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1 Introduction

1.1 Overview

iMAGsystems LIGHTNING LZ1501E / LZ1502D series Encoders and Decoders provide the flexible, powerful, and scalable solution at resolutions up to 4096x2160@60Hz, 3840x2160@60Hz (4:4:4) and 3840x2160@60Hz (4:2:0 10-bit HDR). They allow uncompressed UHD media to be switched and distributed over standard 10GbE Ethernet networks. A local area network is covered with a range up to 300m over fibre optic cable, up to 100m over a single Cat 6a cable or above. Standard features like, bi-directional serial, bi-directional IR, and independent analog audio input/output are included. LZ1501E / LZ1502D allow USB extension to take place to control keyboards, mouse, webcams, flash drives, speakers, microphones, and other USB devices. They are the perfect solution for any zero-frame latency and signal routing applications. Common applications include classrooms, conference rooms, performing arts, and broadcasts.

1.2 Features

- Powerful DIRECTOR software running on a dedicated LZ500DS/LZ550DS Intel NUC system controller
- HDMI 2.0 and HDCP 2.2 compliant
- Lossless distribution of most timing formats
- Light compression when the raw data rate exceeds the 10Gb Ethernet bandwidth
- Fan-less heat radiation structure
- Supports input and output resolutions up to 4096x2160@60Hz, 3840x2160@60Hz (4:4:4) and 3840x2160@60Hz (4:2:0 10-bit HDR)
- Zero frame latency
- Supports point to point transmission, distance up to 100m with a 4K signal
- Supports point to multiple, multiple to multiple mode via 10GbE Ethernet Switch
- Instant and seamless switch between Non-HDCP and same timing sources
- Video wall capabilities with bezel compensation
- Multiview capabilities of displaying up to 32 individual video streams on a single Decoder
- With independent analog audio input and output at 2-channels, 24-bits@48KHz/channel
- Supports Bi-directional IR or IR commands sent from the API
- Supports Bi-directional RS232 or RS232 commands sent from the API
- With 1GbE auto sensing port, for PC control, upgrading and so on
- USB 2.0 for routing of keyboard, mouse and other USB devices
- Bandwidth needed: 4K signal at about 6~8 Gbps, 1080P signal at about 1.485 Gbps

Note:

All the descriptions, specifications, illustrations and pictures in this document are subject to change without notice.
### Technical Specifications

#### VIDEO

**Input**
1 x HDMI, 1x DisplayPort

**Input Signal Type**
HDMI 2.0 with HDCP 2.2 (HDCP in output follows input)

**Supported Resolutions**

- **Up to UltraHD 4K x 2K 50/60 Hz, RGB/YCbCr with 4:4:4-pixel encoding**
  - 640x480\(^1\), 800x600\(^\text{i}\), 1024x768\(^\text{i}\), 1280x1024\(^\text{i}\), 1360x768\(^\text{i}\), 1440x900\(^\text{i}\), 1440x1050\(^\text{i}\), 1600x1200\(^\text{i}\), 720x480\(^\text{i}\)(480p59), 720x480\(^\text{i}\)(480p59), 720x576\(^\text{i}\)(576p50), 1280x720\(^\text{i}\)(720p50), 1280x720\(^\text{i}\)(720p59), 1280x720\(^\text{i}\)(720p60), 1920x1080\(^\text{i}\)(1080i50), 1920x1080\(^\text{i}\)(1080i59), 1920x1080\(^\text{i}\)(1080i60), 1920x1080\(^\text{i}\)(1080p23), 1920x1080\(^\text{i}\)(1080p24), 1920x1080\(^\text{i}\)(1080p25), 1920x1080\(^\text{i}\)(1080p29), 1920x1080\(^\text{i}\)(1080p30), 1920x1080\(^\text{i}\)(1080p50), 1920x1080\(^\text{i}\)(1080p59), 1920x1080\(^\text{i}\)(1080p60), 3840x2160\(^\text{i}\)(2160p23), 3840x2160\(^\text{i}\)(2160p24), 3840x2160\(^\text{i}\)(2160p25), 3840x2160\(^\text{i}\)(2160p29), 3840x2160\(^\text{i}\)(2160p30), 3840x2160\(^\text{i}\)(2160p50), 3840x2160\(^\text{i}\)(2160p60), 4096x2160\(^\text{i}\), 4096x2160\(^\text{i}\)^{1}

1 = 23.98Hz, 2 = 24Hz, 3 = 25Hz, 4 = 29.97Hz, 5 = 30Hz, 6 = 50Hz, 7 = 59.94Hz, 8 = 60Hz

**Pixel Clock**
594MHz

**EDID**
EDID is on the Encoder and can be set from any Decoder

**Latency**
- Sync <0.03 ms (uncompressed) <0.12 ms (compressed)
- Sync_scale ¼ frame
- Fast 1-2 frames
- Video Wall 1 frame
- Multiview 1-2 frames

**Bandwidth**
- 1080P 60Hz/4:4:4/24bit ≈ 3.564Gbps
- 4K 30Hz/4:4:4/24bit ≈ 7.128Gbps

#### AUDIO

**Inputs**
Embedded HDMI or Analog 3.5mm phono connector

**Support audio format**
Stereo

#### CONTROL

**RS232**
1x Bi-Directional 4pin Phoenix connector

**USB**
1x USB 2.0 type B HOST

**Ethernet**
Audio/Video: 1x 10 Gigabit RJ45  
LAN: 1x Gigabit RJ45

**Ethernet Cable Length**
100 Meters maximum with CAT6A (point-to-point / point-to-switch)

#### GENERAL

**Operating Temperature**
0 to + 40°C (32 to + 104 °F)

**Storage Temperature**
-20 to +70°C (-4 to + 140 °F)

**Humidity**
10% to 90%, noncondensing

**Power Supply**
12 VDC 3 A

**Power Consumption**
15.24 W

**Dimensions**
230mm(L) x 139mm(D) x 35mm(H) with mounting 264mm(L) x 139mm(D) x 45mm(H)

**Weight**
1.28 kg (2.82 lb)

**Certification**
CE, RoHS compliant

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# Technical Specifications

## VIDEO

<table>
<thead>
<tr>
<th>Output</th>
<th>1 x HDMI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Output Signal Type</td>
<td>HDMI 2.0</td>
</tr>
<tr>
<td>Supported Resolutions</td>
<td>Up to UltraHD 4K x 2K 50/60 Hz, RGB/YCbCr with 4:4:4-pixel encoding</td>
</tr>
<tr>
<td></td>
<td>640x480, 800x600, 1024x768, 1280x1024, 1360x768, 1440x900, 1440x1050, 1600x1200, 720x576(576p50), 1280x720(720p50), 1280x720(720p59), 1280x720(720p60), 1920x1080(1080i50), 1920x1080(1080i59), 1920x1080(1080i60), 1920x1080(1080p23), 1920x1080(1080p24), 1920x1080(1080p25), 1920x1080(1080p29), 1920x1080(1080p30), 1920x1080(1080p50), 1920x1080(1080p59), 1920x1080(1080p60), 3840x2160(2160p23), 3840x2160(2160p24), 3840x2160(2160p25), 3840x2160(2160p29), 3840x2160(2160p30), 3840x2160(2160p50), 3840x2160(2160p60), 4096x2160, 4096x2160</td>
</tr>
<tr>
<td></td>
<td>¹=23.98Hz, ²=24Hz, ³=25Hz, ⁴=29.97Hz, ⁵=30Hz, ⁶=50Hz, ⁷=59.94Hz, ⁸=60Hz</td>
</tr>
</tbody>
</table>

## AUDIO

<table>
<thead>
<tr>
<th>Outputs</th>
<th>Embedded HDMI or Analog 3.5mm phono connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>Support audio format</td>
<td>Stereo</td>
</tr>
</tbody>
</table>

## CONTROL

<table>
<thead>
<tr>
<th>RS232</th>
<th>1x Bi-Directional 4pin Phoenix connector</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB</td>
<td>2x USB 2.0 type A (mouse keyboard)</td>
</tr>
<tr>
<td>Ethernet</td>
<td>Audio/Video: 1x 10 Gigabit RJ45</td>
</tr>
<tr>
<td>Ethrnet Cable Length</td>
<td>100 Meters maximum with CAT6A (point-to-point / point-to-switch)</td>
</tr>
</tbody>
</table>

## GENERAL

<table>
<thead>
<tr>
<th>Operating Temperature</th>
<th>0 to + 40°C (32 to + 104 °F)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Temperature</td>
<td>-20 to +70°C (-4 to + 140 °F)</td>
</tr>
<tr>
<td>Humidity</td>
<td>10% to 90%, noncondensing</td>
</tr>
<tr>
<td>Power Supply</td>
<td>12 VDC 3 A</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>19.84 W</td>
</tr>
<tr>
<td>Dimensions</td>
<td>230mm(L) x 139mm(D) x 35mm(H)</td>
</tr>
<tr>
<td></td>
<td>with mounting 264mm(L) x 139mm(D) x 45mm(H)</td>
</tr>
<tr>
<td>Weight</td>
<td>1.28 kg (2.82 lb)</td>
</tr>
<tr>
<td>Certification</td>
<td>CE, RoHS compliant</td>
</tr>
</tbody>
</table>
## 3 Panel Description

### 3.1 Encoder LZ1501E

#### 3.1.1 Front Panel

<table>
<thead>
<tr>
<th>No.</th>
<th>Indicator/Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>USB Host Port</td>
<td>Connect this port to a host computer using a USB standard-B cable.</td>
</tr>
</tbody>
</table>
| 2   | LINK TX indicator| **Off**: not sending data  
**Blinking**: sending data |
| 3   | LINK RX indicator| **On**: processing the video signal but not receiving any data  
**Off**: not receiving any data  
**Blinking**: receiving data and processing the video signal |
| 4   | VIDEO indicator  | **On**: A stable video signal is detected  
**Off**: No stable video signal is detected |
| 5   | POWER indicator  | **On**: when LZ1501E is powered on |
| 6   | RESET button     | Restore to factory defaults  
Hold button while applying power until front panel LED’s start to flash |
| 7   | ID button        | Reserved for future version |
### 3.1.2 Rear Panel

<table>
<thead>
<tr>
<th>No.</th>
<th>Ports</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DC 12V</td>
<td>Connects to a power supply, DC 12V 3A</td>
</tr>
<tr>
<td>2</td>
<td>DP IN</td>
<td>Connects to a DisplayPort source device for source input</td>
</tr>
<tr>
<td>3</td>
<td>HDMI IN</td>
<td>Connects to a HDMI source device for source input</td>
</tr>
<tr>
<td>4</td>
<td>10GbE</td>
<td>- Connects to a Decoder LZ1502D for communication with each other</td>
</tr>
<tr>
<td></td>
<td></td>
<td>- Connects to a 10 Gigabit switch for communicating with other Decoders</td>
</tr>
<tr>
<td></td>
<td></td>
<td>LZ1502D for matrix switching between LZ1501E and LZ1502D via software</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong></td>
</tr>
<tr>
<td></td>
<td></td>
<td>You can also connect a switch, a router or a computer to LAN (CONTROL) port</td>
</tr>
<tr>
<td></td>
<td></td>
<td>for matrix switching between LZ1501E and LZ1502D via software</td>
</tr>
<tr>
<td>5</td>
<td>RS232</td>
<td>Bi-directional RS-232 communication with a RS-232 device</td>
</tr>
<tr>
<td>6</td>
<td>IR OUT</td>
<td>Connects to an IR emitter for IR communication with an IR device</td>
</tr>
<tr>
<td>7</td>
<td>IR IN</td>
<td>Connects to an IR receiver to allow the signal to be sent to any LZ1502D Decoder</td>
</tr>
<tr>
<td>8</td>
<td>LAN</td>
<td>10/100/1000 Base-T connection to the network</td>
</tr>
<tr>
<td>9</td>
<td>AUDIO IN/OUT</td>
<td>Analog audio port configurable as an input or output</td>
</tr>
</tbody>
</table>
# iMAGsystems LIGHTNING Specifications

## 3.2 Decoder LZ1502D

### 3.2.1 Front Panel

![Decoder Front Panel]

<table>
<thead>
<tr>
<th>No.</th>
<th>Indicator/Button</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>USB1</td>
<td>Connect this port to a USB device such as a keyboard and mouse</td>
</tr>
<tr>
<td>2</td>
<td>USB2</td>
<td>Connect this port to a USB device such as a keyboard and mouse</td>
</tr>
</tbody>
</table>
| 3   | LINK TX indicator | **Blinking:** Sending data  
|     |                  | **Off:** Not sending any data |
| 4   | LINK RX indicator | **On:** Processing the video signal but not receiving any data  
|     |                  | **Off:** Not processing the video signal and not receiving any data  
|     |                  | **Blinking:** Receiving data and processing the video signal |
| 5   | VIDEO indicator  | **On:** A stable video signal is detected  
|     |                  | **Off:** No stable video signal is detected |
| 6   | POWER indicator  | **On:** when LZ1502D is powered on. |
| 7   | EDID/RESET button | Press once to copy the connected HDMI display’s EDID to all the Encoders LZ1501E on the network  
|     |                  | **Note:** This feature can be enabled/disabled within the software.  
|     |                  | If other display devices are not compatible with this display’s EDID, these displays may have abnormal pictures such as no picture. In that case, try to replace the display devices or press EDID/RESET button on the Decoder connected to them  
|     |                  | Restore to factory defaults. Hold button while applying power until front panel LED’s start to flash |
| 8   | ID button        | Reserved for future version |
### 3.2.2 Rear Panel

<table>
<thead>
<tr>
<th>No.</th>
<th>Ports</th>
<th>Description</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>DC 12V</td>
<td>Connects to a power supply, DC 12V 3A</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>HDMI OUT</td>
<td>Connects to a HDMI display device for source output</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>10GbE</td>
<td>• Connects to a Encoder LZ1501E for communication with each other</td>
<td>• Connects to a 10 Gigabit switch for communicating with other Encoders LZ1501E for matrix switching between LZ1501E and LZ1502D via software</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Note:</strong></td>
<td>You can also connect a switch, a router or a computer to LAN (CONTROL) port for matrix switching between LZ1501E and LZ1502D via software</td>
</tr>
<tr>
<td>4</td>
<td>RS232</td>
<td>Bi-directional RS-232 communication with a RS-232 device</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>IR OUT</td>
<td>Connects to an IR emitter for IR communication with an IR device</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>IR IN</td>
<td>Connects to an IR receiver to allow the signal to be sent to any LZ1501E Encoder</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>LAN (CONTROL)</td>
<td>10/100/1000 Base-T connection to the network</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>AUDIO OUT</td>
<td>Analog audio output that connects to an audio output device such as an amplifier, for outputting audio from an Encoder LZ1501E</td>
<td></td>
</tr>
</tbody>
</table>
4 Hardware Installation

Warnings:
- Before the installation, disconnect the power supplies from all the devices.
- During the installation, connect or disconnect the cables gently.

4.1 Package Content
- 1x Encoder / Decoder
- 1x Power Adapter (12VDC 3A)
- 1x Phoenix RS232 male 4-pin plug
- 1x IR Emitter
- 1x IR Receiver (30kHz ~ 50kHz)
- 2x Mounting brackets
5 Typical Applications

5.1 Point to Point

5.2 Point to Multipoint
5.3 Multipoint to Point

5.4 Multipoint to Multipoint
iMAGsystems LIGHTNING Specifications

6 LIGHTNING Controller LZ500DS

6.1 Overview

To control the LIGHTNING Encoders LZ1501E and Decoders LZ1502D the LIGHTNING Controller LZ500DS is required. The LIGHTNING Controller provides a single point of control over all the LIGHTNING devices on the network. A 3rd party control system needs to only create a TCP connection to the LIGHTNING Controllers IP address on Port 6980.

6.2 Specifications

<table>
<thead>
<tr>
<th>Technical Specifications</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Power Supply</td>
<td>12-19 VDC</td>
</tr>
<tr>
<td>Power Consumption</td>
<td>65 Watts</td>
</tr>
<tr>
<td>I/O Connection</td>
<td>1 x 10/100/1000 Mb/s (RJ45)</td>
</tr>
<tr>
<td>Operating Temperature</td>
<td>0°C ~ +50°C (32°F ~ 122°F)</td>
</tr>
<tr>
<td></td>
<td>10% ~ 90%, non-condensing</td>
</tr>
<tr>
<td>Product Dimension (W x H x D)</td>
<td>114.3 mm x 111.8 mm x 50.8 mm</td>
</tr>
</tbody>
</table>
6.3 Panel Description

1. Intel® Celeron® processor J3455, 1.5 GHz to 2.3 GHz Burst
2. Intel® HD Graphics
3. Two DDR3L SO-DIMM sockets (up to 8 GB, 1666 MHz)
4. 1x SATA3 port for connection to 2.5" HDD or SSD
5. Intel® Dual Band Wireless-AC 3168 and Bluetooth® 4.2
6. Back panel AC power connector (12-19V)
7. Two USB 3.0 ports on the back panel
8. Combo speaker/TOURLINK optical audio jack
9. VGA port
10. One full-size HDMI® 2.0 display port supporting 8 channel audio (7.1 surround sound)
11. Gigabit LAN
12. Multi-color front panel LED ring
13. Support for user-replaceable third-party lids
14. Kensington lock support
15. SD card slot
16. Consumer infrared sensor
17. Two USB 3.0 ports (including one charging port)
18. Headphone/microphone jack
19. Front panel power button
20. Dual array front microphones

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