

Listen EVERYWHERE

USER MANUAL



LW-100



LW-200

Dear Valued Customer,

Thank you for choosing Listen! We are dedicated to providing you with the highest quality products available and take pride in delivering outstanding performance to ensure you are completely satisfied. We independently certify each of our products to the highest quality standards and back them with a limited lifetime guarantee. We are available to answer any questions you might have during installation or in the operation of our products. At Listen, it's all about you, should you have any comments or suggestions we're here to listen.

Here's how to reach us:

+1.801.233.8992 +1.800.330.0891 North America

+1.801.233.8995 fax support@listentech.com www.listentech.com

Thank you and enjoy your listening experience!

Best regards,

Russell Gentner and the Listen Team

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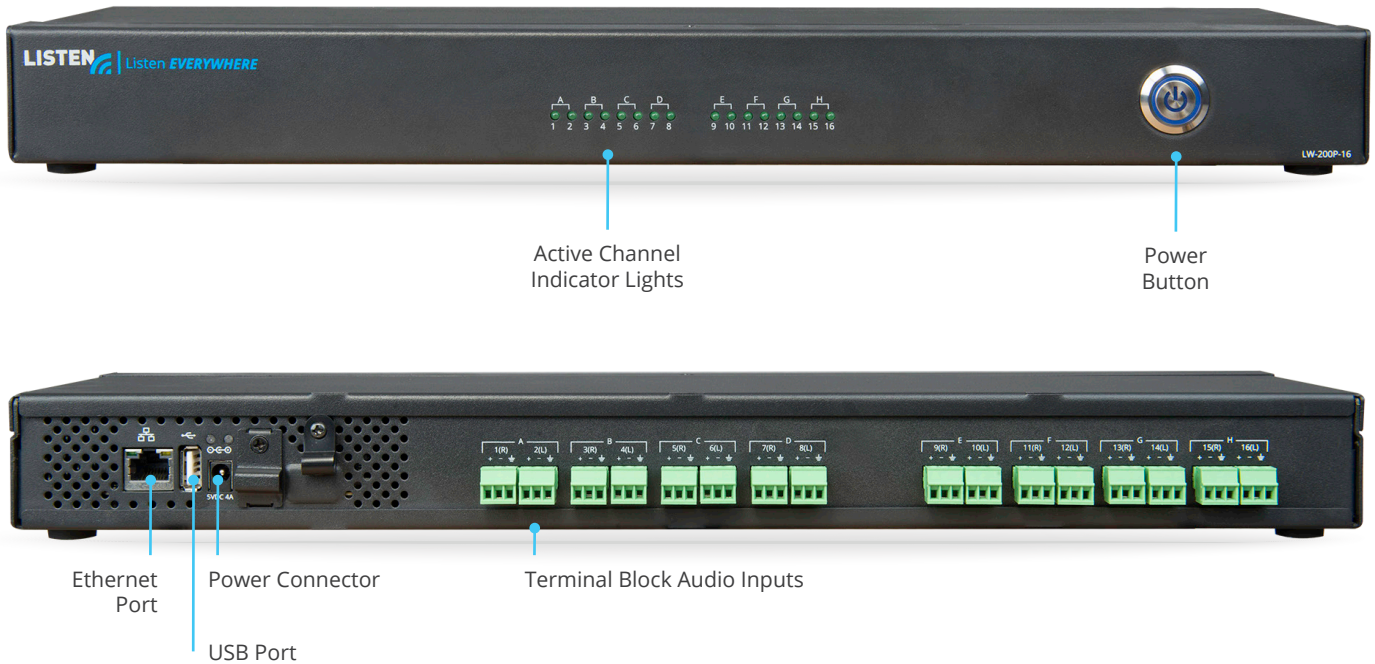
INTRODUCTION

The Listen Everywhere LW-100P-02 and LW-200P-(04, 08, 12, 16) can stream audio to up to 1000 users per server via a free mobile app. Multi-screen and assistive listening environments—including conference centers, and sports bars, houses of worship, language interpretation and hospitality—benefit from the flexibility to provide a wide range of streaming audio options with strong, clear, and reliable performance. Cloud-based management allows for simple management of the system, including updates and customization options. Additionally, in-app functions allow for the creation of custom welcome messages, videos, banners, and more.

COMPONENTS – LW-100



LW-200



SAFETY CAUTIONS

Hearing Safety

This product is designed to amplify audio to a high volume level which could potentially cause hearing damage if used improperly. To protect your hearing make sure the volume is turned down before putting on the headset. Then adjust the volume up to the minimum setting required to hear clearly. Do not allow children or other unauthorized individuals to have access to this product without supervision.

Medical Device Safety

Before using this Listen product with an implantable or other medical device, consult your physician or manufacturer of your implantable or other medical device. Always make sure you are using this product in accordance with the safety guidelines established by your physician or the implantable device manufacturer.

LW-100 & 200 QUICK REFERENCE & SYSTEM SETUP

Connect Audio

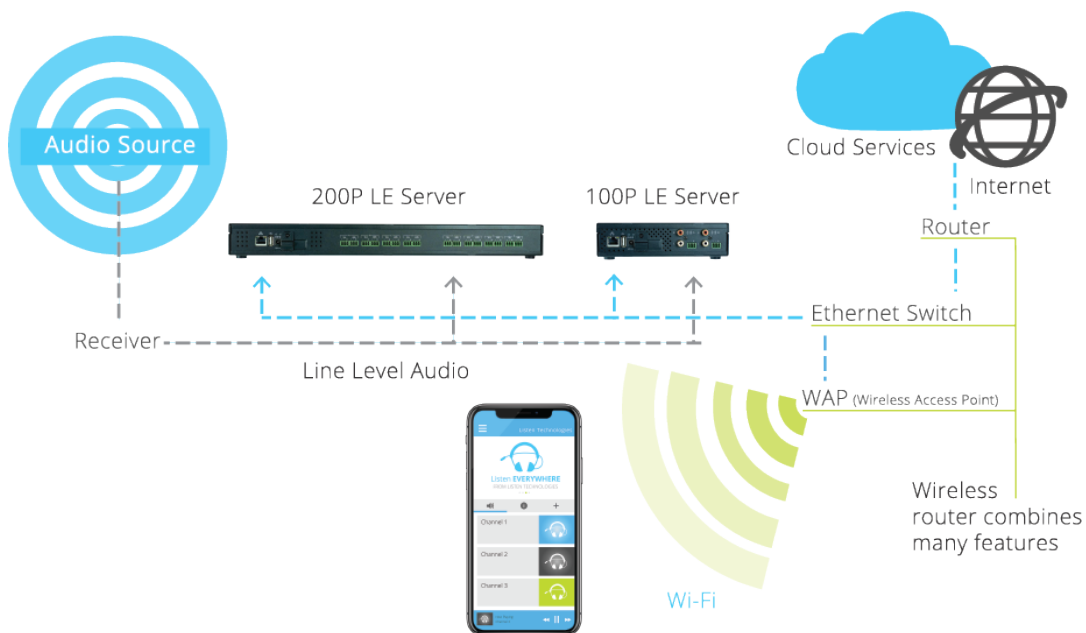
Connect the audio source(s) to the Listen EVERYWHERE (LE) server via the terminal block connectors on the rear panel. LW-100P units may use the enclosed RCA connection cable provided.

Note: The input connectors accept line-level audio inputs. The RCA connectors on the LW-100P units are unbalanced sum-to-mono inputs. If stereo is required, connect the audio source(s) to the (1)L and (2)R connectors and then select, "stereo", in the Cloud Service. (See Cloud Service Setup.)

Network Connection

Connect the LE server to your local area network (LAN) via the ethernet port on the server rear panel, then plug in the power cable. A flashing blue power LED indicates the server is booting up. Once a network connection has been established, the blue power LED will turn solid. The enclosed CAT6 cable may be used to connect the LE server to the network router or network switch. The LE server and smartphones must be on the same public network.

Quick Tip: 2.4 GHz bands tend to have higher traffic; 5 GHz or dual-band access points recommended in high-traffic areas



Download App

Download the Listen EVERYWHERE app. Join the Wi-Fi network associated with the Venue Server (i.e., on the same LAN). Launch the app, select channel to stream, enjoy!

Available on Google Play & the Apple App Store.

Troubleshooting Tip

Experiencing a lack of signal? Check IP addresses on the Venue Server and smartphones to ensure they are on the same public network.

Cloud Server Setup (Optional)

The Cloud Server offers in-app marketing features including banner ads & promotional videos, web-based remote setup & maintenance, and advanced customization. Create an account with the Cloud Server by sending an email to support@listentech.com with the following information:

- User Setup: last name, first name, phone number, & email
- Company Setup: company name, phone number, venue type, address, & LE Server serial number (looks like: AEL6-2345-43RF-TEW9)

You will receive an email with login credentials to service.listeneverywhere.com

SPECIFICATIONS

LW-100P-02

Interconnections

Audio Inputs	Terminal Block: Two analog inputs, rear panel, one terminal block connector per input, balanced, +4 dBu (line) nominal input level, +16 dBu maximum input level, impedance 100k ohm
Audio Inputs	RCA: Two analog inputs, rear panel, one dual summing RCA connector per input, unbalanced, -10 dBu (line) nominal input level, +2 dBu maximum input level, impedance 100k ohm
Audio Inputs	*Stereo operation requires the use of both inputs
Ethernet	RJ-45 supports 10/100/1000 Mbps speed. Green LED flashes at 100 Mbps, Yellow LED flashes at 1000 Mbps.
USB	Type A 2.0 (female)

Power Supply

Connector	5 VDC Barrel
Input Voltage	100-240 VAC, 50-60Hz
Output Voltage	5 VDC
Current	6.0 A
Power	30 W
Countries	North American, UK, EU, AUS

Servers

IP Address	DHCP, Static, Reserved
Prioritization	QoS/ToS
Users	1000 (per server)
Max Channels*	2 mono (1 stereo)
WAP Support	802.11n or better w/WMM enabled
Supported WAP Frequencies	2.4 GHz & 5 GHz
Bandwidth Use	Approx. 140 kbps per user
App Support	iOS/Android
Cloud Service	Yes
Regulatory	FCC, CE, RoHS
Warranty	2 years

*Multiple servers may be used to increase the number of channels

Physical

Dimensions (H x W x D)	45mm x 170mm x 100mm (1.77in x 6.69in x 3.94in)
Weight	.59 kg (1.3 lbs)

LW-200P-(04, 08, 12, 16)

Interconnections

Audio Inputs	Terminal Block: Two analog inputs, rear panel, one terminal block connector per input, balanced, +4 dBu (line) nominal input level, +16 dBu maximum input level, impedance 100k ohm
Audio Inputs	*Each stereo channel requires the use of two inputs
Ethernet	RJ-45 supports 10/100/1000 Mbps speed. Green LED flashes at 100 Mbps, Yellow LED flashes at 1000 Mbps.

Power Supply

Connector	DC Barrel Connector
Input Voltage	100-240 VAC, 50-60Hz
Output Voltage	5 VDC
Current	6.0 A
Power	30 W
Countries	North American, UK, EU, AUS

Servers

IP Address	DHP, Static, Reserved
Prioritization	QoS/ToS
C Users	1000 (per server)
Max Channels*	4, 8, 12, or 16 mono
WAP Support	802.11n or better w/WMM enabled
Supported WAP Frequencies	2.4 GHz & 5 GHz
Bandwidth Use	Approx. 140 kbps per user
App Support	iOS/Android
Cloud Service	Yes
Regulatory	FCC, CE, RoHS
Warranty	2 years

*Multiple servers may be used to increase the number of channels

Physical

Dimensions (H x W x D)	45mm x 483mm x 155mm (1.77 in x 19.02in x 6.1in)
Weight	2.2 kg (4.85 lbs)
Rack Space	1RU

NETWORK CONFIGURATION

Listen EVERYWHERE was designed to be used on pre-existing wireless networks as a plug-and-play system, however it might be necessary to have an IT/Network Administrator assist with the initial setup to ensure proper functionality. This guide will provide you instructions for configuring the network where the LE system will be deployed.

How it works

LE streams audio over Wi-Fi to connected Android and iOS smart-devices. This process has two phases: Discovery and Streaming, in the discovery phase the LE app on the smart-device seeks out the LE Server on the Wi-Fi network via mDNS. It then moves to the streaming phase, where audio is streamed unicast (UDP) from the LE server to the LE app on the connected smart-device.

- Enterprise Grade Router. Consumer Grade routers do not always have the required features or configuration options. Contact Listen for more info on compatible routers.
- Enterprise Grade Access Point(s), 802.11n or better (802.11ac is recommended).
- Multicast UDP (mDNS/Bonjour/Avahi) is enabled (see Enabling Multicast UDP).
- The data load is approximately 140 kbps per connected user. It is recommended that Listen Everywhere traffic only account for 20% of the total available bandwidth.
- Internet connectivity to the LE server is required for initial setup and for some features to be available (See Internet Connectivity).

Suggested Settings

Though not required for the LE system to function, there are several optimizations that can improve performance:

- No Wi-Fi Encryption is used. Using encryption will lower the number of users that can connect to the Access Point and add latency to the LE system. If encryption is used, WPA2-AES is preferred. TKIP encryption should not be used.
- Enable Quality of Service (QoS) on the network (see Enabling QoS).
- Do not use range extenders, mesh networks, or multi-hop networks. Doing so may add latency, noise, or cause dropouts.
- Set the BSS Minrate to 12,000 (12 Mbps). This will disconnect clients from the network if their signal strength is too low, reducing strain on the AP.
- Assign the Listen Everywhere server a static IP through the LAN Manager.
- Set access points to static channels (see AP Channel Optimization).

Internet Connectivity

Note, an internet connection is not required for the LE system to function. However, the LE server must be able to reach the Cloud Manager (see Ports and Services) for the initial setup and for some features to function.

The following features are available without a persistent connection to the cloud manager:

- Audio Streaming
- Theme Settings (title, colors, images)*
- Channel Settings (names, images, gain, delay)*
- Welcome ad (image or video)*

The following features require a persistent connection to the Cloud Manager:

- Banner Ads
- Offers
- Documents
- Analytic Reports
- Firmware updates
- Downloading log files

*Initial setup requires an internet connection and will then function without

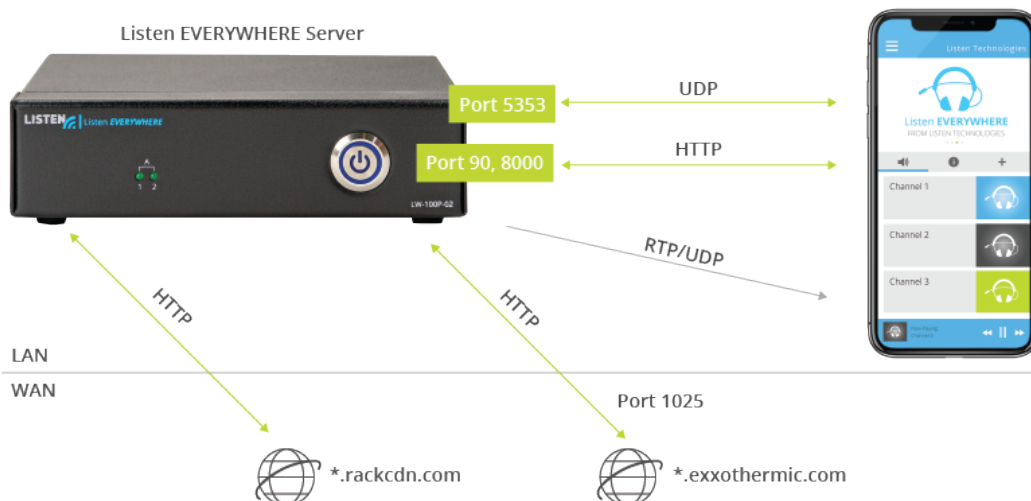
Stand-Alone Networks

When a stand-alone network is desired, the LE server can function as the DHCP server. This setup does require that at least one access point be used. When the LE server is powered on, it checks for a connected DHCP server. If it doesn't find one within 5 minutes, it will become a DHCP server. No internet connectivity is available when in this mode. The network setting when in DHCP mode are:

- Gateway: 172.30.0.1
- Netmask: 255.255.0.0
- Lease Time: 2 Hours

Ports and Services

- LAN ports and services
 - o LE server / phone app discovery: LE server exposes an HTTP server on **port 8000**
 - o LE server exposes a file server on **port 90** to download promotional media (e.g., images, labels, etc). Protocol is HTTP.
- Audio Streaming
 - o LE server sends RTP packets using UDP to the apps over a range of ports
 - o Mobile apps listen for UDP on **port 16384**
- WAN ports and services
 - o LE server communicates with the Cloud Manager at ***.exxothermic.com** (IP address: 108.166.110.178, but subject to change) via **port 1025**. Protocol is HTTP.
 - o Media files are stored on ***.rackcdn.com**. Protocol is HTTP.



Enabling Multicast UDP (mDNS/Bonjour/Avahi)

Multicast is used in the discovery process for the app and the server to connect via the “Scan” feature, which allows automatic connection when the app is opened.

To enable mDNS, perform the following:

- Add the following services to the allowed list in the Router/AP mDNS settings:
 - o ExXothermic._tcp
 - o AsClient_ExXothermic._tcp
- Open Port 5353
- Add the mDNS IP address to the allowed subnets list. 224.0.0.251 is the most common mDNS IP address, but it could be any of the 224.0.0.0/24 range

*Note: for specific assistance with Aruba APs: www.listeneverywhere.com/aruba/

*Note: for specific assistance with Cisco Aps: www.listeneverywhere.com/cisco/

In the event multicast discovery is not the preferred connection method, mDNS can be disabled and connections to the LE server can be achieved by entering the IP address or hostname (serial number) of the server into the app.

AP Channel Optimization

Many access points can automatically change channels to try and find one with less interference, which can cause audio drops each time the channel changes (as frequent as every 20 seconds). If a channel is not settled on after 30-60 minutes, it may be best to choose a channel manually.

When manually setting channels, you should use a Wi-Fi signal analyzer.* A Wi-Fi signal analyzer will provide a clear picture of the signal congestion in your space.

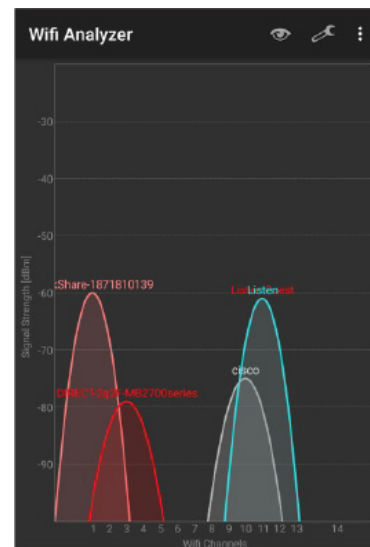
Channel width for 2.4GHz is very important. It should be set to 20MHz. Wider channels are more susceptible to interference.

*For Android devices, we suggest the ‘Wifi Analyzer’ app. No comparable app is available for iOS.

Enabling QoS (Quality of Service)

By default, the LE system uses QoS tags so that audio data can be prioritized over other data traffic on the network, which can provide improved audio quality. However, for this to function, it must be enabled on the network as well.

- Turn on WMM (Wireless Multimedia Extensions) in the access point.
- Turn on QoS in Switch/Router.



Guest Networks

Most access points have a 'guest network' option, which creates a network with tighter security settings. Settings can vary by manufacturer but will usually include client isolation, which prevents connected wireless devices from communicating with other devices on the network (such as smart-devices communicating with the LE server) and disables mDNS (Multicast DNS).

To bypass client isolation to allow wireless clients to connect to the Listen Everywhere server, you must add the Listen Everywhere server to the allowed address list (whitelist) for the Guest VLAN in the router configuration. For some routers require that this is done by IP address, and some by MAC address. The Listen Everywhere Server MAC address can be found on the serial number label on the unit and in the Cloud Manager. The IP address is also available in the Cloud Manager. The mDNS IP address must also be whitelisted (see Enabling Multicast UDP).

*Note: Visit www.listeneverywhere.com/guestnet/ for more detailed information.

Mesh Networks

A mesh network is a type of network topology where each node in the network is connected to every other node, which can cause Multicast discovery issues, increased latency, and audio dropouts. The use of Mesh Networks are not recommended.

Cisco Flex Connect

Cisco's Virtual Network Controller requires the use of FlexConnect, Cisco's version of a mesh network, which is not recommended, whenever possible. By default, only recognized mDNS services are allowed, such as from a brand-name printer. To allow the Listen Everywhere services you will need to go to CONTROLLER > mDNS > General in your Cisco Network Controller, then do the following:

- Ensure mDNS Global Snooping is enabled
- Add the following services to the Master Services Database
 - o ExXothermic._tcp
 - o AsClient_ExXothermic._tcp

The screenshot shows the Cisco Network Controller interface for mDNS configuration. The left sidebar lists navigation options: Controller, General, Inventory, Interfaces, Interface Groups, Multicast, Newtok Routes, Redundancy, Internal DHCP Server, Mobility Management, Ports, NTP, CDP, PMIPv6, IPv6, mDNS (selected), Profiles, and Domain Names. The main content area is titled 'mDNS' and has two tabs: 'Global Configuration' and 'Master Services Database'. Under 'Global Configuration', 'mDNS Global Snooping' is checked (indicated by arrow 1) and 'Query Interval (10-120)' is set to 10 (mins). Under 'Master Services Database', the 'Add' button is highlighted (indicated by arrow 2). Below this, a table lists services:

Service Name	Service String	Query Status
Audio Everywhere	_ExXothermic._tcp	<input checked="" type="checkbox"/>
AE As Client	_AsClientExXothermic._tcp	<input checked="" type="checkbox"/>

Arrows 'a' and 'b' point to the dropdown arrows next to the 'Query Status' checkboxes for the two services.

Troubleshooting

The app on the smart-device will not connect to the LE server:

- Verify that the smart-device is on the same network. Check the IP address of the smart-device and the IP address of the Listen Everywhere server to verify they are in the same IP range.
- If it will connect by IP or hostname but not via the scan feature there is an issue with the Multicast settings (see Enabling Multicast UDP).

Audio cuts out, has high latency, or excessive noise:

- Wi-Fi interference from other Wi-Fi signals (see AP Channel Optimization)
- Bandwidth bottleneck at the access point
 - o Is there enough bandwidth for the number of users? More capable or additional access points may be added.
 - o Encryption lowers bandwidth. Consider disabling encryption, or make sure WPA2-AES is being used, as it has the lowest impact on bandwidth.
 - o Enable QoS (see Enabling QoS).
- Check the audio source
 - o Long cable runs from the audio source to the Listen Everywhere server should be balanced to avoid introducing interference.
 - o Is the audio being input at the nominal level? Input audio should be line level, not Mic level.

COMPLIANCE NOTICE AND FCC STATEMENT AND INDUSTRY CANADA STATEMENTS

FCC Statement

This device complies with Part 15 of the 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.

Canada

CAN ICES-3 (B)/NMB-3 (B)

WARRANTY

Please visit www.listentech.com/support/warranty/ for warranty and service information.



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