MU1

Digital audio can offer perfect reproduction.
If... the implementation is of the highest accuracy.
*MU1: **Your Music Source**. For life.*

96k /24   +0.0 dB
Streamer
Roon
Joni Mitchell
Both Sides, Now
Both Sides Now
03:34   05:43

MU1 | Grimm

MU1 - manual

Please read this manual before operating the unit.

Grimm | AUDIO

Table of Contents

Manual MU1 © Grimm Audio

1. Introduction

Thank you for purchasing the Grimm Audio MU1 media player. It is designed to be the most sophisticated and best sounding music player on the market and at the same time blend seamless in your daily music playing routine. Core of the MU1 technology is an FPGA processor board of our own design that offers the highest quality oversampling and de-jittering possible. The amount of work and knowledge that went into this project can hardly be overestimated. All this effort resulted in an elegant box of minimalistic design that humbly steps out of the way for the music. We are grateful that we were allowed to develop this gem and wish you many pleasurable hours of listening.

In this manual you will find all information related to the hardware of your MU1. Since the software of the MU1 is regularly updated, we decided to offer the MU1 software manual only as download. You can find the latest version of the MU1 software manual on the MU1 page of our web site grimmaudio.com.

The Grimm Audio Team
info@grimmaudio.com

2. Important Safety Instructions

Grimm Audio gaat er van uit dat u deze Engelstalige tekst volledig begrijpt. Als u hier moeite mee heeft dient u contact op te nemen met Grimm Audio. Op verzoek sturen wij u een vertaling toe.

Grimm Audio nimmt an, dass Sie diesen Englischen Text völlig verstehen. Wenn notwendig, nehmen Sie bitte Kontakt auf mit Grimm Audio. Auf Wünsch wird Ihnen eine Übersetzung zugeschickt.

Grimm Audio suppose que le lecteur comprend parfaitement le texte en Anglais ci-dessous. En cas de doute s.v.p. contacter Grimm Audio. Si nécessaire, on pourra vous envoyer une traduction.
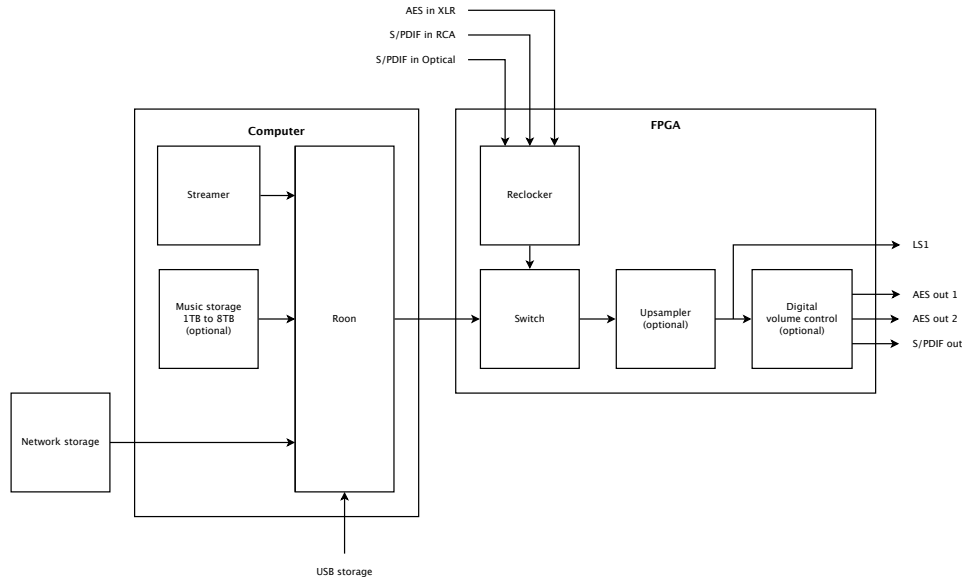
Grimm Audio da por supuesto que el texto en versión Inglesa no ofrece ninguna duda de interpretación y se entiende íntegramente. Si este no fuese su caso rogamos contacte con Grimm Audio quien, a petición, se encargaría de enviarle la correspondiente traducción.

Please follow these precautions when using this product:

1. Read these instructions.

2. Keep these instructions.

3. Heed all warnings.

4. Follow all instructions.

5. Dangerous voltage is inside this apparatus. Opening is only allowed by qualified service personnel.

6. Use the supplied power cable as intended. Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding-type plug has two blades and a third grounding prong. The wide blade or the third prong are provided for your safety. When the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.

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7. Protect the power cord from being walked on or pinched, particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.

8. Unplug this apparatus during lightning storms or when unused for long periods of time.

9. Do not use this apparatus near water.

10. Do not use this apparatus outside.

11. Do not expose the apparatus to dripping or splashing. Do not place objects filled with liquids (flower vases, drink cans, coffee cups, etc) on the apparatus.

12. Clean only with a dry, soft, non-fluffy cloth. Do not spray any liquid cleaner onto the cabinet, as this may lead to dangerous shocks.

13. Install in accordance with the manufacturer's instructions.

14. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat. Avoid exposure to direct sunlight.

15. Use only attachments or accessories specified by the manufacturer.

16. This unit runs slightly warm when operated normally. Operate in a normal ventilated area.

17. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as when the power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

18. WARNING: To reduce the risk of fire or electric shock, do not expose this apparatus to rain or moisture.

3. Block Diagram

AES in XLR
S/PDIF in RCA
S/PDIF in Optical

Computer

FPGA

Streamer

Music storage
1TB to 8TB
(optional)

Roon

Network storage

USB storage

Reclocker

Switch

Upsampler
(optional)

Digital
volume control
(optional)

LS1

AES out 1

AES out 2

S/PDIF out

In this block diagram the signal flow inside a MU1 is shown. The MU1 combines a streamer, audio file server, audio file player, reclocker, upsampler and digital volume control. The audio file and streaming functions are offered by Roon Labs software. The computer operating system is Tiny Core Linux. Most other software is developed by Grimm Audio.

Manual MU1 © Grimm Audio

4. Installing

Unpacking and Installation

Your MU1 was carefully packed at the factory and the packaging it came in was designed to protect it from the trials and tribulations of shipping. Keep the box and all packing materials, so that in the unlikely event that you need to return the MU1 for servicing, you can do so safely.

Placement

The MU1 does not produce strong RF fields nor is susceptible to them. You can position it near other digital gear such as computers and disk recorders without worry. Preferably the MU1 is not placed inside a closet, to prevent it from running too hot and for easy access to the main control knob.

The supplied infrared extension cord should be placed such that it has clear view on your IR handheld remote.

AC Power Hookup

The MU1 has a switch mode power supply that works with AC mains voltages from 90 V to 240 V. Make sure this complies with your local mains voltage. The MU1 is shipped with a proper mains cable. Grimm Audio cannot be held responsible for problems caused by using the MU1 with improper AC wiring or voltage. The MU1 has a small power switch on the rear panel. A short press will initiate start-up of the system. Another press will initiate the power-down cycle. Please wait till the power led turns off before unplugging the AC power cable.

The MU1 relies on safety earth in the mains cable to guarantee your safety. It also needs this connection as low impedance path for mains leakage current to prevent hum or sound quality degradation in your system. For this reason, please connect all audio equipment in your system to a common mains outlet with safety earth connection. If you do not have safety earth available on the outlets in your listening room, please consult an electrician.

5. Operation and System Setup

Front:

On the front you find the MU1 activity LED in the 'i' of the Grimm logo. The display shows all user information. It is a TFT screen that does not suffer from burn-in.

Manual MU1 © Grimm Audio

Top:

The top of the MU1 carries the main control knob. It is used for all user input of the MU1 via turning and pressing. Depending on the state of the system and the menu selection this knob changes functionality.

The system will boot to the Music View. The use of the main control in this state is:

- Volume up (turn right)

- Volume down (turn left)

- Pause/mute (short press)

- Enter menu (long press)

- Press and turn selects the audio source.

A short press is shorter than 2 seconds, a long press is longer than 2 seconds.

For more information about the control of your MU1, please consult the MU1 software manual that can be downloaded from our web site.

Rear:

On the back of the MU1 you find, from left to right: four digital audio outputs (one generic S/PDIF, two generic AES3 and one Grimm LS1), three digital audio inputs, an ethernet network input, a USB connection for external storage, a 3.5mm socket for an external IR remote sensor, a small mains power switch and the mains power connector.

Note that models with serial number 13-0.001.xxx and 13-0.002.xxx do not have the S/PDIF output, and some models may have the USB port swapped with the ethernet port.

Mains power socket

The mains power socket is a standard IEC C13 model. In case your country has an EU, US or UK type wall outlet, your MU1 was shipped with the corresponding power cord. Otherwise, please consult your dealer.

Mains power switch

This is a small recessed switch that triggers the software that turns off and on the system. If the system is off and the power cord is connected, press the switch once with your finger nail to boot the system. If the system is on, press the switch once to shutdown the system.

Note: The power switch does not respond when the MU1 is updating.

The MU1 is switched off when both the power led and the display are dark. Only then you may unplug the AC power hookup without causing any harm.

In general the MU1 is put in 'stand-by' when not in use. For more info, please consult the MU1 software manual.

Mini jack for IR sensor extension cord

This 3.5mm jack input is intended for use with an IR extension cord with the following pinout:

Tip = Signal
Ring = 5 V power
Sleeve = Ground

This pinout is most common for IR extension cords. The supplied extension cord is of the correct type.

For information about how to program the MU1 for use with your IR remote, please consult the MU1 software manual.

Note: Only (dis)connect the IR extension cord when the MU1 is turned off.

Ethernet connector

Connect your wired local network to the MU1 using this RJ45 connector. The cable type should be at least Cat5e to ensure that loss of network data packets does not occur. Please use high quality cables intended for use with computer systems and avoid cables with claimed special qualities for audio. The MU1 makes use of DHCP. To use a static IP address in the MU1 please consult the manual of the network device that acts as DHCP server within your network (usually the main router).

USB connector

This general purpose USB type A connector can be used to connect an external USB drive (flash drive, SSD or HDD) to the MU1 system. You may then play music files from this drive. For information about supported disk formats and about how to access the drive in your system, please refer to the MU1 software manual.

Digital audio inputs

The MU1 has three digital inputs on the back: AES3 on XLR, S/PDIF on RCA and Toslink optical. They can receive PCM rates up to 192 kHz and also DoP ("DSD64 over PCM"). These sources can be selected with the main control dial. The selected source is routed via the FPGA for oversampling and de-jittering and benefits from MU1's high performance rendering.

Digital audio outputs

There are three or four digital outputs (depending on your hardware revision). These can be configured as stereo outputs that all carry the same audio data or as three dual channel outputs for surround playback.

From right to left:

- LS1 output: a proprietary connection for the Grimm Audio LS1 playback system. It carries both audio data and control data. The cable for this connection

is supplied with the LS1 system. Connect this cable to the "Control in" input of the LS1.

Warning: Do not connect a computer network to this connector! Although a normal RJ45 connector fits, this output may only be used for LS1 control connection. Grimm Audio is not liable for damage to a local network system as a result of incorrect wiring by the user.

• AES out 1: 'Digital output 1', transformer coupled balanced XLR3 digital output for connection to a third-party DAC or use in a surround LS1 system. Please use 110 Ohm balanced cable with this output.

• AES out 2: 'Digital output 2', transformer coupled balanced XLR3 digital output for connection to a third-party DAC or use in a surround LS1 system. Please use 110 Ohm balanced cable with this output.

• *(Serial numbers 13-0.003.xxx and higher)* S/PDIF out: transformer coupled unbalanced RCA digital output for use with a third-party DAC with S/PDIF input. Please use 75 Ohm coax cable with this output.
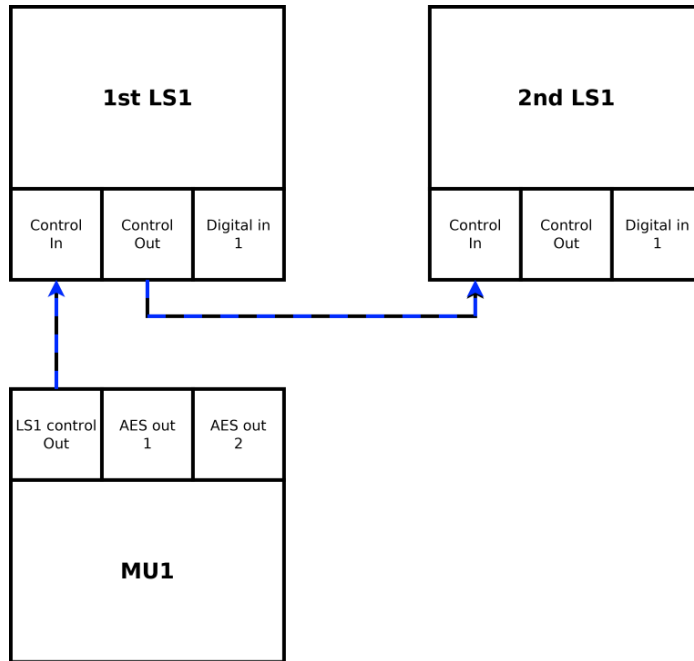
Stereo system wiring

Wiring the MU1 into your stereo system is straight-forward: just connect power, ethernet and a DA Converter via AES3 or S/PDIF and you're good to go. If applicable, add extra sources to the MU1 digital inputs such as a CD transport or TV set.

Stereo LS1 wiring

In case you use the MU1 with a Grimm Audio LS1 system, the connections are elegantly minimalistic too, as shown on the next page.

LS1 Stereo wiring

Blue & Black = Audio & Control

1st LS1		
Control In	Control Out	Digital in 1

2nd LS1		
Control In	Control Out	Digital in 1

LS1 control Out	AES out 1	AES out 2
MU1		

Surround system wiring

This chapter describes how to connect a surround speaker system with the MU1. It is unavoidable that this is a little more complicated than setting up a stereo system. Still the MU1 offers a pretty elegant integration of functions and is a unique replacement of an SACD player for surround playback. In the upcoming pages, we guide you through the setup of various variants of surround systems. In the MU1 software manual the software setup of your MU1 for surround use can be found.

For a surround system with the MU1, one can use LS1s, multiple DACs or a combination of the two.

Setup with 5 LS1s

The LS1 uses a proprietary Cat5 connection, carrying both audio data and control data (and sometimes only control data). Like AES3, this connection supports two channels of audio. In a MU1 surround system with LS1s, the main Left and Right channels are provided by the

Cat5 cable. It also conveys the control data (like the volume setting). This control data is however needed for all other speakers too. Therefore the Cat5 connection should be linked through, in 'daisy chain' fashion, to all speakers, in a prescribed order. Examples of the pathway of this wiring are shown in the next pages.

As said, the audio connection of the Left and Right front speakers comes from the Cat5 connection of the MU1. The audio connection of all other speakers comes from its AES3 XLR outputs: AES out 1 is for the surround channels, AES out 2 is for the center.

In the graphs on the next pages the wiring of both the Cat5 and XLR cables is shown. The Cat5 control data cables are shown in black or black & blue, the XLR AES3 cables in blue. The prescribed order of the Cat5 connection is to first go from the MU1 to the front speakers, then to the center speaker and then to the rear speakers.

For instance if your MU1 is close to your right front LS1, you can connect the wires as on the next page.

5 LS1 Surround wiring, right front and right rear first

Blue = Audio
Black = Control
Blue & Black = Audio & Control
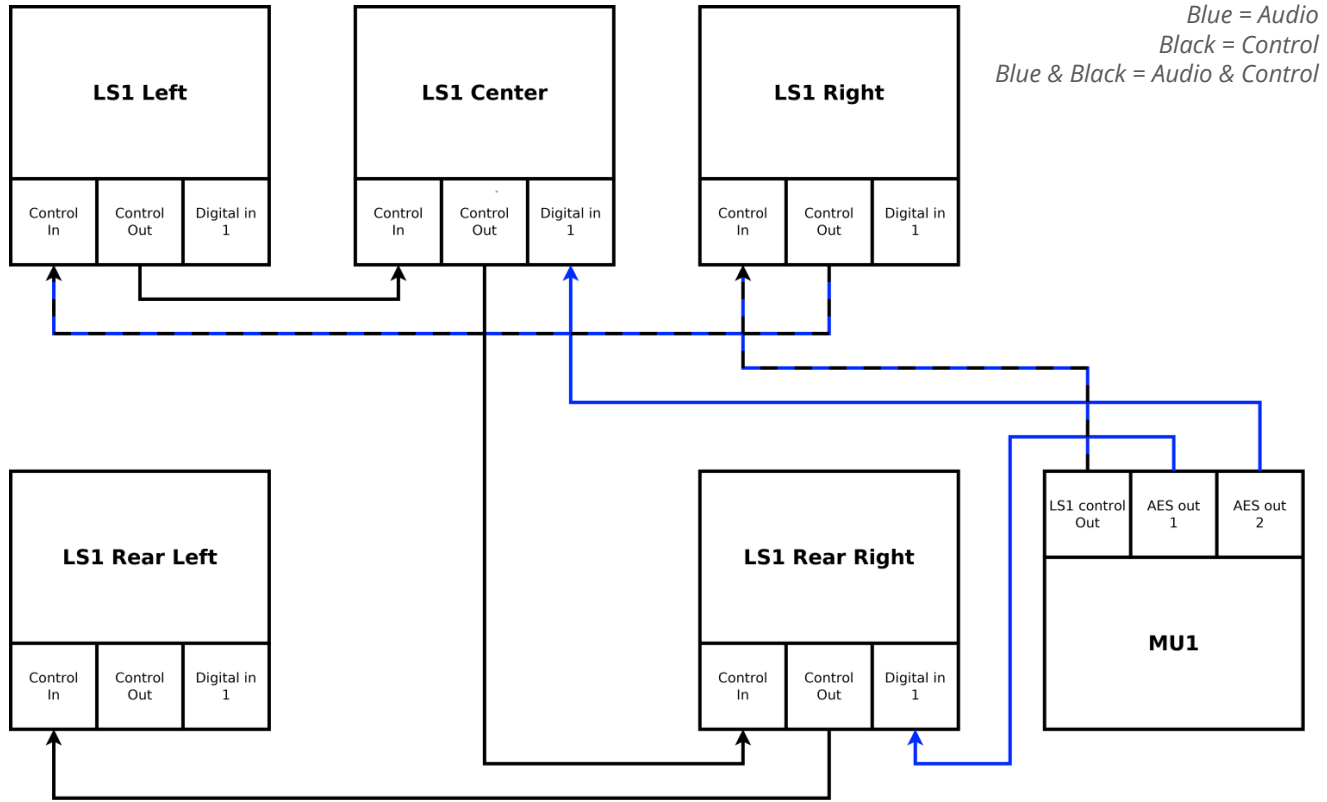
In this case you have made the following chain with the Cat5 cable system: MU1 → LS1 Right → LS1 Left → LS1 Center → LS1 Rear Right → LS1 Rear Left.

If you rather start at the left front LS1 and at the left rear LS1, it looks like on the next page. Now you have created this Cat5 chain: MU1 → LS1 Left → LS1 Right → LS1 Center → LS1 Rear Left → LS1 Rear Right.

You may arbitrarily swap left and right of the front and rear, so the following four Cat5 chains are allowed:

MU1 → LS1 Right → LS1 Left → LS1 Center → LS1 Rear Right → LS1 Rear Left

MU1 → LS1 Right → LS1 Left → LS1 Center → LS1 Rear Left → LS1 Rear Right

MU1 → LS1 Left → LS1 Right → LS1 Center → LS1 Rear Right → LS1 Rear Left

MU1 → LS1 Left → LS1 Right → LS1 Center → LS1 Rear Left → LS1 Rear Right

For the audio connections of the center and rear LS1 speakers, you should also connect two digital XLR AES3 cables. These go from the MU1 output AES out 2 to the center speaker AES Digital in 1, and from MU1 AES out 1 to the *first* rear speaker in the Cat5 chain.
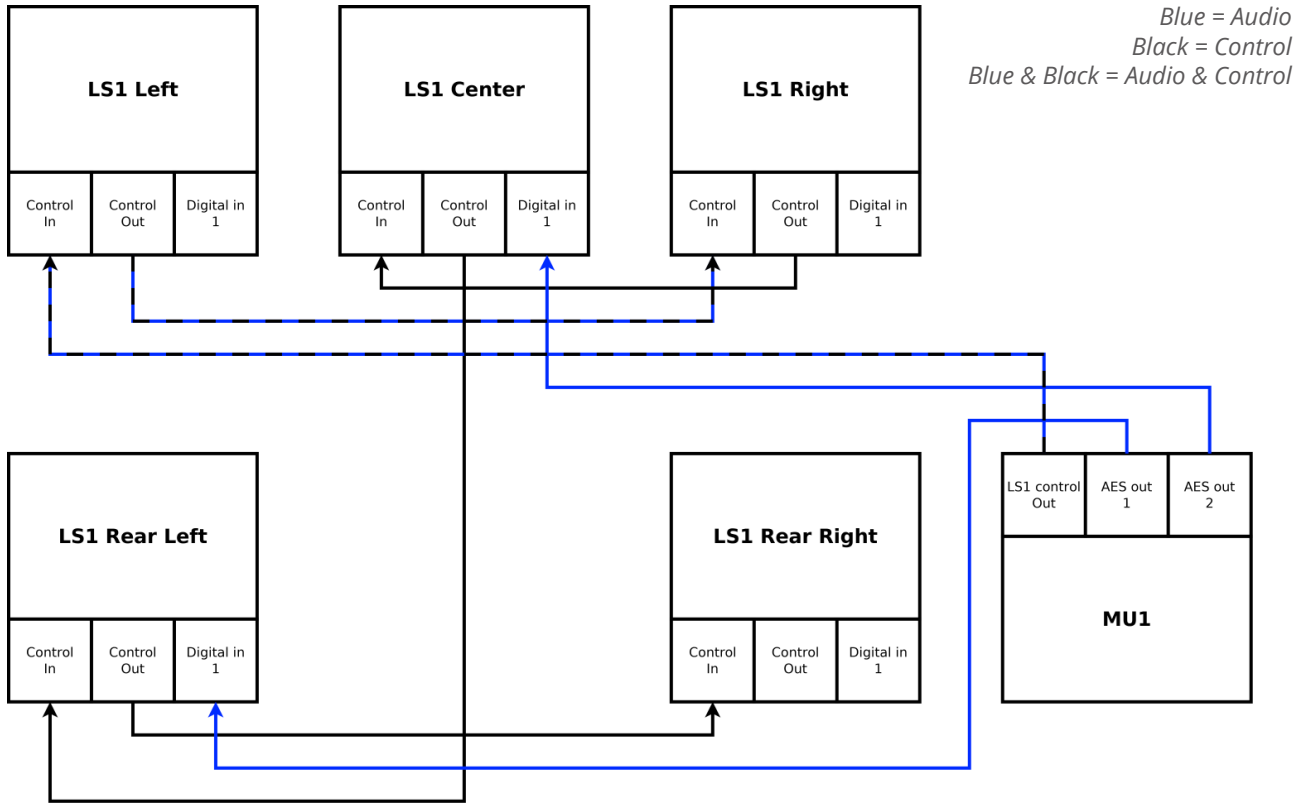
For example, if you made the following chain:

MU1 → LS1 Right → LS1 Left → LS1 Center → LS1 Rear Right → LS1 Rear Left

The AES out 1 should be connected to the LS1 Rear Right since that is the first rear speaker in the Cat5 connection chain.

Please read the MU1 software manual for information about how to setup the presets of the LS1s for your situation. Note that the settings of all connected LS1s are accessible via the MU1 'GRUI' web interface.

5 LS1 Surround wiring, left front and left rear first

Blue = Audio
Black = Control
Blue & Black = Audio & Control

Setup with 4 LS1s

For a surround setup with four LS1s (with a 'virtual center speaker') you should follow the setup for five LS1s and just skip the center speaker.

This means that the Cat5 wiring can be made in one of the following chains:

MU1 → LS1 Right → LS1 Left → LS1 Rear Right → LS1 Rear Left

MU1 → LS1 Right → LS1 Left → LS1 Rear Left → LS1 Rear Right

MU1 → LS1 Left → LS1 Right → LS1 Rear Right → LS1 Rear Left

MU1 → LS1 Left → LS1 Right → LS1 Rear Left → LS1 Rear Right

The MU1 output AES out 1 should be connect to the Rear speaker that's the first in the Cat5 cable chain.
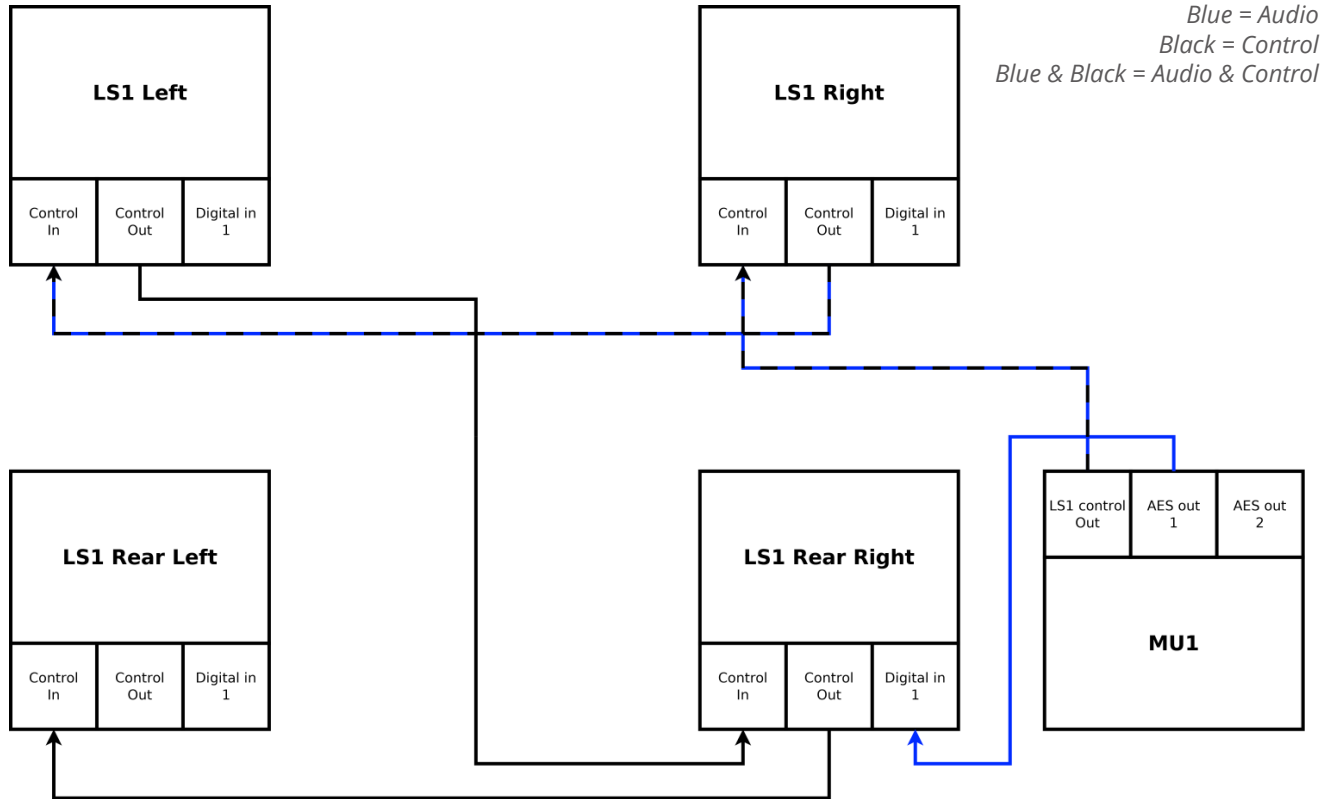
So for example if you made the following chain:

MU1 → LS1 Right → LS1 Left → LS1 Rear Right → LS1 Rear Left

The AES out 1 should be connected to the LS1 Rear Right, since that is where the Cat5 chain comes first. This setup is shown in the illustration on the next page.

Please read the MU1 software manual for information about how to setup the presets of the LS1s for this situation.

4 LS1 Surround wiring, right front and right rear first

Blue = Audio
Black = Control
Blue & Black = Audio & Control

LS1 Left		
Control In	Control Out	Digital in 1

LS1 Right		
Control In	Control Out	Digital in 1

LS1 Rear Left		
Control In	Control Out	Digital in 1

LS1 Rear Right		
Control In	Control Out	Digital in 1

|		
LS1 control Out	AES out 1	AES out 2
MU1		

Setup with 2 or 3 LS1s and 3 or 2 other DAC channels

You may combine LS1s as front speakers with DACs (or 3rd party active speakers with digital inputs) for the rear and/or center channels. In such cases, connect the LS1s to the MU1 using the Cat connection as if it were a stereo setup. Connect the other channels via the MU1 XLR AES3 outputs. Digital output AES out 1 of the MU1 carries the Rear Left and Rear Right audio, digital output AES out 2 carries the Center channel and the LFE channel if the source material has 5.1 channel mapping.

Please read the MU1 software manual for information about how to set up your system for the proper channel layout and volume control.

The illustration on the next page shows how to wire a system with three LS1s for the front and a stereo DAC for the rear. For a four channel setup, remove the center LS1 from the diagram. For a system with a 3rd party speaker as center channel, replace the center LS1 with the center DAC.

3 LS1 Surround wiring, with stereo DAC for rear speakers

Blue = Audio
Black = Control
Blue & Black = Audio & Control
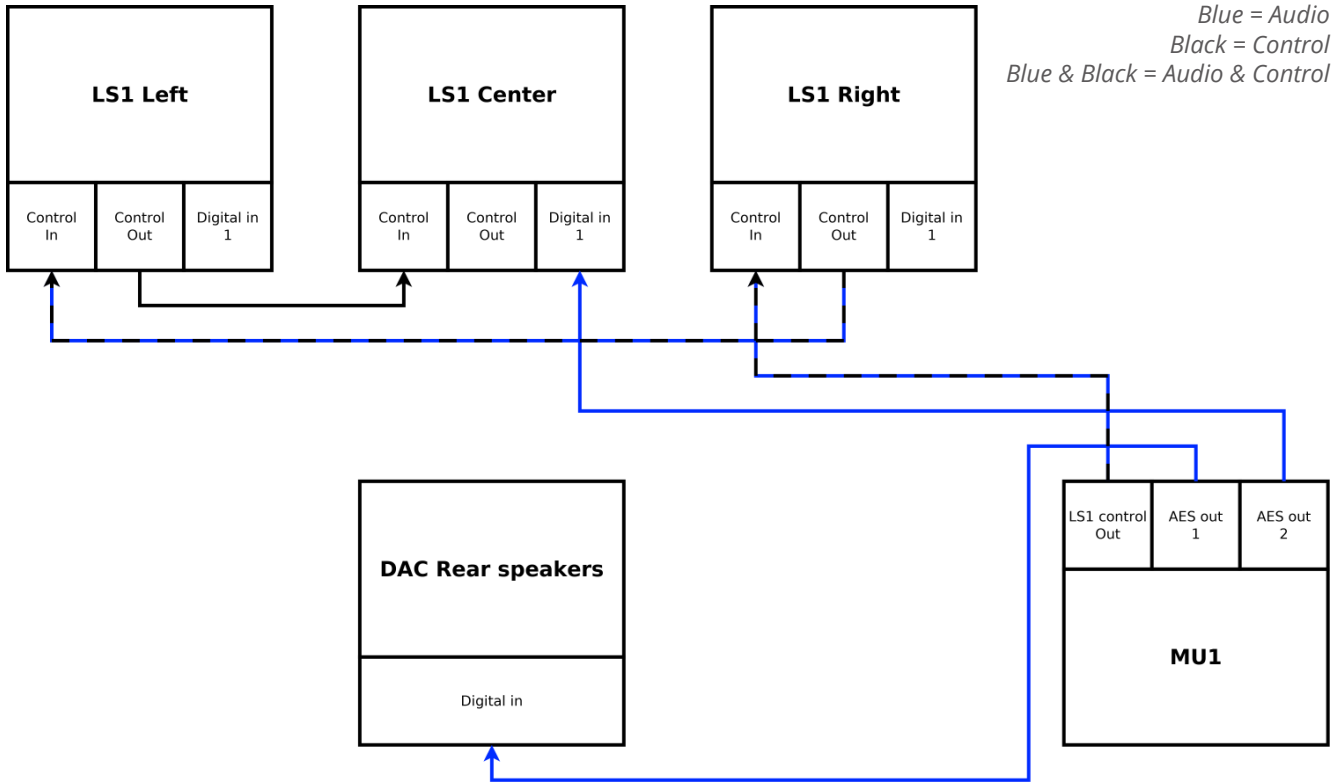
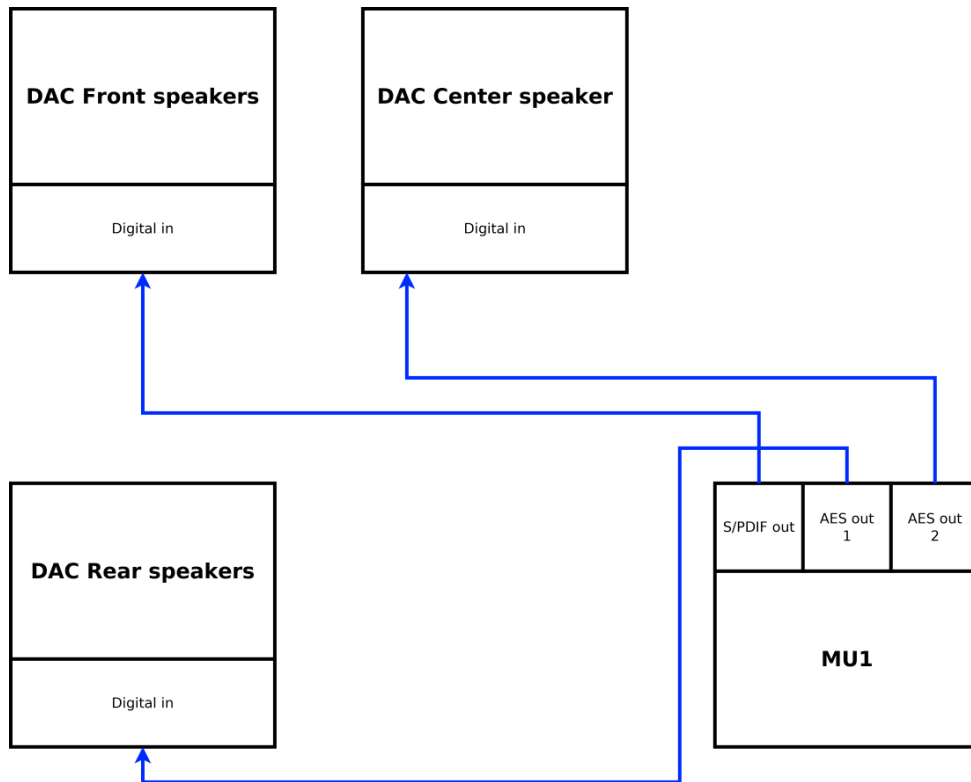**Setup with 5 channels of DACs or 3rd party speakers with digital inputs**

The MU1 can be used as surround source for systems that consist of just 3rd party speakers with digital inputs or five channels of DACs. In that case, the Front Left and Right channels are available on the MU1 S/PDIF output, the Rear Left and Right on AES out 1 and the Center (and LFE if applicable) on AES out 2. All channels can be volume controlled via the MU1 FPGA. The picture on the next page illustrates the wiring of such a system.

Please read the MU1 software manual for information about how to setup the MU1 for this topology, like how to enable or disable the FPGA volume control on all channels.

5 DAC channels Surround wiring

Blue = Audio

DAC Front speakers
Digital in

DAC Center speaker
Digital in

DAC Rear speakers
Digital in

S/PDIF out | AES out 1 | AES out 2

MU1

6. Specifications

General:

- Max. ambient temperature for operation: 40 °C.
- Fuse (worldwide): 630 mA fast blow.
- Weight: 4.5 kg.
- Dimensions: width x depth x height: 355 x 295 x 100 mm or 14" x 11.6" x 3.9".
- Package dimensions: 540 x 392 x 235 mm.

Clock specifications:

- Internal intrinsic clock jitter < 0.6 ps RMS (> 10 Hz).
- Can slave to 44.1 kHz and 48 kHz based digital sources at 1FS, 2FS and 4FS +/- 50ppm.
- The output will mute for 80 ms when changing clock base rates.

Sample rate conversion with fpga processor:

- Upsampling of 1FS and 2FS files, streams and digital sources to 4FS or 2FS with "Pure Nyquist" decimation filter.
- Downsampling of DSD64, DSD128, DSD256 and DXD files and streams to 4FS or 2FS with "Pure Nyquist" decimation filter.
- Optional FPGA volume control on Digital 1 and 2 outputs, and S/PDIF in case no LS1 is connected: from 0 dB to -63 dB in 0.5 dB (partly 1 dB) steps.
- Latency from digital in to digital out: 11 ms at 48 kHz.

Power supply:

- Mains voltage range: 90 – 240 V AC (50 and 60 Hz).
- Power factor: > 0.98.
- Power consumption: Normal use 17 W, maximum 50 W.

Internal computer properties:

- Intel i3 CPU, > 2.4 GHz.
- 4 cores, 4 threads, with Hyper-threading.
- 8 GB DDR4-2133 RAM 2400 MHz.
- 1000 Mb/s Ethernet.
- 1 x USB 2.0 port.
- Internal SSD for OS.
- Optional internal SSD for music data storage.

Display specifications:

- Full color TFT LCD.
- 3.5 inch diagonal.
- 480 x 320 pixels

7. Grimm Audio Limited Warranty

Grimm Audio BV ("Grimm Audio") warrants this product to be free of defects in material and workmanship for a period of two (2) years for parts and for a period of two (2) years for labor from the date of original purchase. This warranty is linked to the serial number of the device and can be transferred to second hand owners if they can show their purchase bill. The original owner can extend his limited warranty to a period of five (5) years for labor and parts if he sends the original warranty card that came with the unit to the Grimm Audio factory. The extended warranty is enforceable only by the original retail purchaser and cannot be transferred or assigned. The extended warranty does not apply to the built in computer and SSD drive parts of the MU1.

During the warranty period Grimm Audio shall, at its sole and absolute option, either repair or replace free of charge any product that proves to be defective on inspection by Grimm Audio or its authorized service representative. In all cases disputes concerning this warranty shall be resolved as prescribed by law. To obtain warranty service, the purchaser must first call or write Grimm Audio at the address and telephone number printed below to obtain instructions where to send the unit for service. All enquiries must be accompanied by a description of the problem. All authorized returns must be sent to Grimm Audio or an authorized Grimm Audio repair facility postage prepaid, insured and properly packaged. Proof of purchase must be presented in the form of a bill of sale or some other positive proof that the product is within the warranty period. Grimm Audio reserves the right to update any unit returned for repair. Grimm Audio reserves the right to change or improve design of the product at any time without prior notice.

This warranty does not cover claims for damage due to abuse, neglect, alteration or attempted repair by unauthorized personnel, and is limited to failures arising during normal use that are due to defects in material or workmanship in the product.

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In no event will Grimm Audio be liable for incidental, consequential, indirect or other damages resulting from the breach of any express or implied warranty, including, among other things, damage to property, damage based on inconvenience or on loss of use of the product, and, to the extent permitted by law, damages for personal injury.

Grimm Audio MU1 hardware manual v1.4, 10/4/23

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