PCX1221e
PCX1222e

*Professional Multichannel
Sound Cards*

User's manual

Digigram

**For technical support,
please contact your system supplier**

PCX1221e & PCX1222e
User's Manual

Table of Contents

INFORMATION FOR THE USER

This device complies with part 15 of FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

This equipment has been tested and found to comply with the limits for a CLASS B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions contained in this data sheet, may cause harmful interference to radio and television communications. However, there is no guarantee that interference will not occur in a particular installation.

If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

* reorient or relocate the receiving antenna
* increase the separation between the equipment and the receiver
* connect the equipment into an outlet on a circuit different from that of the receiver
* consult the dealer or an experienced audio television technician.

Note: *Connecting this device to peripheral devices that do not comply with CLASS B requirements or using an unshielded peripheral data cable could also result in harmful interference to radio or television reception. The user is cautioned that any changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate this equipment. To ensure that the use of this product does not contribute to interference, it is necessary to use shielded I/O cables.*

IMPORTANT NOTICE

This card has been tested and found to comply with the following standards:

• International: CISPR22 Class B
• Europe: EMC 89/336/CEE (1992) specifications
• United States: FCC Rules-Part 15-Class B (digital device)

In order to guarantee compliance with the above standards in an installation, the following must be done:

• the provided cable must not be modified
• additional cables used must have their respective shield connected to each extremity

Warning:

Electrostatic discharge (ESD) can damage several components on the board. To avoid such damage in handling the board, take the following precautions:

Bring the device and everything that contacts it to ground potential by providing a conductive surface and discharge paths. As a minimum, observe these precautions:

- *Disconnect all power and signal sources.*
- *Place the device on a grounded conductive work surface.*
- *Ground yourself via a grounding wrist strap or by holding a grounded object.*
- *Ground any tool that will contact the device.*

CONTENTS OF THIS PACKAGE

Thank you for purchasing a Digigram PCX sound card.

The package consists of the following components:
* a PCX1222e or PCX1221e sound card
* the user's manual at hand

The breakout cables to connect the card's I/Os are not part of this package. They are delivered separately.

FEATURES

PCX1222e and PCX1221e are audio cards for PCI EXPRESS™ (PCIe®). They are in PCI EXPRESS™ x1 format and can thus be plugged into any PCIe® slot (x1, x2, x4, x8, x16, x32).

PCX1221e main hardware features

- 1 digital AES/EBU* stereo input, with hardware sample rate converter (up to 96 kHz) and programmable digital gain
- 6 digital AES/EBU* stereo outputs (up to 192 kHz) with programmable digital gain
- 1 digital AES/EBU* stereo sync input (up to 192 kHz in play and record)
- 1 standard Word Clock input (up to 96 kHz)
- 1 standard Word Clock output (up to 96 kHz)
- 1 video sync input
- 1 SMPTE/LTC (Linear Time Code) sync input

PCX1222e main hardware features

All features of the PCX1221e, plus:
- 2 balanced** analog mono line inputs, with software programmable analog and digital gain
- 12 servo-balanced*** analog mono line outputs, with software programmable analog and digital gain
- 192 kHz / 24-bit converters
- Maximum level on analog inputs and outputs: +24 dBu

Note: *The digital outputs always play the digital version of the corresponding analog output. The selection of the AES/EBU input excludes the selection of the analog inputs.*

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* *can be used as S/PDIF interface as well*

** *can be used with unbalanced signals*

*** *Electronically servo-balanced outputs provide automatic level adjustment to accommodate either balanced or unbalanced lines*

Main software features

- Real-time, simultaneous record and playback in PCM (8, 16 and 24 bits) as well as in MPEG Audio Layer I, Layer II and Layer III[Φ], Float IEEE754 conversion supported (with 24-bit fixed-point dynamic range)
- When using the np SDK, real-time mixing of several PCM and MPEG audio streams, direct monitoring, level adjustment, panning, cross-fades, punch-in/punch-out, scrubbing, time-stretching, pitch-shifting, 3-band parametric equalizer, maximizer, format and frequency conversions
- Low latency DirectSound, Wave, and ASIO drivers. Under DirectSound and ASIO, the cards operate in PCM mode only (nevertheless, an application can integrate coders/decoders on the host PC). Under Wave, PCX PCIe boards can operate in both PCM and MPEG (layer 1 and layer 2).
  [Φ] *MPEG Layer III play-only on DSP;*
  MPEG Layer III recording on the host computer is available through Digigram's PC Codec option using the np SDK

REQUIREMENTS

Minimum hardware requirements

PC with one free PCI EXPRESS™ (PCIe®) slot
(x1, x2, x4, x8, x16 ou x32).
CPU power and memory required depend on the operating system and on the audio application used.

Software requirements

To use your PCX1221e or PCX1222e, install the driver from the HR Runtime package version 1.60 or higher. This package includes:

- a Digigram np driver enabling OEM applications to best capitalize on the PCX PCIe® boards
- a WDM DirectSound driver. Microsoft DirectX 9 or higher must be installed on your computer
- a Wave driver (installation optional).
- an ASIO driver (installation optional)

Supported operating systems

PCX1221e and PCX1222e cards run under Windows 2000, XP[*], and Windows Server 2003[*].

HARDWARE INSTALLATION

The card has to be installed in the computer prior to installing its driver.

Installing the card

Gently plug the card into a free PCI slot and press it down to position it firmly. Tighten the screw.

Interrupt and memory address

Hardware interrupt and addresses are automatically set up at start-up by the PCI PnP BIOS.

SOFTWARE INSTALLATION

Please visit the Digigram web site at **www.digigram.com** for the most recent driver.

In case you run a specific application developed or installed by a Digigram Partner, this application might require the use of a specific driver version. In this case, make sure that the updated driver has been approved by your supplier.

To update an HR driver, please uninstall the old version, then install the more recent one.

Standard installation under Windows 2000, XP, and Windows Server 2003

If the driver has been downloaded from our web site, it has to be expanded prior to the driver's installation as follows: double-click on the downloaded file (self-expanding). You can use the default destination location (Windows temporary folder) or select another directory.

Important note: this default procedure installs the 'Digigram Hardware Settings' control panel. This application allows the configuration of the hardware resources of Digigram cards for all audio applications. The DHS allows for instance to define the clock of the card, the input source, input and output analog and digital gain, Sample Rate Converters, digital output format, etc...

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[*] *32-bit version*

Please note that, with the DHS installed, controls available <u>through the DirectSound control panel</u> are limited to:

- *Volume control for input and output*
- *Wave control*

You may also install the driver without installing the DHS control panel, and in this case more controls available are <u>through the DirectSound</u> control panel:

- *Volume control for input*
- *Wave control*
- *Monitoring control*
- *Analog input level*
- *Digital input level*
- *Clock selection: AES Sync, AES1, Word Clock*
- *Digital output format: professional, consumer*

*To do so, install the driver with the command line: "**setup x_topology**". For detailed information, please refer to the dedicated document on our web site.*

- Shut down your computer and insert your PCX card.
- Restart your computer.
- Click on **Cancel** if the **Found New Hardware Wizard** appears.
- Double-click on the **HR Runtime vxx.msi** icon to launch the driver installation.
- A welcome message is displayed, click **Next** to continue.
- The "**License Agreement**" window appears: read it, and click on *"I accept the terms in the license agreement"* to approve it.
- Do the same in the next window for Virtual PCX and PC Codec Legal Notice.
- In the **"Custom Setup"** window, the "*Drivers for the HR board*s" are displayed; by default, both WDM DirectSound and ASIO HR are installed. **Next**.
- In the "Ready to Install the Program Window", click on Install to start copying the files.

   <u>Note:</u> *In case you use an unsigned driver version, the "Digital Signature Not Found" message may appear because a non-Microsoft software is about to be installed.*
   *Click on **Continue anyway** in the **"Hardware installation"** window (Windows XP, Server 2003).*

- In the **"Digigram drivers"** window, select the number and the size of buffers required by your applications. Click on **Ok**.
- Click **Finish** to complete the driver installation.

Parameterizing the ASIO driver

- To use the ASIO driver on your PCX sound card, the option **"PCM only"** has to be activated in the Digigram control panel (CPL). To access this control panel, go to **<Start>**, **<Programs>**, **<Digigram>**, **<Digigram Control Center>**.
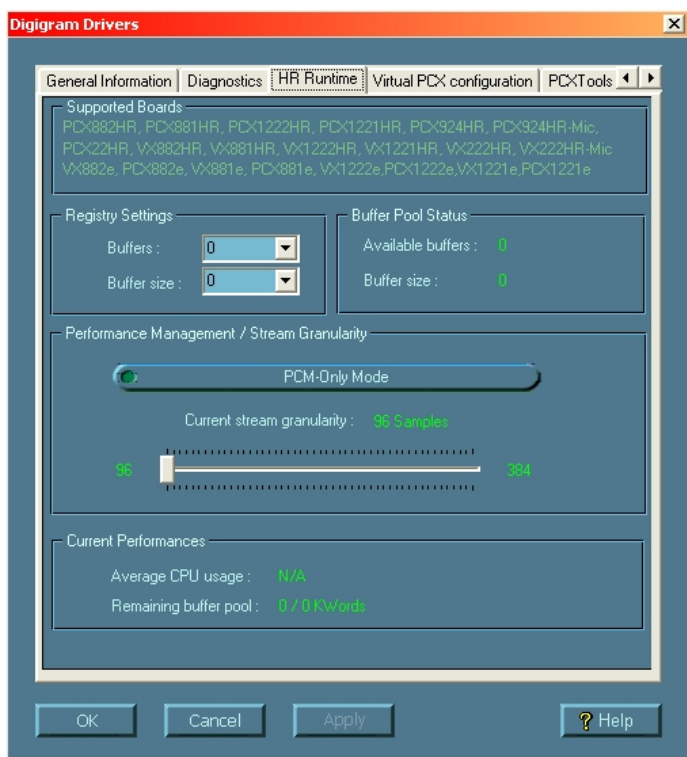
Parameterizing the Wave driver

- In the case of an application managing exclusively PCM audio, the latency of the Wave driver can be optimized activating the option **"PCM only"** in the Digigram control panel (CPL). With this option enabled, the latency of the Wave driver is optimized (in this case the PCX on-board MPEG encoding/decoding is disabled). To access this control panel, go to **<Start>**, **<Programs>**, **<Digigram>**, **<Digigram Control Center>**.

Removing the driver under Windows 2000, XP, and Windows Server 2003

- Open the **Windows Control Panel** and double-click on the **Add/Remove Software** icon.
- Select "*Digigram HR Runtime …*", and **Change/Remove**.
- Select **Remove** in the np Runtime window.
- Follow the instructions to finish driver removal.

How to check the installation

Once the cards and the driver have been installed according to the procedure described in this manual, you can verify that the card is properly installed and works fine as follows:

- Menu **<Start> <Settings> <Control panel>**, **<Sound and Multimedia>**, tab "**Audio**", **Default device** (Playback device, Recording device). The card's channels can be selected. The card can be used with any *DirectSound* application.
  Available WDM recording and playback devices are:
    - PCX1221 (PCX1222) 1+2 (WDM) (*record and playback*)
    - PCX1221 (PCX1222) 3+4 (WDM) (*playback*)
    - PCX1221 (PCX1222) 5+6 (WDM) (*playback*)
    - PCX1221 (PCX1222) 7+8 (WDM) (*playback*)
    - PCX1221 (PCX1222) 9+10 (WDM) (*playback*)
    - PCX1221 (PCX1222) 11+12 (WDM) (*playback*)
    - PCX1221 (PCX1222) 5.1A (WDM) (*playback*)
    - PCX1221 (PCX1222) 7.1 (WDM) (*playback*)
    - PCX1221 (PCX1222) 5.1B (WDM) (*playback*)
- The card is also visible via the np interface: go to **<Start> <Programs> <Digigram>** and select **<Digigram Control Center>**.
    - In the "**Digigram drivers**" window, select the '**General Information**' tab.
      In the "**Modules Information**" window, you can see the **HR Runtime** modules that have been installed, and their versions.
    - In the "**Digigram drivers**" window, select the '**Diagnostics**' tab.
      You should see here the icons of the cards you have installed.
    - If the card you have installed is listed:
        - Right click on the icon of the card.
        - Select '**Diagnostics**', and *Play Sine*. This plays in loop a sine signal on the outputs of the card. You can also select

Play file to play in loop a file of your choice (PCM only). If the playback is correct, the card is correctly installed and works.

- To stop the playback, right click on the card icon, and select *Stop Activities*.

- If the card is not displayed:
  - Make sure that during the HR runtime installation the **"Driver for the HR boards"** has been selected in the **"Select components"** window.
  - Make sure that the card is correctly inserted in the PCI slot, and screwed on the PC chassis.
  - If necessary, uninstall the HR runtime package as described in this manual, and re-install it.

- If the Wave driver has been installed:
  - Go to menu **<Start>**, **<Settings>**, **<Control panel>**, **<Sound and Multimedia>**, tab "**Audio**", **Default device** (**Playback device, Recording device**). The card's channels can be selected. The card can be used with any Wave application.

    Available Wave recording and playback devices are:
    - PCX1221 (PCX1222) 1+2 (Wave) (*record and playback*)
    - PCX1221 (PCX1222) 3+4 (Wave) (*playback*)
    - PCX1221 (PCX1222) 5+6 (Wave) (*playback*)
    - PCX1221 (PCX1222) 7+8 (Wave) (*playback*)
    - PCX1221 (PCX1222) 9+10 (Wave) (*playback*)
    - PCX1221 (PCX1222) 11+12 (Wave) (*playback*)
    - PCX1221 (PCX1222) 5.1A (Wave) (*playback*)
    - PCX1221 (PCX1222) 5.1B (Wave) (*playback*)
    - PCX1221 (PCX1222) 7.1 (Wave) (*playback*)
    - PCX1221 (PCX1222) 5.1+2 (Wave) (*playback*)
    - PCX1221 (PCX1222) 7.1+2 (Wave) (*playback*)

- If the ASIO driver has been installed:
  - The card is visible from any ASIO application.

Note:
5.1A plays on outputs 1, 2, 3, 4, 5, 6
5.1B plays on outputs 7, 8, 9, 10, 11, 12
7.1 plays on outputs 1, 2, 3, 4, 5, 6, 7, 8
5.1+2 plays on outputs 1, 2, 3, 4, 5, 6, 7, 8
7.1+2 plays on outputs 1, 2, 3, 4, 5, 6, 7, 8, 9, 10

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The 'Digigram Hardware Settings' ('DHS') control panel

Digigram Hardware Settings (DHS) is an application allowing to configure the hardware resources of Digigram cards for all audio applications using them. This application is installed by default with the driver unless the command line "***setup x_topology***" has been executed to install the driver.

A resource being managed by the DHS application can not be modified by any other applications. To enable an audio application to modify a Digigram card resource, this resource must not be managed by the DHS.

Note: As soon as a resource of a card is managed by the DHS, the clock selection of this card MUST be defined in the DHS.

The DHS allows to:

- Select the clock the card uses
- Select of the input source
- Adjust analog and digital gains of inputs and outputs
- Enable Sample Rate Converters of an input
- Select the input monitored on an output
- Set the monitoring gains
- Define the digital output format

For more detailed information on how to use this control panel, please refer to its on-line help.

SPECIFICATIONS

Configuration

	PCX1221e	PCX1222e
Bus/Format	PCI EXPRESS™ (PCIe®) x1 (x2, x4, x8, x16, x32 compatible)	
Digital Signal Processor	Motorola 56321 at 240 MHz	
RAM	512 kWords	
Size	168 mm x 111 mm x 20 mm	
Power requirements (+3.3V / +12V)	1.5 A / 0.1 A	3 A / 0.4 A
Operating: temp / humidity (non-condensing)	0°C / +50°C • 5% / 90%	
Storage: temp / humidity (non-condensing)	-5°C / +70°C • 0% / 95%	

Inputs

	PCX1221e	PCX1222e
Analog line inputs (mono)	-	2 balanced[*]
Maximum input level/ impedance	-	+24 dBu/ >10 kΩ
Digital input (stereo)	1 AES/EBU[**] with hw Sample Rate Converter, 7.5:1 to 1:8, up to 192 kHz	
Programmable input gain	digital: from −110 dB to +18 dB	analog: from −94.5dB à +15.5 dB[⊗] digital: from −110 dB à +18 dB
Other inputs	AES/EBU Sync (up to 192 kHz), Word clock (up to 96 kHz), LTC, Video	
AES11 synchronization	Yes	

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[*] *can be used with unbalanced signals*
[**] *can be used as S/PDIF interface as well*
[⊗] *maximum sensitivity: 0 dBFs for −15.5 dBu input*

Outputs

	PCX1221e	PCX1222e
Analog line outputs (mono)	-	12 servo-balanced[***]
Maximum output level / impedance	-	+24 dBu / <100 Ω
Digital outputs (stereo)	6 AES/EBU[**], up to 192 kHz	
Programmable output gain	digital: from −110 dB to +18 dB	analog: from −86 dB to +24 dB digital: from −110 dB to +18 dB
Other outputs	Word clock (up to 96 kHz)	

Connectors

	PCX1221e	PCX1222e
Internal connectors	Inter-board Sync	
External connector	68-pin SCSI MDR	

Audio specifications

	PCX1221e	PCX1222e
Sampling frequencies available	Programmable from 8 to 192 kHz	
A/D and D/A converter resolution	-	24 bits
Supported audio formats	PCM (8, 16, 24 bits), Float IEEE754	

[***] *electronically servo-balanced outputs provide automatic level adjustment to accommodate either balanced or unbalanced lines*

Audio Performance

measured at Fs=48 kHz

	PCX1221e	PCX1222e
Frequency response (record + play)	-	20 Hz–20 kHz: ±0.3 dB
Channel phase difference: 20/20kHz	-	<0.2°/2°
Dynamic range (A-weighted)	-	Analog In: >104 dB Analog Out: >110 dB
THD + noise 1 kHz at –1 dBfs	-	Analog In: <–96 dB Analog Out: <–96 dB
Crosstalk (Analog in or out)	-	1 kHz at 24 dBu: <–100 dB 15 kHz at 24 dBu: <–90 dB

Development environments

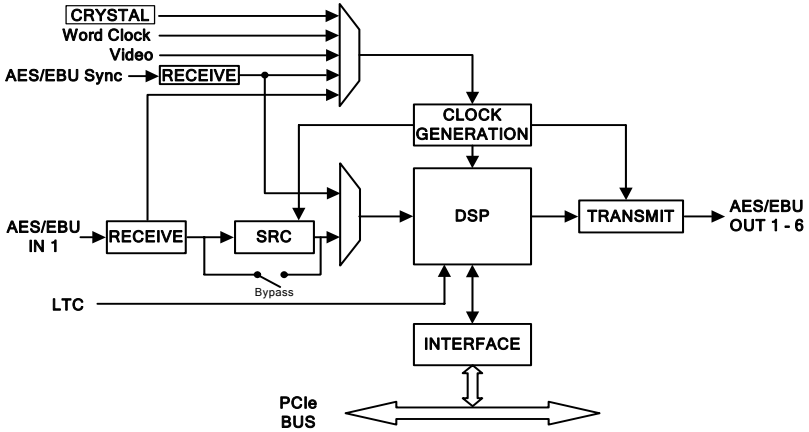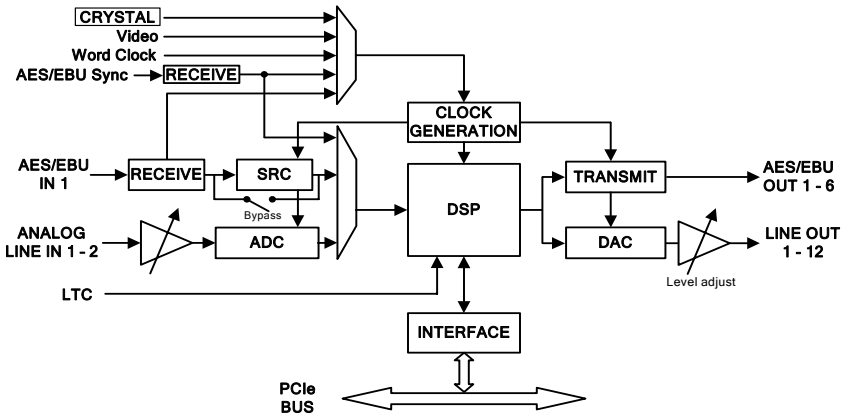|	PCX1221e	PCX1222e
Digigram management	np SDK (HR Runtime, PCM only)	
Other management	Wave (PCM, MPEG), ASIO, and DirectSound (PCM only)	
OS supported	Windows 2000, XP[*], and Windows Server 2003[*]	
Main on-board processing features (with np SDK)	PCM play, rec, Float IEEE754, and MPEG layer 1 et layer 2 (layer 3 in playback) direct monitoring, real-time mixing, level adjustment, panning, cross-fade, punch-in/punch-out, scrubbing	

[*] *32-bit version*

APPENDICES

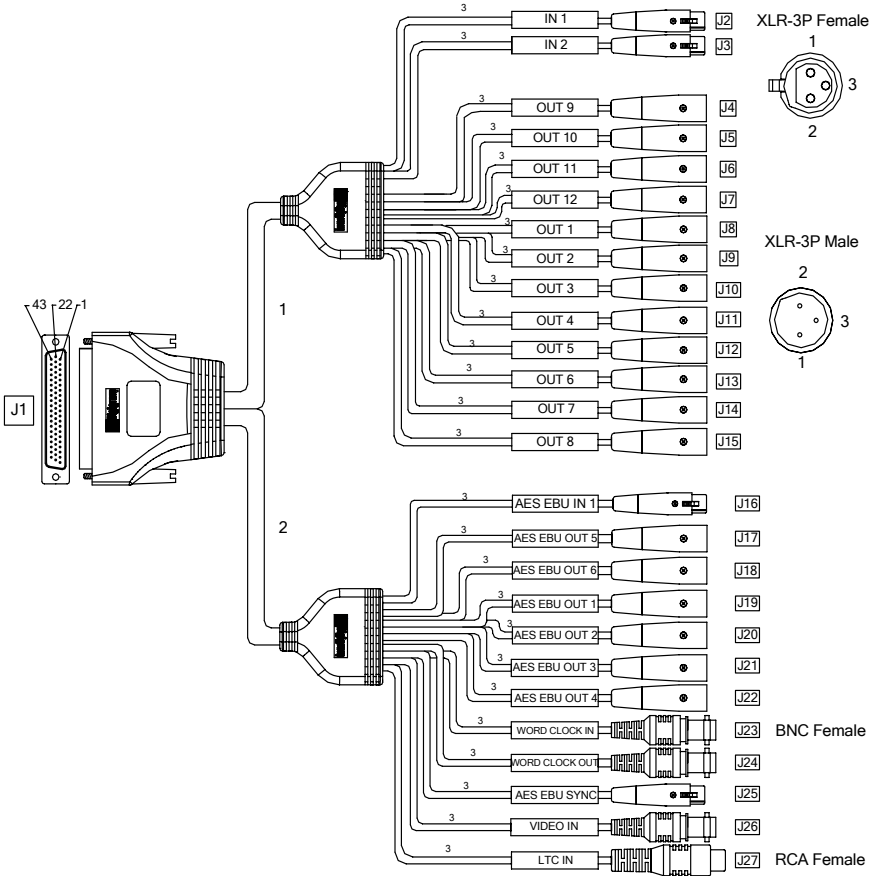## PCX1221e Schematic Diagram

PCX1222e Schematic Diagram

D i g i g r a m

Cable diagram
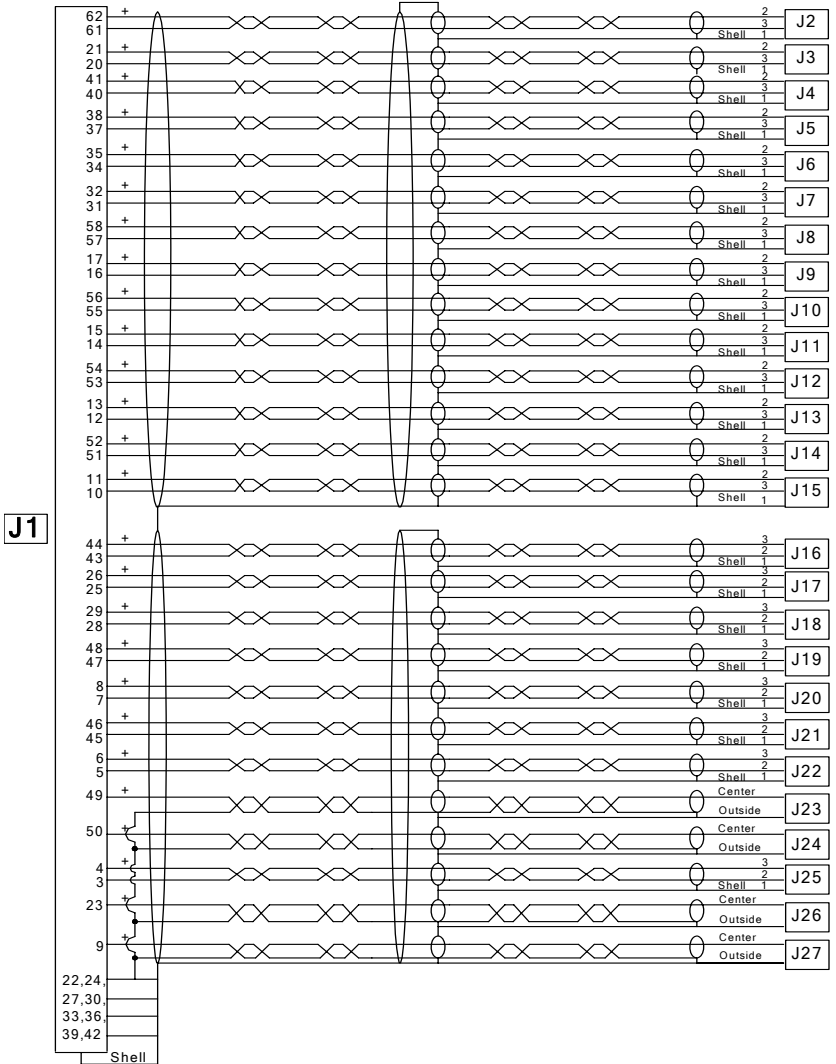
Schematic diagram of the cable delivered by Digigram*****:

* Your cable may look different if it is not a Digigram cable.

Wiring diagram

D i g i g r a m

Cable pinout

	Pin	Signal	Pin	Signal	Pin	Signal
Digital	1	AES/EBU IN 6 +	11	AES/EBU OUT 2 +	41	GND
	2	AES/EBU IN 6 -	12	AES/EBU OUT 2 -	42	GND
	3	AES/EBU SYNC +	15	Video IN	43	AES/EBU OUT 3 +
	4	AES/EBU SYNC -	16	GND	44	AES/EBU OUT 3 -
	5	NC	35	AES/EBU IN 5 +	45	AES/EBU OUT 1 +
	6	NC	36	AES/EBU IN 5 -	46	AES/EBU OUT 1 -
	7	GND	37	Reserved	47	Word Clock IN
	8	GND	38	Reserved	48	GND
	9	AES/EBU OUT 4 +	39	AES/EBU IN 1 +	49	Word Clock OUT
	10	AES/EBU OUT 4 -	40	AES/EBU IN 1 -	50	GND

	Pin	Signal	Pin	Signal	Pin	Signal
Analog	13	LTC IN	28	OUT 12 -	57	OUT 1 +
	14	GND	29	OUT 10 +	58	OUT 1 +
	17	OUT 8 +	30	OUT 10 -	59	GND
	18	OUT 8 -	31	NC	60	GND
	19	OUT 6 +	32	NC 4 -	61	OUT 11 +
	20	OUT 6 -	33	IN 2 +	62	OUT 11 -
	21	OUT 4 +	34	IN 2 -	63	OUT 9 +
	22	OUT 4 -	51	OUT 7 +	64	OUT 9 -
	23	OUT 2 +	52	OUT 7 -	65	NC
	24	OUT 2 -	53	OUT 5 +	66	NC
	25	GND	54	OUT 5 -	67	IN 1 +
	26	GND	55	OUT 3 +	68	IN 1 -
	27	OUT 12 +	56	OUT 3 -		

LAYOUT

J1: Analog/digital cable