two units must be wired and connected separately and independently. In the discussions below, we will use the term “Kaleido-Quad” to refer to an individual device within a Kaleido-Quad-Dual frame.

### 2.4.1 Ethernet Connection for use with KEdit

KEdit software is used to create layouts for the Kaleido-Quad. Each Kaleido-Quad can have layouts created specifically for its application requirements. These layouts are created on a PC running KEdit software (described in its own manual) and uploaded to the Kaleido-Quad via Ethernet, each Kaleido-Quad having its own IP address.



**Figure 2.4** Kaleido-Quad-Duals connected to an Ethernet network

### 2.4.2 Controlling Multiple Kaleido-Quad-Duals using RS-422 with a Kaleido-RCP

Figure 2.5.1 above shows a separate Kaleido-RCP remote control panel connected to each Kaleido-Quad (i.e. two RCPs for each Kaleido-Quad-Dual, since the two Kaleido-Quad units within the frame are independent). However, using the RS-422 A communication port allows up to 32 daisy-chained Kaleido-Quad units to be controlled using only one Kaleido-RCP, through the use of a multidrop cable. Figure 2.5 illustrates cabling between the Kaleido-Quads and the Kaleido-RCP. Other products in the Kaleido family may be included, as shown in the figure.

For this to work, the Kaleido-RCP must be able to send commands to a specific Kaleido-Quad in the daisy-chain. This is accomplished by assigning an identification code to each of the Kaleido-Quad units.

By default, Kaleido-RCP will send instructions using RS-422 protocol to ID 1. This means that a system comprised of only one Kaleido-Quad will work out of the box as each unit's default ID is also set to 1. However, for applications where more than one Kaleido-Quad is used (e.g. both Kaleido-Quads in a Kaleido-Quad-Dual frame) you will need to assign a unique ID number to each of them. Consult the Kaleido-Quad-Dual software User's Manual for details.

As indicated in the figure below, a 120  $\Omega$  termination resistor must be installed on the cable connector on the last Kaleido-Quad in the daisy-chain. In a point-to-point connection, it must be installed on the receiver; for a more-than-one Kaleido-Quad connection (called a "multidrop connection"), it must be installed on receiver **and** driver. For more details, consult Miranda Application Note #229-99T00-101.

## RS-422 Multi-drop Cable Example

### Notes:

- 1: For pins 2/7 and 3/8, using Belden 8162 or similar is recommended, 24AWG. 2 Twisted Pairs individually shielded, both GND and the Overall foil connected to pin 1
- 2: For PINS 4 and 5, wires should be 20AWG.
- 3: As illustrated, it is strongly recommended to get 12V required for the RCP from an external DC supply or AC/DC adaptor. It shall deliver 3W or more (250mA or more). The distance between the supply and the RCP should be the shortest possible.
- 4: As illustrated, the Tango has Tx and Rx signals located at different pins than other Kaleido products.

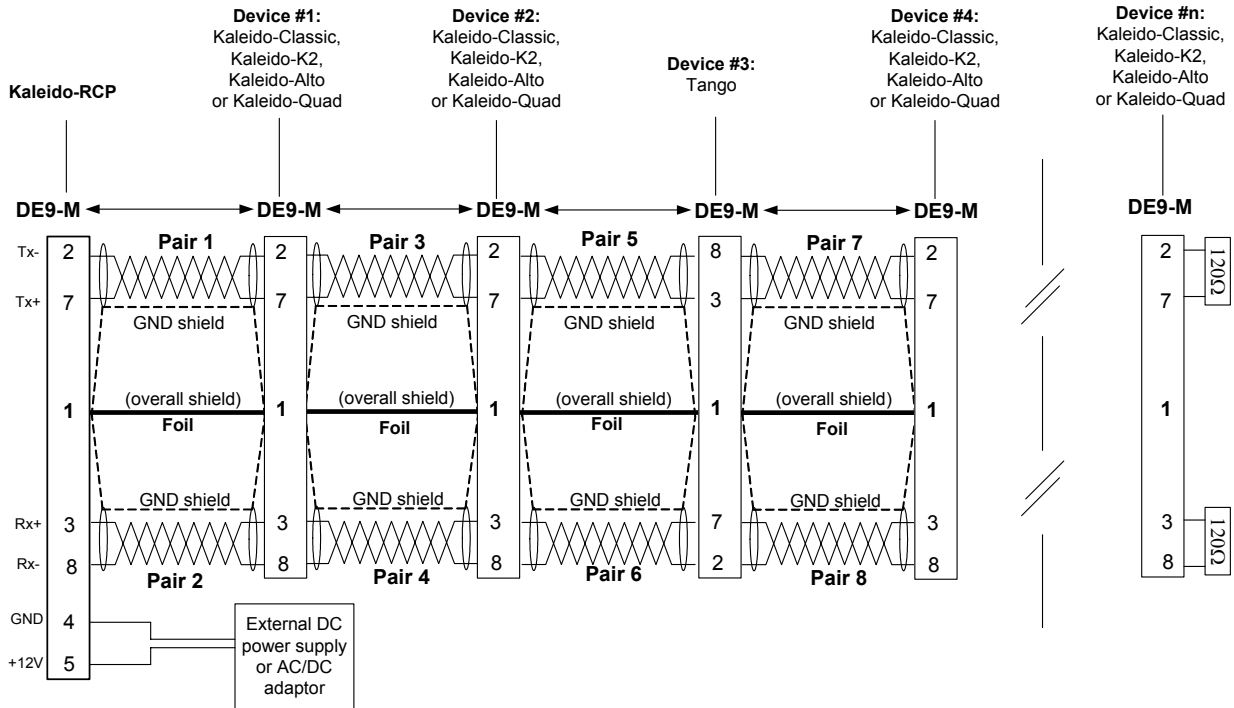


Figure 2.5 Kaleido Alto/Kaleido-RCP interconnection for cascading multiple frames



### 3 Operation

The Kaleido-Quad-Dual has no local controls beyond the power switch. Operational concerns are outlined here, but for detailed operating instructions, see the Kaleido-Alto/Quad/Quad-Dual User's Manual. Periodically, new software versions may be uploaded using "live update" through the Ethernet connection.

#### 3.1 Powering Up

The power switches for the dual redundant power supplies are located on the rear panel of the Kaleido-Quad-Dual, just beside the power cords. Plug the cords into an appropriate AC power supply, and set the switches to ON ( I ).

- If you have just switched the unit OFF ( 0 ), always wait a few seconds before turning it ON again to ensure a proper startup procedure.

#### 3.2 Front Panel Status LED

There is a system status LED mounted on the front panel for each of the two Quad units in the Kaleido-Quad-Dual. These LEDs give operational status when powering up the unit, and signal any malfunction of the units. Note that these LEDs do not report on the status of the inputs connected at the back.



**Figure 3.1** Front panel Status LEDs

At startup, the LEDs will briefly light up red, then flash yellow. After 10 to 15 seconds the LEDs light up green to indicate normal system operation. Other states may be:

- Yellow (continuous): system boot-up problem or live update not completed correctly
- Red (continuous): system failure

#### 3.3 Startup and Preparation

The Kaleido-Quad-Dual is shipped with the current version of the software installed, and configured to auto-start when the system is powered on. Upon initial startup, the system will present the default monitoring window at its output. Upon subsequent start-ups, the system will present the last monitoring window that was present before shut-down. See the Kaleido-Alto/Quad/Quad-Dual User's Manual for detailed instructions on how to operate the software.

#### 3.4 Software Installation

In case of recovery from a system failure, or when a software update is available, it is necessary to install the Kaleido-Quad-Dual software and K-Edit layout editor. All the necessary software is delivered on a CD included in the product package, or downloaded from Miranda's web site. As Kaleido-Quad-Dual unit does not have a CD drive, it is necessary to install the software from a remote computer through a network connection. Installation of the software is detailed in a *ReadMe* file included with the update.

## 4 Technical Specifications

### 4.1 Inputs

<b>Digital Video Input (HD-SDI)</b>	
Signal	SMPTE 292M
Cable length	100m (325') (Belden 1694A)
Return loss	15dB up to 1.5Gbps
Impedance	75Ω
Connector	BNC
<b>Digital Video Input (SD-SDI)</b>	
Signal	4:2:2 SMPTE 272M, 259M-C
Cable length	100 m (325') (Belden 1694A)
Return loss	15dB up to 270 MHz
Impedance	75Ω
Connector	BNC
<b>Composite Video Input</b>	
Signal	NTSC SMPTE 170M, PAL, PAL-M, SECAM, B&W
Return loss	35dB up to 5.75MHz
Quantization	8 bits
Impedance	75Ω
Connector	BNC
<b>HD Embedded Audio Input</b>	
Signal	SMPTE 292M
Bit resolution	20-24 bits
Sampling rate	48 kHz synchronous
<b>SD Embedded Audio Input</b>	
Signal	SMPTE 272M
Bit resolution	20 bits
Sampling rate	48 kHz synchronous
<b>Analog Audio Input (4 or 10)</b>	
Signal	Balanced analog stereo
Impedance	20 KΩ balanced, 10 KΩ single-ended, 600Ω selectable
Connector	DB-44
<b>AES Audio Input (4 or 10)</b>	
Signal	AES3 balanced (AES3-1992 / ANSI S4-40-1992)
Impedance	110Ω
Connector	DB-44
<b>Time Code Input (LTC)</b>	
Signal	SMPTE 12M-1995 (EBU-3259-E)
Level	100 mVp-p to 10 Vp-p
Impedance	13.5 kΩ
Connector	DB-44S (part)

## 4.2 Outputs

<b>DVI-I Video</b>	
Signal	DVI
Resolution	From 800 x 600 to 1920 x 1200 NI
H frequency	31 kHz to 96 kHz
Refresh rate	50 / 59.94 Hz
Cable length	3.6 m (12') with Altinex CB4012DB
Connector	DVI-I
<b>RGBHV Video</b>	
Signal	Analog RGBHV
Resolution	From 800 x 600 to 1920 x 1200 NI
H frequency	31 kHz to 96 kHz
Refresh rate	50 / 59.94 Hz
Cable length	4.5 m (15')
Level	Selectable 0.7 or 1.0 Vp-p
Connector	DVI-I
<b>Analog Audio (1)</b>	
Signal	Balanced Analog Stereo
Impedance	<600Ω
Level	+24 dBu maximum
Volume control	6 dBu steps
Connector	DB-44S (part)
<b>AES Audio (1)</b>	
Signal	AES3
Impedance	110Ω
Connector	DB-44S (part)

## 4.3 Control

<b>GPI Inputs</b>	
Contact closure	GND
Total cable length	200'
Minimum pulse duration	100 ms
Connector	DB-44S (part)
<b>GPI Outputs</b>	
Max. voltage	12 VDC differential voltage
Cable length	100 m
Connector	DB-44S (part)
<b>RS-422 A</b>	
Signal	RS-422 (SMPTE 207M, EBU-3245) (a 12V power supply is provided for the Kaleido-RCP)
Data rate	38400 BPS, according to application
Connector	DB-44S (part)
<b>RS-422 B</b>	
Signal	RS-422 (SMPTE 207M, EBU-3245)
Data rate	38400 BPS, according to application
Connector	RJ45

<b>Ethernet</b>	
Signal	10 BASE-T, 100BASE-T (IEEE 802.3)
Connector	RJ-45
<b>USB</b>	
Signal	USB ver. 1.0
Connector	USB double type receptacle A

#### 4.4 Processing Performance

Signal path	8 bits
Quantization	24 bits on RGBVH output
Graphic	18 bits on RGB
Maximum video processing delay to DVI output	60 Hz: less than 34 ms 50 Hz: less than 44 ms

#### 4.5 Frame

<b>Kaleido-Quad-Dual</b>	
Voltage	100-240 VAC
Power	120 W
Dimensions	1RU (19" rack) X 19.5 in (495 mm) deep (incl. connectors)
Weight	8.1lbs (3.7 kg)
Operating temperature	0-30° C

## Annex – Kaleido Display Resolution

The Kaleido-Quad-Dual displays all the elements of its layout in a frame whose maximum vertical resolution is 1024 pixels. However, the RGBHV output can drive displays with greater vertical resolution, provided they are equipped with an appropriate hardware version (see the chart below). In particular, displays operating at 1920x1080 and 1600x1200 can be used.

### 1600 x 1200 resolution:

To drive a 1600x1200 display from a Kaleido-Quad-Dual unit, the layout must be created at 1600x1024 pixels. In KEdit, you must generate a 25 x 16 display aspect ratio. When this layout is shown on the display, 88 lines on top and bottom will be displayed in black.

### 1920 x 1080 resolution:

To drive a 1920x1080 display from a Kaleido-Quad-Dual unit, the layout must be created at 1920x1024 pixels. In KEdit, you must generate a 15 x 8 display aspect ratio. When this layout is shown on the display, 28 lines on top and bottom will be displayed in black (see figure A1).



**Figure A1:** Kaleido-Quad-Dual output on a 1920x1080 display showing black bars top and bottom

## Contact Us!

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