IPEX2000 Series Installation Guide

IPEX2001

POWER STATUS

IPLINX
BY LIBERTY AV SOLUTIONS

TX RX G

DC 12V   RS232   HDMI IN   L R G   AUDIO OUT   LAN (PoE)

IPEX2002

POWER STATUS

IPLINX
BY LIBERTY AV SOLUTIONS

DC 12V   LAN (PoE)   HDMI OUT   AUDIO OUT   RS232

L R G   TX RX G

Important Safety Instructions

1. Read these instructions – All the safety and operating instructions should be read before this product is operated.

2. Keep these instructions – The safety and operating instructions should be retained for future reference.

3. Heed all warnings – All warnings on the appliance and in the operating instructions should be adhered to.

4. Follow all instructions – All operating and use instructions should be followed.

5. Do not use this apparatus near water – The appliance should not be used near water or moisture – for example, in a wet basement or near a swimming pool, and the like.

6. Clean only with a dry cloth.

7. Do not block any ventilation openings. Install in accordance with the manufacturer's instructions.

8. Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.

9. Do not defeat the safety purpose of the polarized plug. A polarized plug has two blades with one wider than the other. The wide blade or the third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.

10. Protect the power cord from being walked on or pinched particularly at the plugs, convenience receptacles, and at the point where it exits from the apparatus.

11. Only use attachments/accessories specified by the manufacturer.

12. Use only with the cart, stand, tripod, bracket, or table specified by the manufacturer, or sold with the apparatus. When a cart or rack is used, use caution when moving the cart/ apparatus combination to avoid injury from tip-over.

13. Unplug the apparatus during lighting storms or when unused for long periods of time.

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

15. CAUTION: 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.

16. Do not install this equipment in a confined or built-in space such as a book case or similar unit. The equipment must remain in well ventilation conditions. Ventilation should not be impeded by covering the ventilation openings with items such as newspaper, table-cloths, curtains etc.

17. WARNING: Only use attachments/accessories (such as the battery etc.) specified or provided by the manufacturer.

18. WARNING: Refer to the information on the underside of the enclosure for electrical and safety information before installing or operating the apparatus.

19. WARNING: To reduce the risk of fire or electric shock do not expose this apparatus to rain or moisture. The apparatus shall not be exposed to dripping or splashing and objects filled with liquids, such as vases, shall not be placed on apparatus.

20. CAUTION: Danger of explosion if battery is incorrectly replaced. Replace only with the same or equivalent type.

21. WARNING: The battery shall not be exposed to excessive heat such as sunshine, fire or the like.

22. WARNING: The all-pole mains switch located on rear panel is used as the disconnect device, the switch shall remain readily operable.

23. WARNING: DO NOT INGEST BATTERY. CHEMICAL BURN HAZARD.

24. Keep new and used batteries away from children. If the battery compartment does not close securely, stop using the product and keep it away from children.

25. If you think batteries might have been swallowed or placed inside any part of the body, seek immediate medical attention.

26. When the apparatus is not in use or during its relocation, take care of the power cord and plugs; e.g. tie up the power cord with cable tie or similar. The tie must be free from sharp edges and the like that might cause abrasion of the power cord. When put into use again ensure the power cord and plugs are not damaged. If any damage is found the power cord and plugs should be replaced by items either specified by the manufacturer or that have same characteristics as the original items.

CAUTION

**RISK OF ELECTRIC SHOCK
DO NOT OPEN**

ATTENTION: RISQUE DE CHOC ELECTRIQUE - NE PAS OUVRIR

27.   This lightning flash with arrowhead symbol within an equilateral triangle is intended to alert the user to the presence of non-insulated "dangerous voltage" within the product's enclosure that may be of sufficient magnitude to constitute a risk of electric shock.

28. WARNING: To reduce the risk of electric shock, do not remove cover (or back) as there are no user-serviceable parts inside. Refer servicing to qualified personnel.

29.   The exclamation point within an equilateral triangle is intended to alert the user to the presence of important operating and maintenance instructions in the literature accompanying the appliance.

30.   Protective earthing terminal. The apparatus should be connected to a mains socket outlet with a protective earthing connection.

31. CAUTION: To prevent electric shock hazard, replace grille. (CSA 60065, clause 5.3A)

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Table of Contents

Product Overview

IPEX2001 Encoder

The IPLinx IPEX2001 transmits HDMI video and audio over a gigabit IP network using CBR or VBR h.264 AVC encoding with a configurable data rate up to 30 Mbps. The IPEX2001 supports video signals up to 1920x1200 at 60 Hz. The IPEX2001 outputs two video streams: one large IP stream at the native content resolution and a smaller video stream at 352x288 at 5 Hz to easily view a preview of the content on the IPLinx Control software for Windows and iPad. Up to 999 encoders may be used to create an incredible matrix or switching system within a single installation. An analog audio output port de-embeds the audio from the HDMI content, while still streaming the audio with the video content.

The IPEX2001 supports PoE and can be powered remotely by compatible power source equipment, such as a PoE Ethernet switch, eliminating the need for a nearby power outlet. Encoding control provides adjustments for encoding bit rate and quality. The RS232 port operates in a pass-through capacity to control a third party device such as a projector.

The IPEX2001 requires an IPEXCB control box and is compatible with IPEX2002 and IPEX2003MV streaming decoders.

IPEX2002 Decoder

The IPLinx IPEX2002 receives HDMI video and audio over a gigabit IP network using CBR or VBR h.264 AVC encoding with a configurable data rate up to 30 Mbps. The IPEX2002 supports video signals up to 1920x1200 at 60 Hz. The IPEX2002 outputs video up to 1920x1200 at 60 Hz and will scale the content based on the native resolution of the connected display while seemlessly switching between sources. Up to 999 decoders may be used to create an incredible matrix or distribution system within a single installation. Depending on the needs of the installation, multiple IPEX2002 devices can be configured to make a video wall up to a 16x16 configuration. An analog audio output port de-embeds the audio from the HDMI content, while still passing the audio to the HDMI output.

The IPEX2002 supports PoE and can be powered remotely by compatible power source equipment, such as a PoE Ethernet switch, eliminating the need for a nearby power outlet. Encoding control provides adjustments for encoding bit rate and quality. The RS232 port operates in a pass-through capacity to control a third party device such as a projector.

The IPEX2002 requires an IPEXCB control box and is compatible with the IPEX2001 streaming encoders.

Package Contents per Device

1. Installation Guide
2. Power Supply with US, UK, EU, and AU adapters
3. 3-pin Removable Screw Terminal (2 ea)
4. Mounting Ears (2 ea)

Front and Rear Panels

IPEX2001 Front Panel

1. Power indicator
2. Status indicator

IPEX2001 Rear Panel
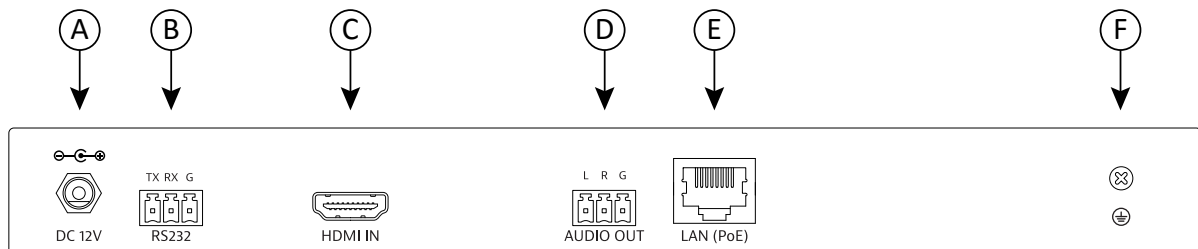
A. 12V DC power input
B. RS232 Connection
C. HDMI input
D. Analog audio output
E. LAN connection with PoE support
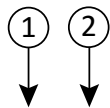F. Ground screw

IPEX2002 Front Panel

1. Power indicator
2. Status indicator

IPEX2002 Rear Panel

A. 12V DC power input
B. HDMI input
C. Local HDMI output
D. Analog audio output
E. RS232 connection
F. Ground screw

System Considerations

Gigabit Switch Features

A high quality, managed Level 2 gigabit switch with a high bandwidth backplane should be used in the installation, preferably with PoE support. The two primary features to look for in the switch are support for multicast with jumbo frames and support for IGMP snooping, which are required technologies for stable video signals.

Be sure to verify the PoE gigabit switch can provide 15.4 watts to each output under full load. Some switches support 15.4 watts per output but do not have enough available power under full load. For a 24 port switch, it should be able to provide about 370 watts to the LAN ports (24 x 15.4 = 369.6) plus power for the switch.

Gigabit Switch Size(s)

When calculating the size of switch needed, the following devices need to be considered:
1. Number of sources
2. Number of displays
3. IPEXCB
4. Wireless access point for iPad app or Windows app (optional)
5. Hardwire port for Windows app (optional)

If the installation requires 14 sources and 10 displays, a 24 port switch will not have enough ports for the installation, because there are no open ports for the IPEXCB.

System Bandwidth

40 Mbps should be considered when calculating the bandwidth for the highest quality video setting. This value covers the maximum quality 30 Mbps encoded stream plus packet overhead. Six 1080p sources using the highest quality video setting will be using approximately 240 Mbps of effective bandwidth on the backplane.

When configuring the IPEX2001 in the IPEXCB, the encoding method (CBR or VBR) can be changed as well as the bandwidth of the signal. CBR is Constant Bit Rate. In a CBR h.264 stream, the encoder uses the same amount of bits for every second of video. If you set the IPEX2001 to CBR at 10 megabits per second, every second of video will use 10 megabits per second of bandwidth regardless of the content. A still image will use the same bandwidth as a moving image.

VBR is Variable Bit Rate. In a VBR h.264 stream, the encoder will transmit different bit rates of data depending on how much information is present or has changed from frame to frame of video, while averaging the stream to the bandwidth set. If you set the IPEX2001 to VBR at 10 megabits per second, every frame of video will use varying bandwidth based on how much information has changed from frame to frame. A still image will use less bandwidth than a moving image.

Gigabit Switch Expansion

Quite often, a switch will not have enough ports for a complete installation. There are two methods to connect switches together to expand the number of ports: cascading and stacking.

Cascading refers to connecting the copper LAN port from one switch to another. This is a low cost method of expanding the number of ports, but the bandwidth is limited to the speed of the LAN port, which will become an issue if there are more than 25 sources.

Stacking refers to connecting the fiber SFP port from one switch to another. This is a slightly more expensive option, but it does not interfere with the number of LAN ports needed for the installation. The SFP port on modern switches will often support 10 Gbps, which should be enough bandwidth for approximately 250 sources.

LAN Cabling

For all LAN cabling, the EIA/TIA-568B crimp pattern must be used on Category 5e or greater cable. In areas with large amounts of electromagnetic (EM) or radio frequency (RF) interference, a shielded variety of Category 5e or greater cable is recommended with shielded connectors on both ends of the selected cable.

	TIA/EIA-568B
Pin 1	Orange/White
Pin 2	Orange
Pin 3	Green/White
Pin 4	Blue
Pin 5	Blue/White
Pin 6	Green
Pin 7	Brown/White
Pin 8	Brown
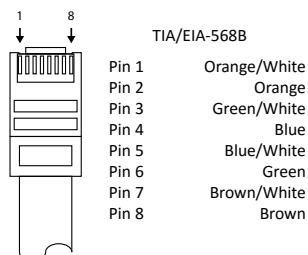
IPEXCB Controller

In addition to the gigabit switch, the IPEXCB is required for the encoders and decoders to communicate with each other regardless of system layout, such as one to many.

System Control

There are multiple ways to control the system once installation is complete. There is the IPLink Control software for iPad and Windows. While not recommended, the IPEXCB can be controlled through a web browser. A third party controller can communicate directly with the IPEXCB via the LAN (CONTROL) port or via RS232.

Heat and Ventilation

All electronics generate heat, and excessive heat can cause electronic devices to fail prematurely. The IPEX2001 and IPEX2002 devices are passively cooled and should not be stacked on top of each other or other devices. Please leave at least 1 ½ inches (approximately 35-40 mm) of open space by the side vents to provide adequate airflow.

The gigabit switch will likely have active cooling. Please follow the manufacturer's installation instructions for proper mounting in an equipment rack.

Backup Power

It is always a good practice to install a high quality UPS (uninterruptible power supply) with line filtering with expensive electronics. The UPS can provide "clean" power to all the devices in the equipment rack while also providing enough time to properly shut down connected devices in the event of an extended power failure.

HDMI CEC

The IPEX2002 can turn on and turn off connected displays via CEC. This technology has been a part of the HDMI specification for years. The IPLinx Control software for Windows and iPad can turn on and off the displays for easy end user control.

Source Content Resolution

Even though the IPEX2000 series devices support 1080i, this resolution may cause artifacts through the encoding process. Please set the output resolution of devices showing 1080i content to 720p or 1080p.

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Installation Instructions

Basic Installation

1. Configure the gigabit switch for IP video operation. Liberty has guides for many common switch manufacturers on the IPEXCB page on the Liberty website (www.libav.com).

2. Turn off power and disconnect the audio/video equipment by following the manufacturer's instructions.

3. Turn off power to the configured switch.

4. Connect Category 5E or greater twisted pair cable with the TIA/EIA-568B crimp pattern between the LAN port on the encoder(s) (IPEX2001) and the gigabit switch.

5. Connect Category 5E or greater twisted pair cable with the TIA/EIA-568B crimp pattern between the LAN port on the decoder(s) (IPEX2002) and the gigabit switch.

6. If the gigabit switch cannot provide power or enough power to the IPEX2001 or IPEX2002, connect the included power supply to the 12V DC power input of the device. If the gigabit switch cannot provide enough power, disable the PoE function of the connected LAN ports on the switch.

7. Connect an HDMI cable between the display and the decoder (IPEX2002).

8. Connect an HDMI cable between the source and the encoder (IPEX2001).

9. Power on attached audio/video devices.

10. Apply power to the gigabit switch.

11. If the gigabit switch cannot provide power to the IPEX2001 or IPEX2002, connect the included power supply connected to the encoders and decoders to an AC outlet.
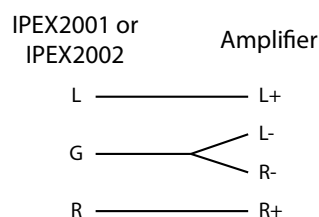
RS232 Connections

To use the RS232 control transport capabilities of the IPEXCB or the RS232 extension capabilities of the IPEX2001 or IPEX2002, connect the TX, RX, and ground control signal wires to the removable 3-pole terminal block. Consult the manual of the source or display device(s) to determine which pins the TX and RX signals are carried on. Be sure to always connect TX to RX and RX to TX.

IPEX2001 or IPEX2002   Source or Display

TX ——————— RXD

RX ——————— TXD

G ——————— GND
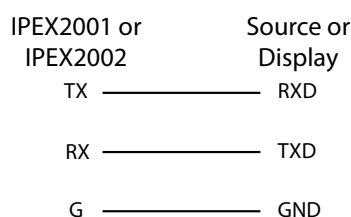
Audio Output Connections

To use the analog audio outputs of the IPEX2001 or IPEX2002, connect the L, R, and ground wires to the removable 3-pole terminal block. Connect the other end of the cable to an audio amplifier.

IPEX2001 or IPEX2002   Amplifier

L ——————— L+

    L-

G ———<

    R-

R ——————— R+

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Audio/Video Input

Audio/Video Output

Device Control

IPEX2001

DC 12V

RS232 · TX RX G

HDMI IN

AUDIO OUT · L R G

LAN (PoE)

Media Player

Amplifier

Laptop Computer with
IPLinx Control

System Control

Streaming Media

Switch

Wireless Access
Point

iPad with
IPLinx Control

Streaming Media

System Control

IPEX2002

DC 12V

LAN (PoE)

HDMI OUT

AUDIO OUT · L R G

RS232 · TX RX G

Display

Amplifier

IPEXCB

LAN1 (AV/PoE)

LAN2 (CTRL)

RS232 · TX RX G RX TX 12V

DC 12V

Video

Ethernet

RS232 / USB / IR

Analog Audio
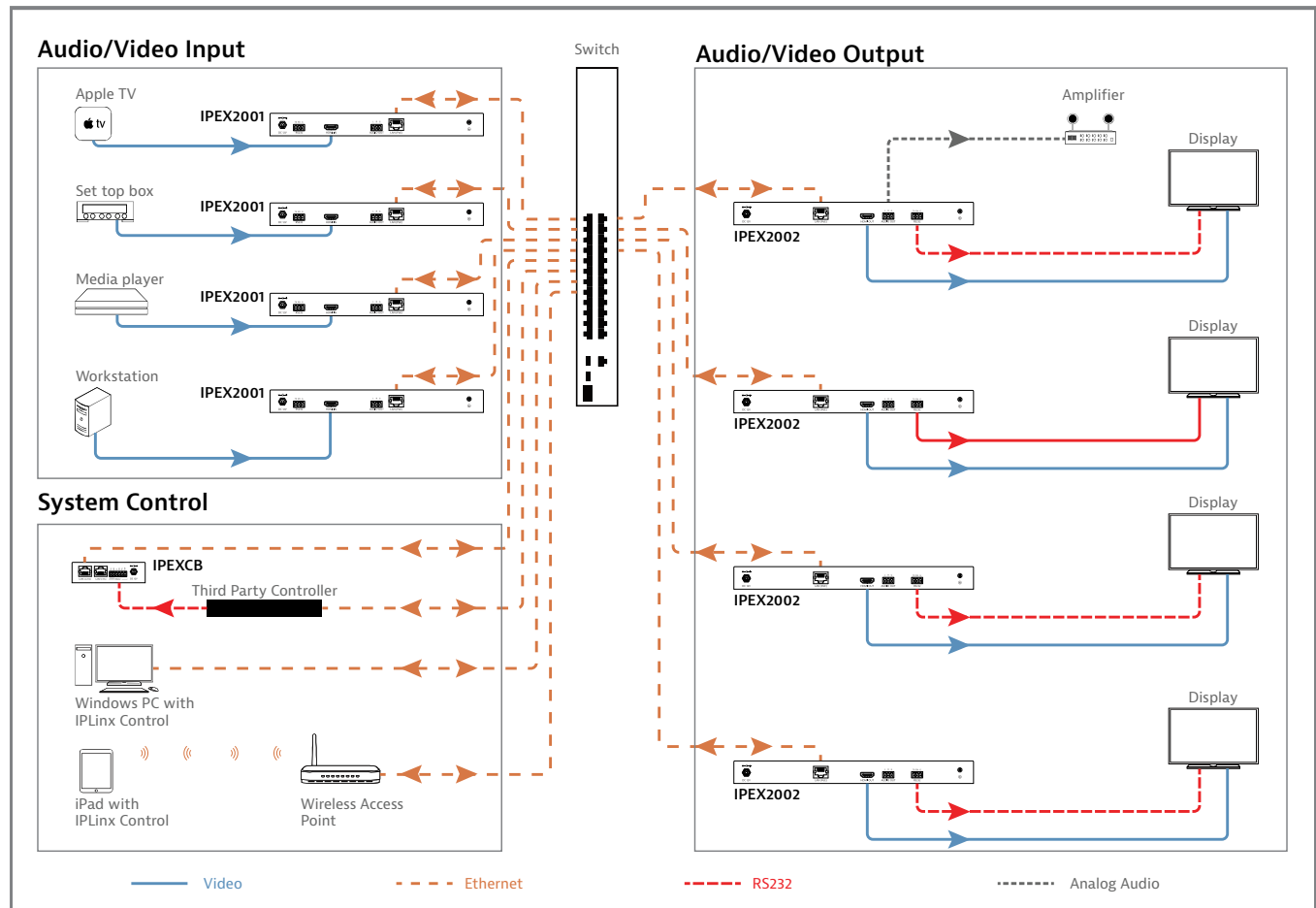
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General Operation

Matrix, Switch, Distribution Amplifier

With multiple encoders and decoders, an IPEX2000 series installation can be configured to be a video matrix, video switch, and a distribution amplifier. The video configurations and signal routes can be easily changed through the IPLinx Control software for Windows and iPad or through a third party controller.

Please see the IPEXCB user manual for configuring this functionality.

Video Wall

In addition to matrix configurations, multiple IPEX2002 devices can be configured to make a video wall up to 16x16 in size. This functionality is also managed through the IPLinx Control software for Windows and iPad or through a third party controller.

Please see the IPEXCB user manual for configuring this functionality.
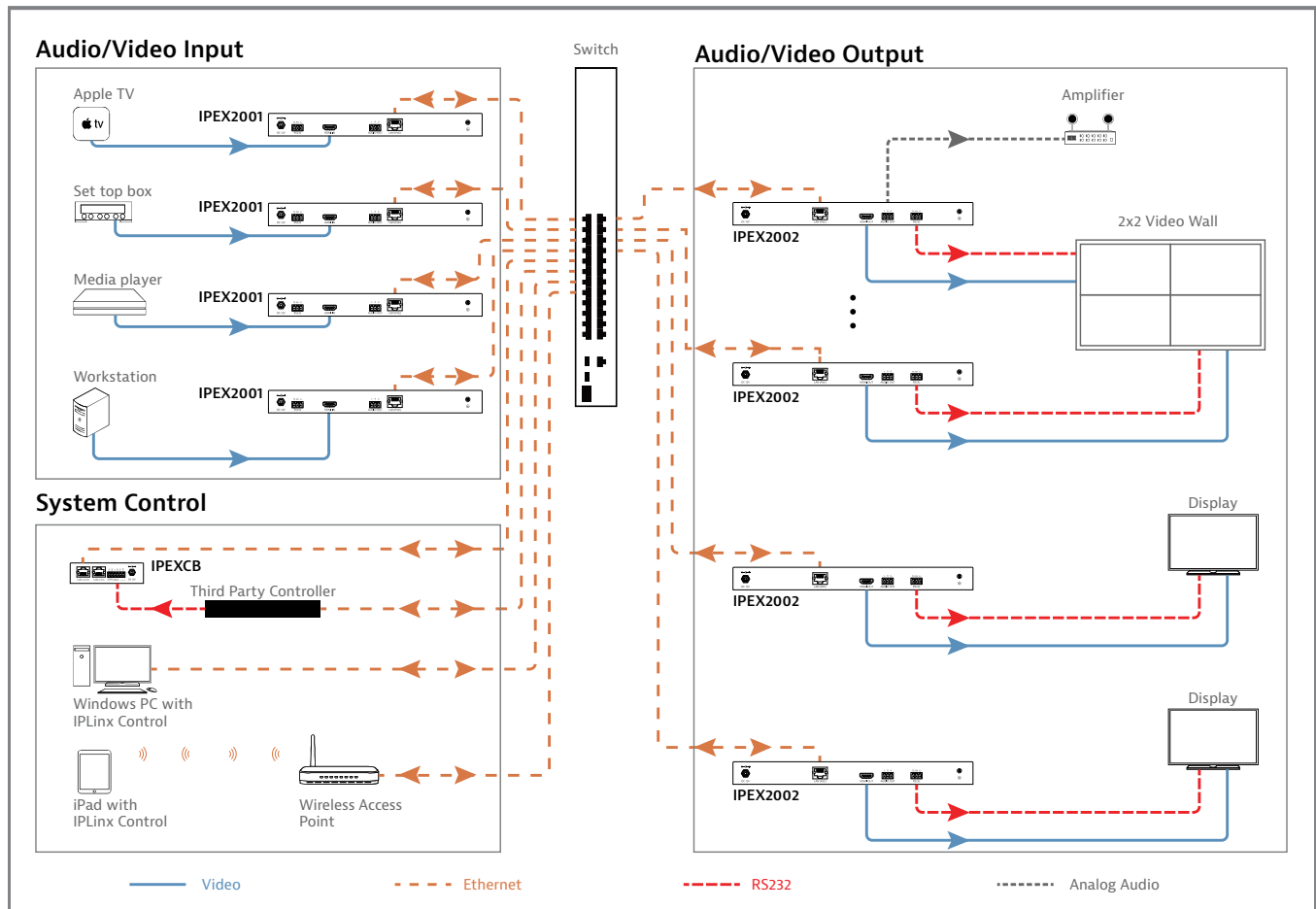
Updates and Troubleshooting

Firmware Updates

Firmware updates for the IPEX2001 and IPEX2002 are handled through the IPLinx Updater software, which can be found on the IPEXCB page of the Liberty website. Please see the documentation included with the software to update the encoders and decoders.

Device Reset

Resetting the IPEX2001 and IPEX2002 is handled through the IPLinx Config software. Please see the documentation included with the software to reset the encoders and decoders to factory defaults.

Troubleshooting

No Picture

1.   Verify all devices are powered on.

2.   Verify LAN cable continuity between devices.

3.   Verify the STATUS LED is lit on the encoders and decoders.

4.   Verify the encoders and decoders are configured properly in the IPLinx Config software.

5.   Verify the source and display devices work correctly without signal extension.

6.   Verify the display is set to the correct input.

7.   If the source content is HDCP encrypted, verify the display supports HDCP.

8.   Verify the output resolution of the decoder matches the display resolution in the IPLinx Config software.

9.   Verify that only one power source is used with the encoders and decoders. using the included power supplies with a PoE switch that is providing PoE will cause stability issues.

No Audio

1.   Verify all devices are powered on.

2.   Verify LAN cable continuity between devices.

3.   Verify the STATUS LED is lit on the encoders and decoders.

4.   Verify the encoders and decoders are configured properly in the IPLinx Config software.

5.   Verify the source and display devices work correctly without signal extension.

6.   Verify the source audio output is set to Stereo output.

7.   If the source content is HDCP encrypted, verify the display supports HDCP.

8.   Verify the output resolution of the decoder matches the display resolution in the IPLinx Config software.

9.   Verify that only one power source is used with the encoders and decoders. using the included power supplies with a PoE switch that is providing PoE will cause stability issues.

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IPEX2001 Technical Specifications

Input/Output Connections	
HDMI Input	One (1) HDMI Type A Receptacle
LAN	One (1) 8P8C port (Shielded RJ45)
Power	One (1) 5.5 mm OD, 2.6 mm ID Threaded Barrel
RS232 Port	One (1) 3-pin Removable Terminal Block Connector
Audio Output	One (1) 3-pin Removable Terminal Block Connector
Supported Audio, Video and Control	
Video Resolutions	SMPTE: 480p, 576p, 720p, 1080i, 1080p VESA: Resolutions up to 1920x1200 Color Depth: 24, 30, 36 bit
Video Compliance	HDMI 1.3 and HDCP 1.3
Embedded Audio	PCM 2 channel
ARC (Audio Return Channel)	No
HEC (HDMI Ethernet Channel)	No
CEC (Consumer Electronics Control)	Yes
Supported Baud Rates	2400, 4800, 9600, 19200, 38400, 57600, 115200
Streaming Signal Characteristics	
Maximum Distance (point to point)	100 m (328 ft)
Cable Requirements	Category 5e or greater with TIA/EIA-568B crimp pattern
Encoding Data Rate	2 Mbps to 30 Mbps
Encoding Method	CBR or VBR
End to End Latency	Low Latency/Quality Mode: 79 ms High Quality Mode: 250 ms
Maximum Supported Encoders	999
Maximum Video Wall Size	16 x 16
Chassis and Environmental	
Construction	Black Steel
Dimensions (H x W x D)	25 mm x 237 mm x 94.3 mm (0.98in x 9.33 in x 3.71 in)
Operating Temperature	0° to +40° C (+32° to +104° F)
Operating Humidity	20% to 90%, Non-condensing
Storage Temperature	-10° to +60° C (+14° to +140° F)
Storage Humidity	20% to 90%, Non-condensing
Power and Regulatory	
Power Input	12V DC 1A or 48V DC PoE (Power over Ethernet)
Power over Ethernet (PoE) Compatibility	802.3af Alternative A
Power Consumption	10 watts
ESD Protection	8kV air, 4kV contact
Regulatory	FCC, CE, RoHS
Other	
Warranty	2 years
Diagnostic Indicators	Power and Status
Included Accessories	Installation Guide, Power Supply with US, UK, EU, and UK adapters, 3-pin Removable Screw Terminal (2 ea), Mounting Ears (2 ea)
IP Controller	IPEXCB
Compatible Decoders	IPEX2002, IPEX2003MV

Distances and picture quality may be affected by cable grade, cable quality, source and destination equipment, RF and electrical interference, and cable patches.

IPEX2002 Technical Specifications

Input/Output Connections	
HDMI Output	One (1) HDMI Type A Receptacle
LAN	One (1) 8P8C port (Shielded RJ45)
Power	One (1) 5.5 mm OD, 2.6 mm ID Threaded Barrel
RS232 Port	One (1) 3-pin Removable Terminal Block Connector
Audio Output	One (1) 3-pin Removable Terminal Block Connector
Supported Audio, Video and Control	
Video Resolutions	SMPTE: 480p, 576p, 720p, 1080i, 1080p VESA: Resolutions up to 1920x1200 Color Depth: 24, 30, 36 bit
Video Compliance	HDMI 1.3 and HDCP 1.3
Embedded Audio	PCM 2 channel
ARC (Audio Return Channel)	No
HEC (HDMI Ethernet Channel)	No
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Streaming Signal Characteristics	
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Encoded Data Rate	2 Mbps to 30 Mbps
Encoded Method	CBR or VBR
End to End Latency	Low Latency/Quality Mode: 79 ms High Quality Mode: 250 ms
Maximum Supported Decoders	999
Maximum Video Wall Size	16 x 16
Chassis and Environmental	
Construction	Black Steel
Dimensions (H x W x D)	25 mm x 266.2 mm x 111.3 mm (0.98in x 10.48 in x 4.38 in)
Operating Temperature	0° to +40° C (+32° to +104° F)
Operating Humidity	20% to 90%, Non-condensing
Storage Temperature	-10° to +60° C (+14° to +140° F)
Storage Humidity	20% to 90%, Non-condensing
Power and Regulatory	
Power Input	12V DC 1A or 48V DC PoE (Power over Ethernet)
Power over Ethernet (PoE) Compatibility	802.3af Alternative A
Power Consumption	10 watts
ESD Protection	8kV air, 4kV contact
Regulatory	FCC, CE, RoHS
Other	
Warranty	2 years
Diagnostic Indicators	Power and Status
Included Accessories	Installation Guide, Power Supply with US, UK, EU, and UK adapters, 3-pin Removable Screw Terminal (2 ea), Mounting Ears (2 ea)
IP Controller	IPEXCB
Compatible Encoder	IPEX2001

Distances and picture quality may be affected by cable grade, cable quality, source and destination equipment, RF and electrical interference, and cable patches.

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