# Installation Guide

## R-vR – instant replays and video refereeing on one server

# Introduction

**Warning!** Operation of this equipment in a residential environment could cause radio interference.

**Warning!** The device is sensitive to electrostatic discharge. Before handling an electronic unit, you must first touch a grounded metal object in order to discharge yourself.

Users should be familiar with safe operation of computers and know the basics of using Microsoft Windows.

Important! Slomo.tv system's hardware & software is of high complexity.
During its development, all hardware, software and system components were carefully selected and tested for long-term joint operation.
Therefore, any attempts to modify the system by customer, including installation of any additional software, drivers, operating system updates, changing of network or disk configuration settings, antivirus software, etc. can highly likely lead to unstable operation or system failure.
**Malfunctions resulting from such modifications are not covered by the warranty!**
It is **strongly recommended not to** connect the system to the Internet or to a local network that is not Firewall-protected.

**Warning!** Due to the peculiarity of Direct X in Windows 10, it is **strongly recommended not to** use the **Ctrl + Alt + Delete** shortcut during operation.
After pressing this key combination, there may be no video in the video windows of the program for 2 minutes.
**All consequences of using the specified key combination while the program is running are at your own risk.**

Insert the connectors gently into the ports. Do not use force.
When connecting, make sure that:
– no other objects are obstructing the connection to the port;
– the connection is made to the corresponding port;
– the connector is correctly positioned relative to the port.

All systems come with **USB Recovery Stick**. It contains an image of that particular system. Keep it safe.
The data available on the USB Recovery Stick is necessary to cherish, not to remove as much as possible to create a backup on the side of the media!
Using the supplied Recovery Stick you can, if necessary, restore the original software configuration and get a fully functional system in a few minutes.

Use a special tool for disconnecting the Din 1.0 / 2.3 cables.
**In case of damage to the connectors the warranty will be void.**
*The tool and its placement are shown below:*

# System components

The system comes ready to use and includes the following:

- Arrow V – 2U server for Instant replays an video refereeing all in one;
- Remote console Control ZR;
- Remote console Control-VR;
- Keyboard;
- Mouse;
- LTC cable;
- Control ZR connecting cable;
- Control-VR connecting cable;
- Power cord;
- USB Software Recovery Stick.

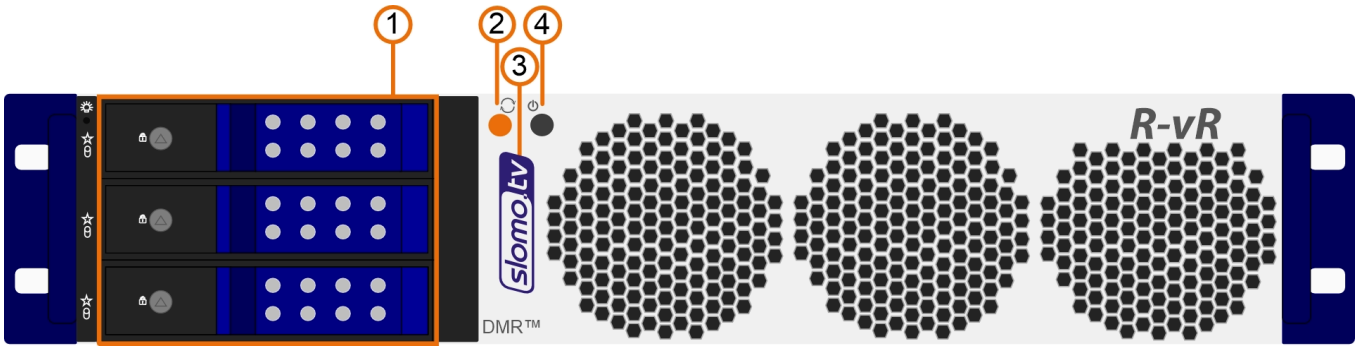
Optional (*If specified at ordering*):

- Embedders: Balanced Analog Audio /AES/EBU > SDI
- Scoreboard interface – MC Mini Interface

► LCD monitor (1920 x 1080 resolution; HDMI® or Display Port Input)

# Connecting the system

The front panel of the server is shown below. It contains 3 DMR™ racks for 3.5” SATA HDD, **Power** and **Reset** Buttons.




1 – Bays for DMR™ disks
2 – System power LED

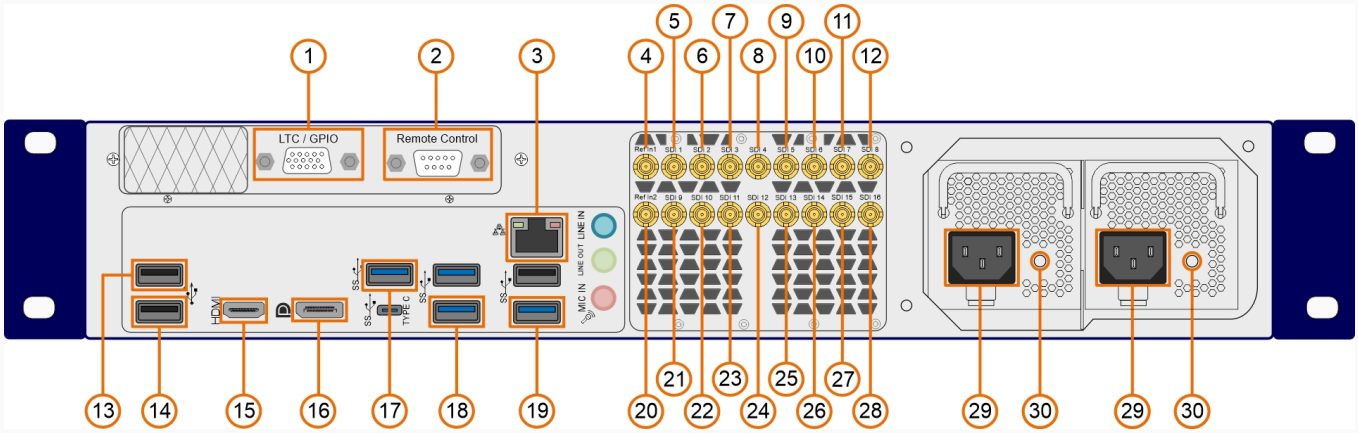
3 – slomo.tv logo:
– Power On – LED is On;
– Power Off – LED is flashing.
4 – Power switch

Before you start working, make sure that server is safely secured either on the flat surface or inside a rack. R-vR has to be connected to monitor, keyboard, mouse and remote control.

Cameras, Embedders and time code can be connected either before or after the system is turned on.

To avoid omitting anything which may result in equipment failure or loss of functionality, we recommend going step by step, using the check-list on the last page of this guide.

Figure 1 – Connection diagram for R-vR

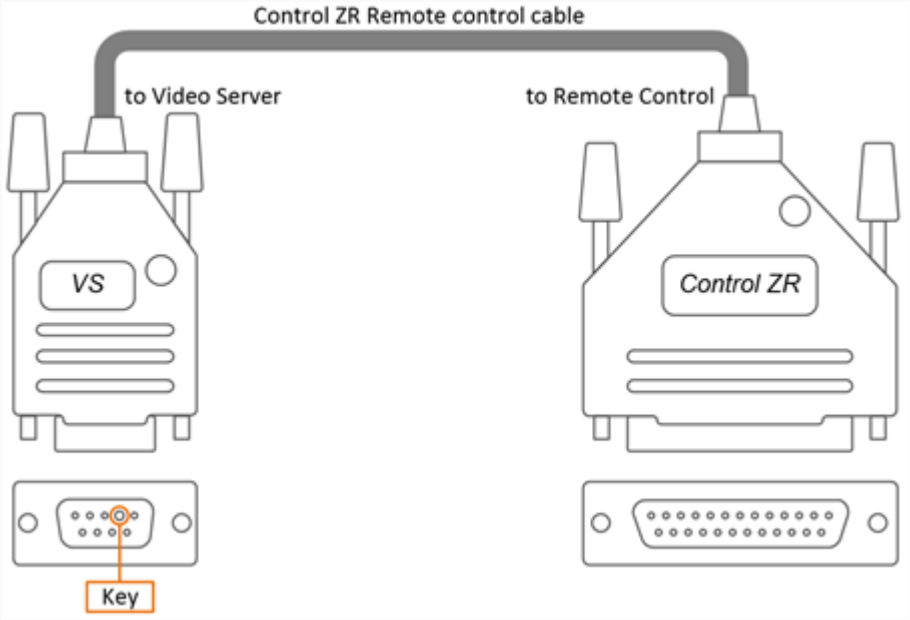


1 – LTC / GPIO – Time-code and GPIO (DHS-15);
2* – Remote Control 2 connector – for Control ZR (DB-9);
3 – LAN (RJ-45 Port);
4 – Ref In 1 – Synchronization (DIN1.0/2.3);
5...12 – SDI I/O 1...8 – SDI video Inputs (DIN1.0/2.3);
13 – Mouse (USB Port);
14 – Keyboard (USB Port);
15 – Monitor 1 – HDMI® 1920x1080 – Main Monitor;
16 – Display Extension option – for Additional Monitors;
17 – Remote Control 1 connector – for Control VR (USB Port type A);
18 – Remote Control 2 connector – for Control ZR (USB Port type A);
19* – RRA Module (USB v3 Port type A);
20 – Ref In 2 – Synchronization (DIN1.0/2.3);
21...26 – SDI I/O 9...16 – SDI video Inputs (DIN1.0/2.3);
27, 28 – SDI I/O 9...16 – SDI video Outputs (DIN1.0/2.3);
29 – Power connection ~110/220V 60/50Hz;
30 – BZ Reset.
** – optional*

# Connection Steps

1. **Main HDMI® monitor** (1920 x 1080 resolution)
   Connect HDMI® Monitor cable to **15**. Connect monitor power.
2. **Display Extension option** – for connecting additional monitors via the Display Port interface.
   Connect cable to **16**. It is also necessary to connect the power cable from the monitors to the monitors.
3. **Keyboard** – use USB port **14**.
4. **Mouse** use USB port **13**.
5. **Control ZR** (Remote Control)
   Connect the 900.007.300.01 cable to **2** and to Control ZR as shown in Figure 2.
   Remote control is turned on by an on/off switch on its back panel.

Figure 2 – Cable 900.007.300.01




When connecting the remote control using USB (connector **18**) or Ethernet interface, use corresponding cables – Figure 3 and Figure 4 respectively.
These interfaces require the use of external power supply for the remote control (Ethernet with PoE, USB 5V).

Figure 3 – Cable for USB Connection (900.026.300.01)

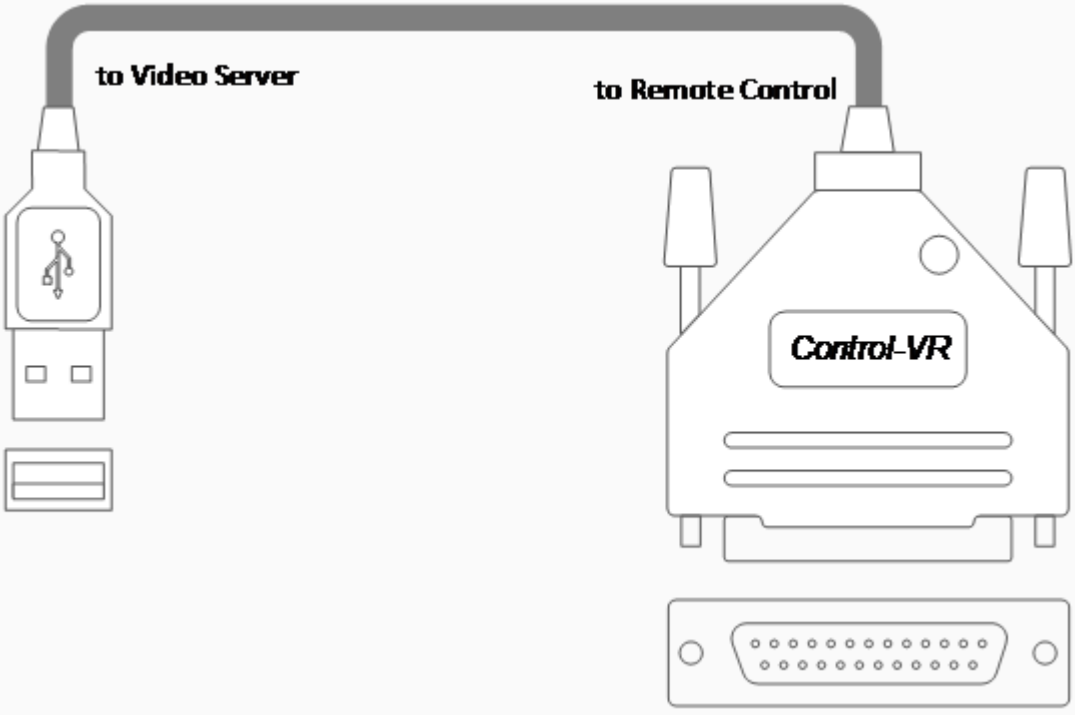
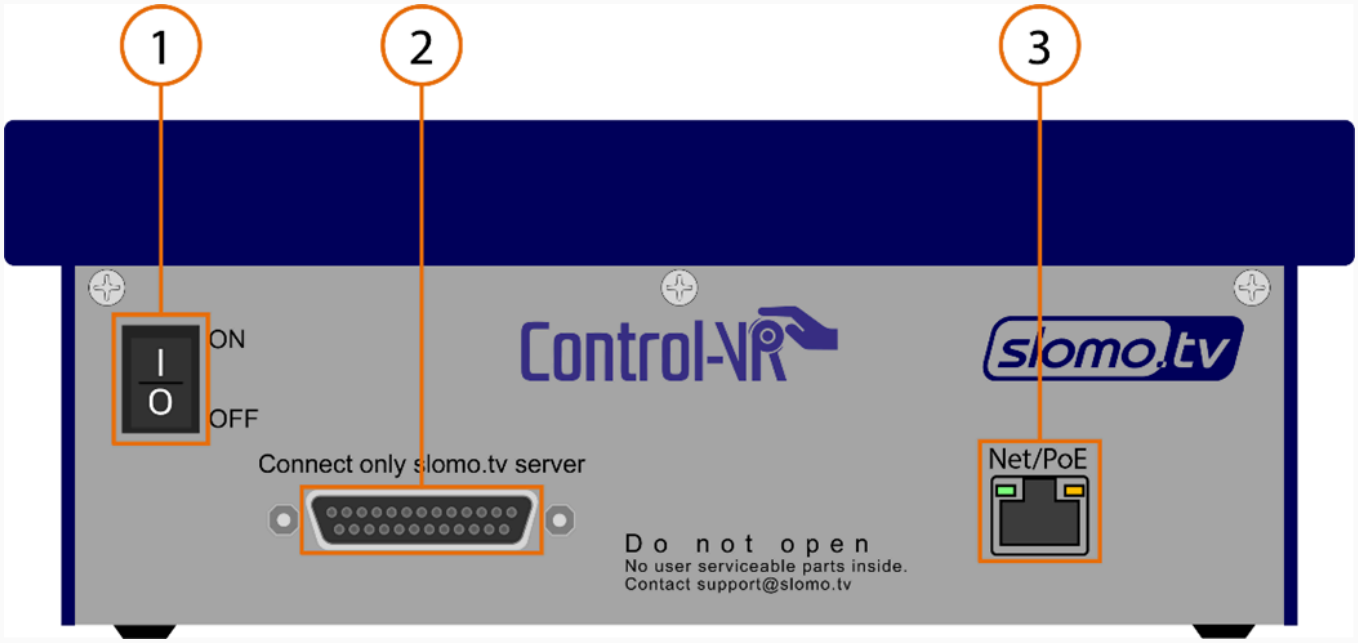


Figure 4 – Cable for Ethernet Connection

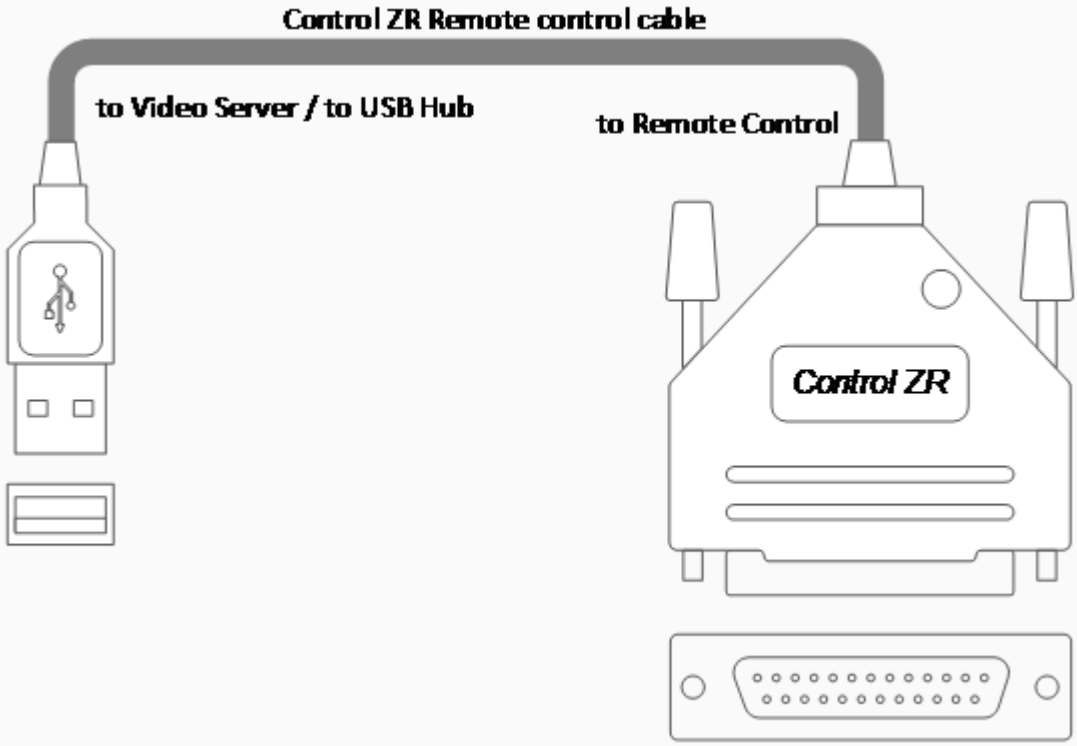
6. **Control-VR remote control**. Connect the cable 900.026.200.01 (Figure 6) to the connector **2** (DB-25) on the back panel of the remote control (Figure 5) and to the USB connector **17** on the back panel of the R-vR system.

Figure 5 – Back panel of the remote control




1 – Power switch
2 – USB / RS-232 / RS-422 / RS-485 interface connector
3 – Ethernet / PoE interface connector.

Figure 6 – Cable 900.026.200.01 for remote control connection via USB




If the remote control is connected correctly, all keys will light up when the video-refereeing system is turned on. If the COM port is not defined or the cable is connected incorrectly, the remote control keys will not light up.

7. **RRA Module** is connected to **19** (USB connector 3.0 or later). The RRA module is used to connect the RRA monitor.
8. **SDI video signals**
   SDI Inputs are connected to **5...12** and **21...26**.
   SDI Outputs are connected to **26** (Preview), **27** (Program).
   2nd SDI output (Preview) can be configured as:
   1. Preview,
   2. Multiviewer,
   3. Alpha Channel,
   4. Game Analyzer Output – optional,
   5. Delay output – optional,

⚠ SDI is a high-frequency signal and therefore requires high quality connection cables and connectors, especially at the large cable lengths. Poor cable quality and excessive cable length can lead to a periodic signal loss.

To check video inputs, start the application. The presence of video inputs should be seen in the Live windows of the interface. In case any window does not display video, connect to its corresponding Input the signal from a properly working channel. This is a simple way to check the video signals and systems inputs.

**All incoming signals should be of the same TV standard.** They also must be synchronized as much as possible. R-vR works with the following television standards:

- Standard Definition:
  - 720x576 4:2:2 10 bit 50i 3x4/16x9 (PAL) ;
  - 720x480 4:2:2 10 bit 59.94i 3x4/16x9 (NTSC).
- High Definition:
  - 1920x1080 4:2:2 10 bit 50i 3x4/16x9;
  - 1920x1080 4:2:2 10 bit 59.94i 3x4/16x9.

**Important! Despite the seeming similarity of 59.94Hz and 60Hz, the latter is not a broadcast frequency and is not supported by the system. The same applies to the frame rate of 24Hz.**

7. **Time-code** (LTC). Connect to **1**.
   slomo.tv systems use two types of inputs for connecting the time-code signal:
   - Balanced, with Canon XLR 3Pin connector.
   - Unbalanced, with BNC connector.

If external time-code is not connected, the system time is used.

8. **Synchronization** (Ref In). Connect to **20**.
9. **Embedders**. This is described in Working with Audio.
10. **Power**. Connect power cords to **29**.

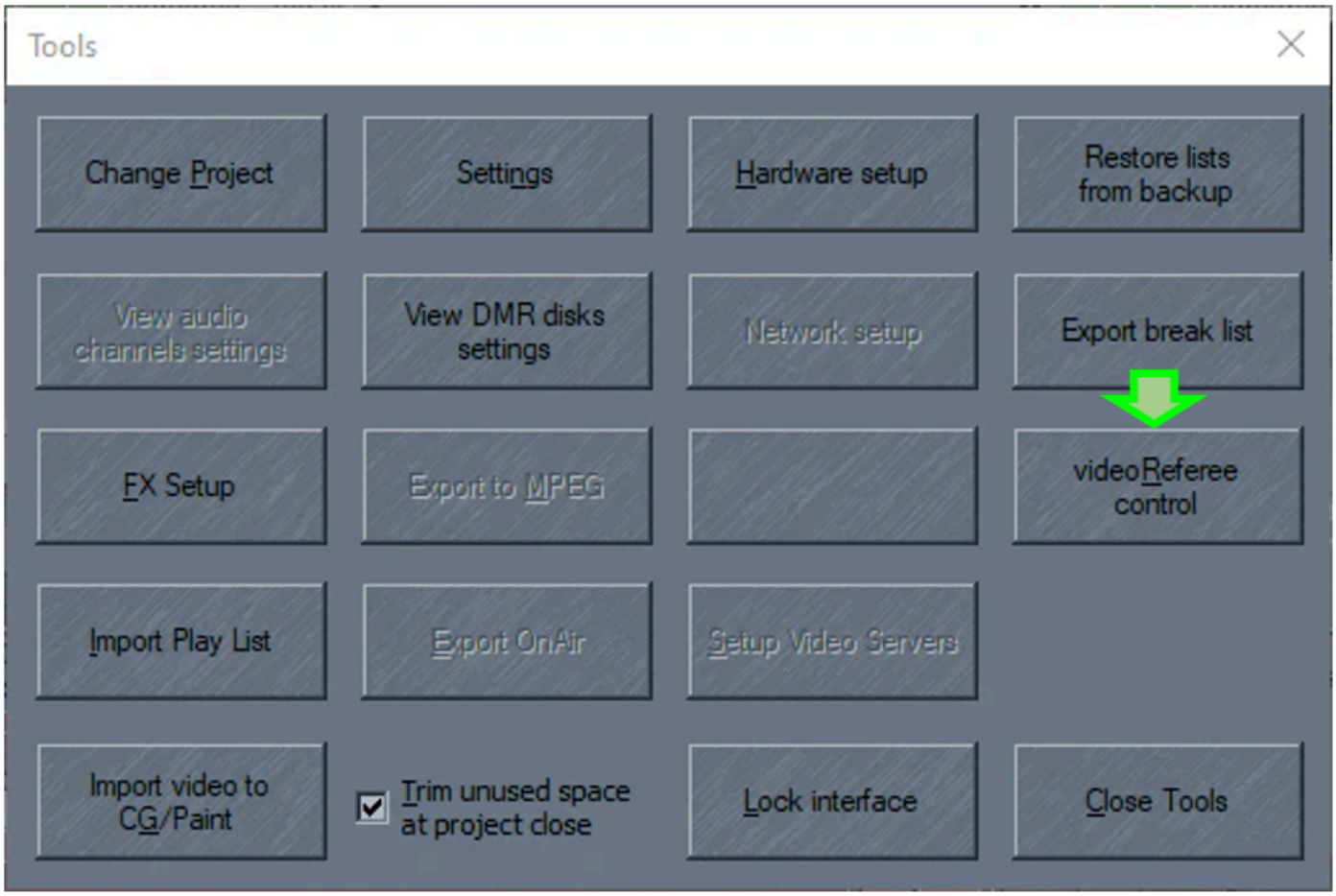
Check that the system and signal sources have a common "ground" and are powered by the same circuit. There should not be any detectable voltage between the “grounds” of all devices.

# Turning the system On

After completing all connection steps described above, turn on the power (on the front panel).

## Switching control interfaces

The ***videoReferee* control** button in the *Tools* (  ) menu is used to switch control interfaces:

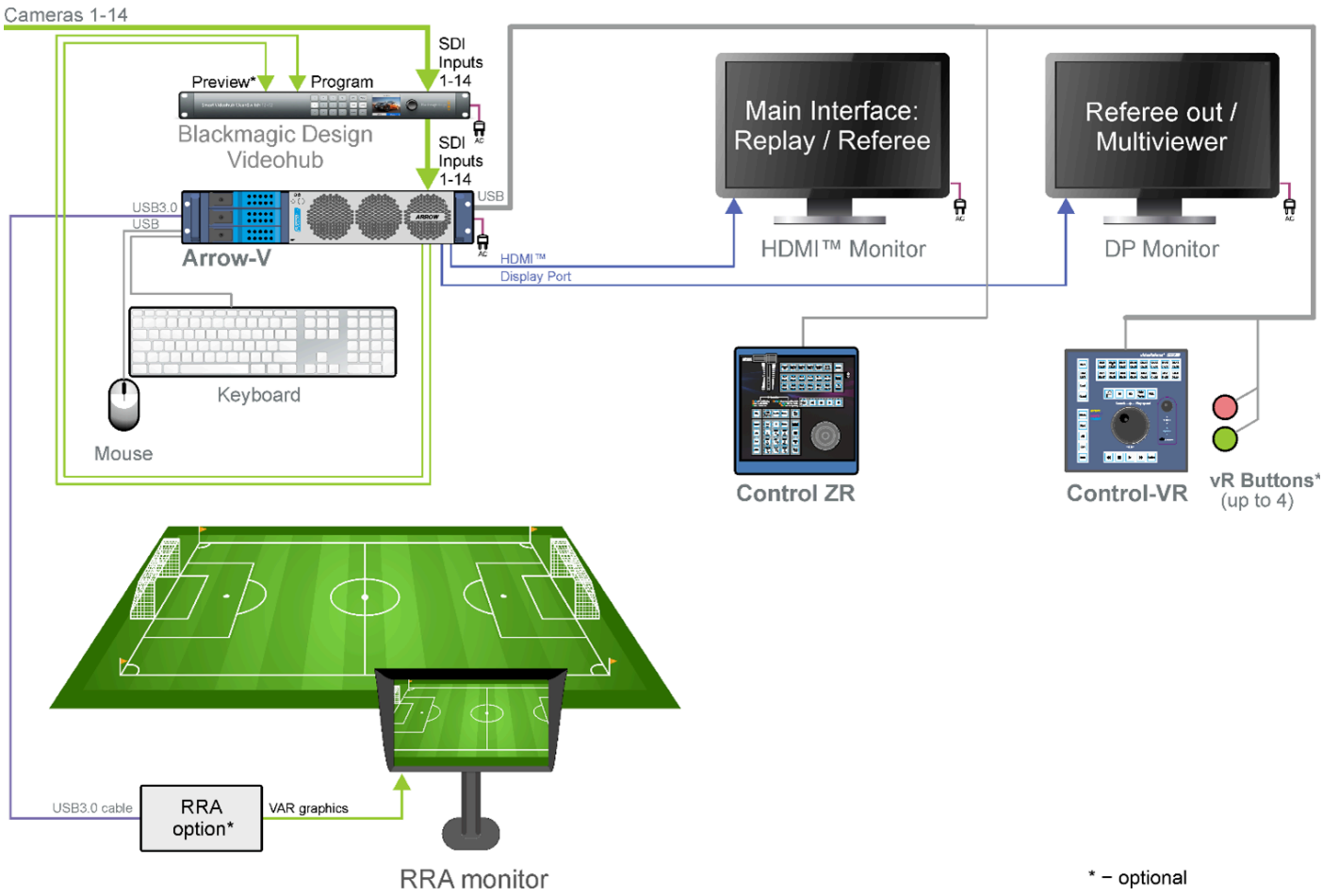



Or **Ctrl + Shift + T** buttons and then **R** button on the keyboard.

## R-vR usage example

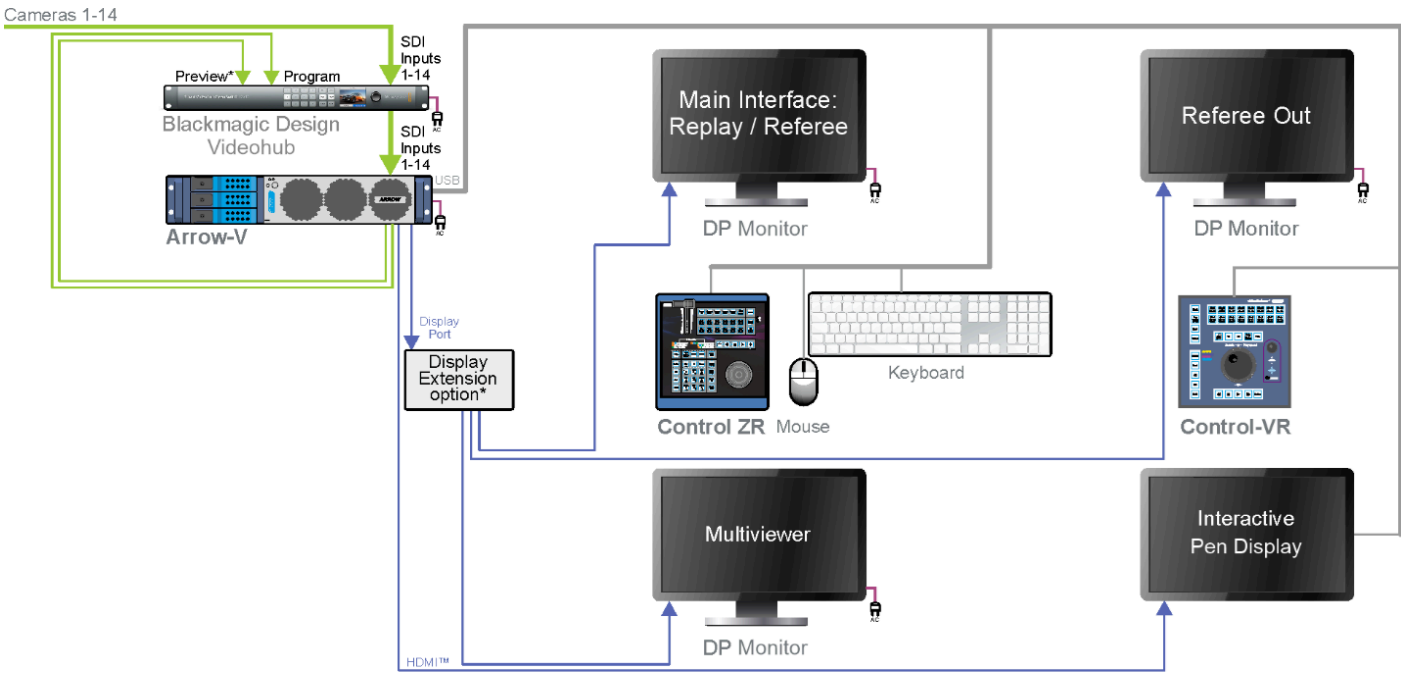
### Instant replays and video refereeing on one server

The solution is based on the Arrow-V server.
The Main Interface has a function to switch from Replay to Referee and is displayed on one monitor.
To switch the displayed interfaces (Referee out / Multiviewer) the Multiskin function is used.
The workplace of the video referee is equipped with a specialized control panel – Control-VR and USB referee buttons.
The replay operator's workplace is equipped with Control-ZR control panel.




## Instant replays and video refereeing on one server with additional monitors and interactive pen display

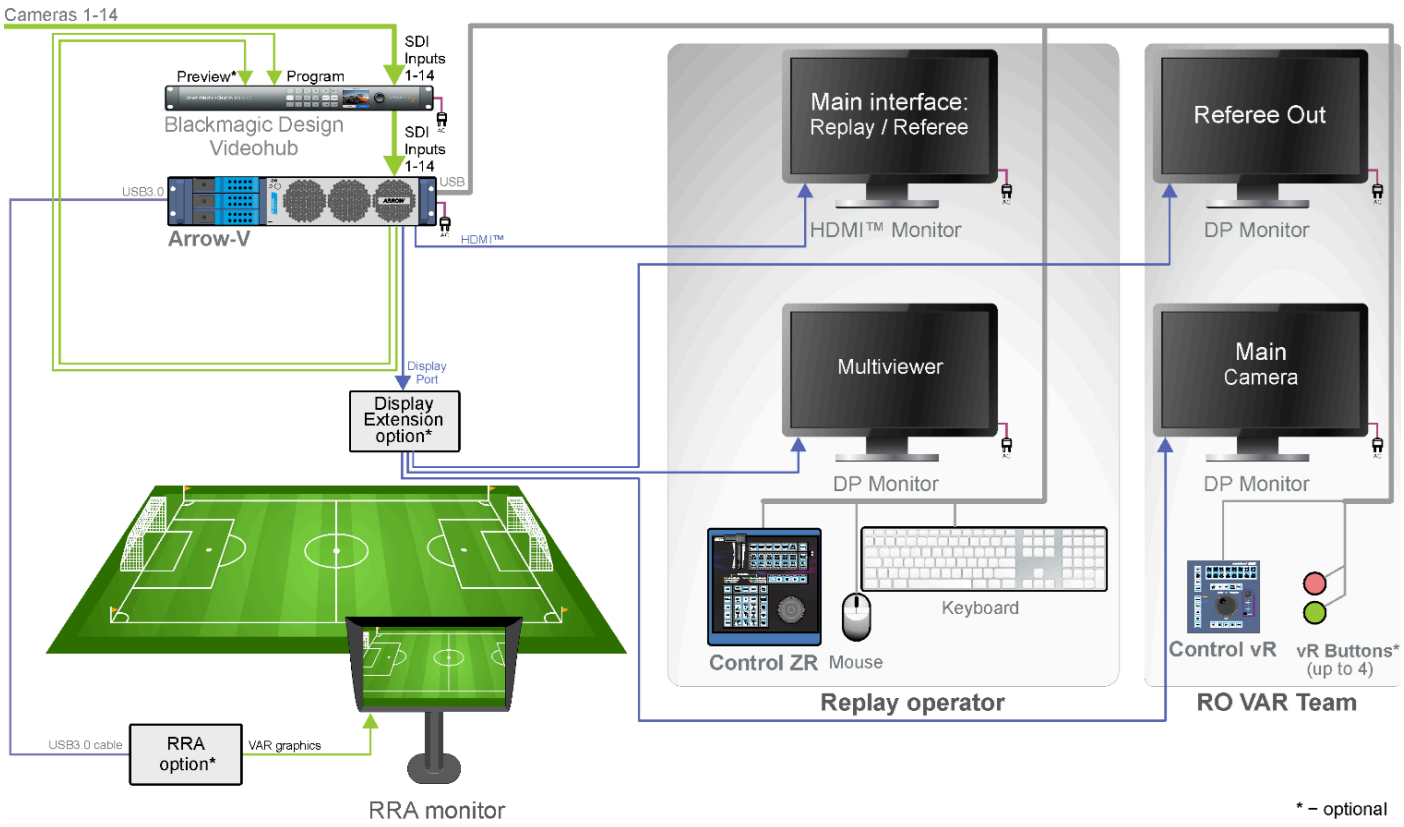
This solution is based on the Arrow-V server with Display Extension Option.
The workplace of the video referee is equipped with a specialized control panel – Control-VR.
The replay operator's workplace is equipped with a Control-ZR control panel.
The Display Extension Option is used to connect additional monitors.
For the replay operator's workplace the first monitor displays the Main Interface (monitor is switched between Replay and Referee Interfaces). Multiviewer is displayed on the second monitor.
Referee out is displayed on the third monitor. And another video output is used to connect a interactive pen display.




* – optional

## Instant replays and video refereeing on one server with additional monitors

This solution is based on the Arrow-V server with Display Extension Option.
The replay operator's workplace is equipped with a Control-ZR control panel.
The workplace of the video referee is equipped with a specialized control panel – Control-VR and USB referee buttons.
The Display Extension Option is used to connect additional monitors.
The main monitor has a function to switch the displayed interfaces from Replay Mode to Referee mode.
Multiviewer is displayed on the second monitor.
Referee out is displayed on the third monitor.
The fourth monitor displays the Main Camera.
The monitor at the pitch is connected using the RRA SDI Option.




# Working with Audio

R-vR is able to record without any distortion 16- and 24-bit audio imbedded in the video signal.
When working with embedded audio, make sure that all the audio signals are present.

> ⚠ The system does not process audio.
> The sound quality is the responsibility of audio engineers.

## Using Embedders

For embedding audio the most popular are the following devices:

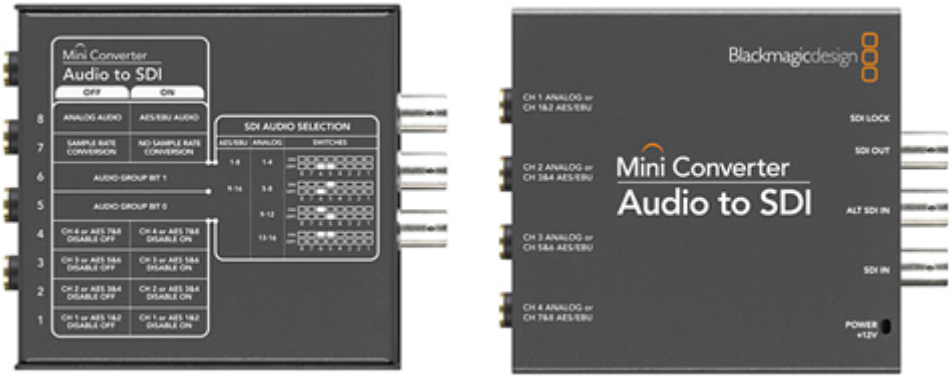
- **AJA** HD10AMA
- **Black Magic Design** Mini Converter Audio to SDI.

Each embedder can accept up to 4 channels analog audio.
The BMD Mini Converter Audio to SDI can embed 8 channels of digital audio AES/EBU.
The use of AES/EBU audio is more preferable, because Analog → AES/EBU converters provide higher quality.

Data converters must receive the WordClock synchronization signal, synchronous with the entire system. Otherwise the following defects of audio are possible:
– Loss of synchronization of audio and video
– Clicking sounds
– Partial audio loss

The use of AES / EBU audio only makes sense if analog audio converters are synchronized with all studio signals.
In this case Sample Rate Conversion of embedder must be switched off.

For illustration we show Black Magic Design mini Converter:



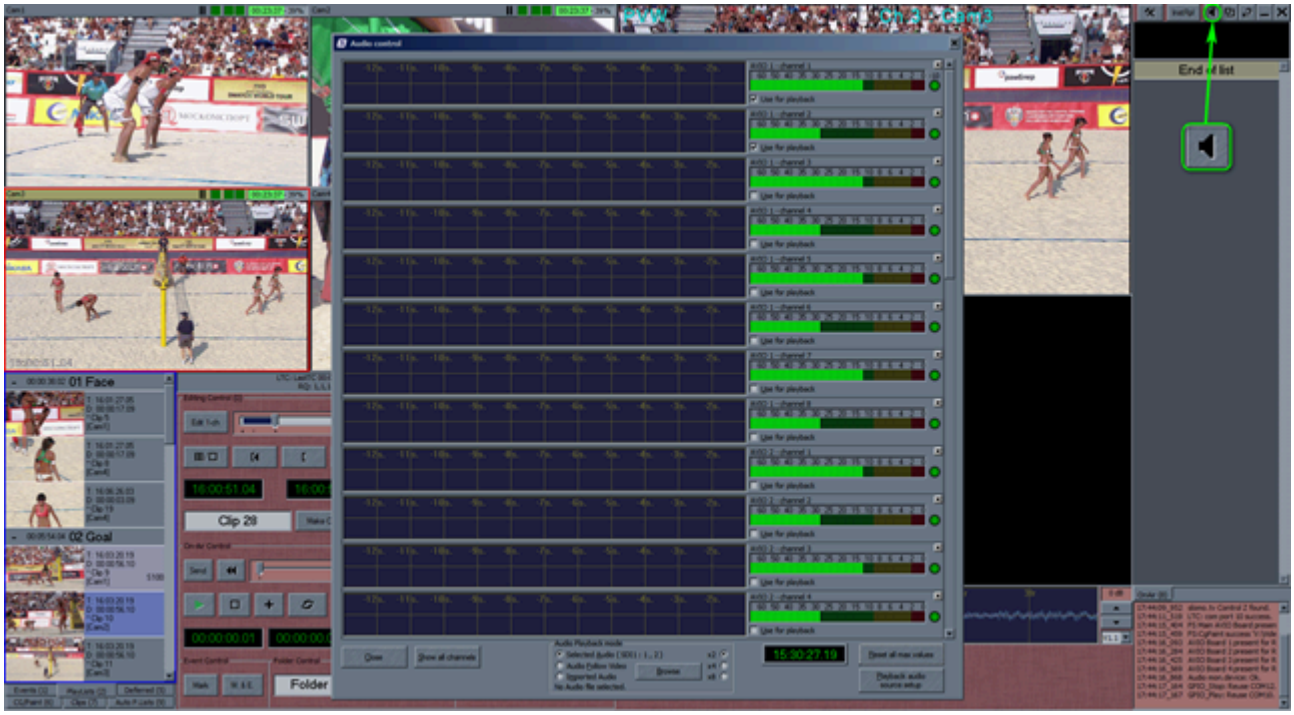

- **SDI IN**: is the input for SD/HD SDI video signal, which audio will be imbedded in.
- **SDI OUT**: Output of SD/HD SDI video with imbedded audio.
- **CH1-CH4/CH1&2 – CH7 & 8HD** – Audio Inputs.
  (Presence of audio is indicated by blinking light next to audio input).
- **POWER +12V**: Power connector (power is indicated by a white LED).

R-vR works with 8 channels of embedded audio in each video signal. Audio connections should not exceed that number. Audio is taken from the first 8 of the 16 embedded channels, and therefore proper configuration becomes very important. (Configuration of switches is described in the device manual).

For embedding up to 4 analog audio channels in one video signal use a single converter.
For 5 to 8 channels it is necessary to use two embedders connected in series. Make sure the audio is imbedded in different groups. The correct configuration of all 8 audio channels will appear in Audio Monitor.

# Checking the audio

The presence of audio is checked by Peak Meters and Audio Waveforms on the Audio monitor.




If the number of audio channels is no more than 8, then choose the most stable and reliable video source. Typically, it is the output of Program mixer. Do not use outputs of non-genlockable switcher or a mixer without the Frame Sync Output. Possible loss of video frames will lead to loss of audio!

In the absence of a mixer with a stable output, use the most stable camera signal.

# Normal operating conditions

- Operating position – on a flat horizontal surface,
- Adequate heating/air-conditioning and ventilation,
- Relative humidity: 20 to 80 %,
- Dust: no more than 0.70 mg / $m^3$,
- The absence of chemically reactive vapors,
- The absence of strong magnetic or electric fields,
- Temperature range: 12 °C to 29 °C,

Temperatures below 12 °C require mandatory «warm-up»

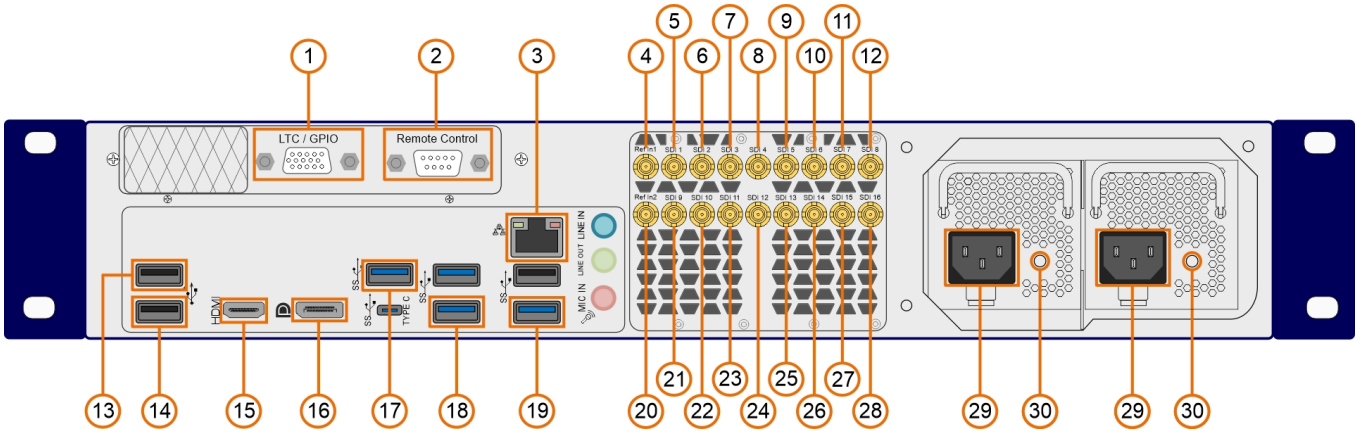
- Electrical power: Grounded 110/220 V.

## Storage and transportation

- Use original packaging or transport case supplied by the manufacturer.
- System can be stored at ambient temperatures from -20 °C to + 60 °C and relative humidity (non-condensing) 85 % (at a temperature of 25 °C).
- After exposure to temperatures below 5 ºC the unit must be left at room temperature of 15 to 25 °C for at least 8 hours.

# Installation Checklist

| Step | Description | Reference | Completion |
|---|---|---|---|
| 1 | Connecting the Main monitor | 15 | |
| 2 | Connecting the Display Extension options | 16 | |
| 3 | Connecting keyboard | 14 | |
| 4 | Connecting mouse | 13 | |
| 5 | Connecting remote control Control ZR | 18 or 2* | |
| 6 | Connecting remote control Control VR | 17 | |
| 7 | Connect the RRA module* | 19* | |
| 8 | Connecting video Inputs | 5...12, 21...26 | |
| | Connecting video Outputs for Instant Replay | 27, 28 | |
| 9 | Connecting time-code | 1 | |
| 10 | Connecting synchronization | 20 | |
| 11 | Connecting power | 29 | |




1 – LTC / GPIO – Time-code and GPIO (DHS-15);
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15 – Monitor 1 – HDMI® 1920x1080 – Main Monitor;
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30 – BZ Reset.
* – *optional*