



kaleidescape™

Technical Note

Establishing Internet Access
over Wireless and Powerline Networks
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1.0 Introduction

Your Kaleidescape System must be connected to the Internet to receive updates from the Movie Guide and Music Guide, receive KEAOS software updates and notify Kaleidescape when service is needed, such as when a hard drive fails. This connection is most often provided using a wired Ethernet network, which is often preferred for reasons of security, range, reliability and speed. However, these services are more tolerant of latency (the time delay between the source sending a packet and the destination receiving it) than time-critical movie and music streams, and therefore better suited for use with alternative methods such as wireless and powerline networking technologies. Wireless networks use radio frequencies to communicate without wires, while powerline networks carry data over a conductor also used for electric power transmission.

While the reliability of a wired Internet connection is preferred if possible, there are situations in which establishing an Internet connection to a Kaleidescape System using powerline communication or a wireless local area network is the most practical option. For example, if there is no way to get an Ethernet cable into the area in which the Kaleidescape System will be installed, these technologies provide an alternative that is more desirable than no Internet connection at all.

Kaleidescape strongly recommends the use of a wired Ethernet network between the Server and the Player(s). While wireless and powerline connections work well for providing Internet access to the Kaleidescape System, for connecting control systems, and for accessing the Web Utility from a PC, a wired Ethernet network should be used for connecting the Kaleidescape components to each other because there is little tolerance for latency while streaming movies or music.

This document helps you understand the advantages of a wireless or powerline Internet connection to your Kaleidescape System and the techniques used to establish such a connection.

2.0 Understanding Wireless Local Area Networks

If you cannot run cables from the home's Internet connection to the Kaleidescape System, a wireless router (or router and wireless access point (WAP)) can be located near the DSL or cable modem and used to provide wireless Internet connectivity throughout the home for a wide variety of devices, including a Kaleidescape System. In order to connect the Kaleidescape System to the Internet using this wireless network, a wireless bridge (also sometimes marketed as a "wireless game adapter") is necessary.

The Wi-Fi trademark identifies certified wireless networking products that are widely used in home and business networks to allow connectivity of mobile and desktop computers, video game consoles, mobile phones, printers and other peripherals. It is also used widely in audio/video equipment, most notably for wireless control devices. The various IEEE 802.11 standards include the following:

Standard	Frequency	Max Raw Data Rate	Typical Throughput
802.11b (1999)	2.4 GHz	11 Mbit/s	5.9 Mbit/s
802.11a (2001)	5 GHz	54 Mbit/s	23 Mbit/s
802.11g (2003)	2.4 GHz	54 Mbit/s	19 Mbit/s
802.11n (expected 2009)	2.4, 5 GHz	248 Mbit/s	74 Mbit/s

Note that while the typical throughput of today's Wi-Fi technologies (predominantly 802.11g) seems to indicate that a wireless connection might be a practical option for streaming movies and music from the Kaleidescape Server to a Player, as DVD throughput does not exceed 11.5 Mbit/s and CD throughput is limited to 1.5 MBit/s, wireless LANs do not typically provide suitable latency performance for this task. (While we have received reports from customers that are successfully using 802.11g to connect a Kaleidescape Player to the Server, Kaleidescape strongly encourages the use of Ethernet cabling between components.)

Wireless Channel Separation

802.11b/g wireless devices communicate with each other using radio frequency signals between 2.4 GHz and 2.5 GHz. The centers of neighboring channels are 5 MHz apart but the channels themselves are 22 MHz wide. So two wireless networks that use nearby channels (for example, channels 1 and 4) in the same general vicinity may interfere. Using channels that are five channel numbers apart decreases the channel cross-talk and improves performance. In the United States, only channels 1 through 11 are available, so the only three wireless networks that do not overlap are channels 1, 6 and 11.

Wireless Security

The ability to access a local area network without a wire provides great benefits. However, wireless networking raises security issues, since it's often possible to access the network without entering the building. You should implement effective wireless security policies that guard against unauthorized access to your network. For more information, refer to the documentation provided with your wireless networking equipment.

3.0 Understanding Powerline Communication

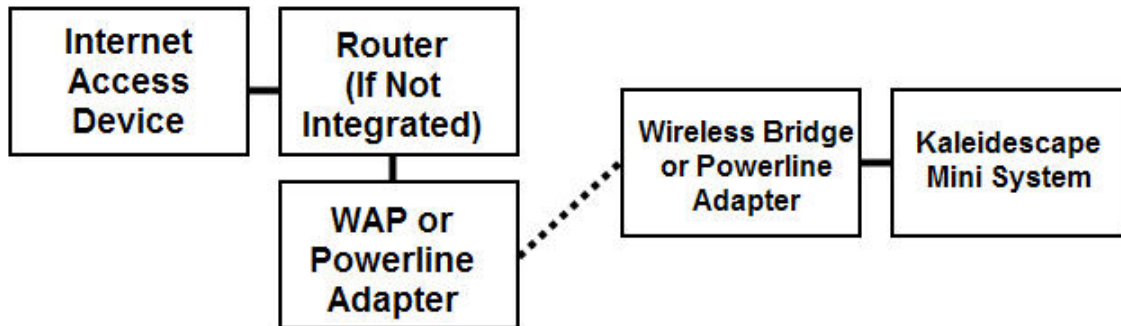
Another option you can use to deliver an Internet connection to the Kaleidescape System when Ethernet cables are not feasible is powerline communication (PLC). PLC uses the electrical wiring in a home to interconnect segments of an Ethernet network. There are several proprietary PLC standards, including HomePlug, HD-PLC, and UPA. Equipment from differing standards cannot interoperate and may interfere.

To connect your Kaleidescape System to the Internet using a Powerline network, plug a Powerline adapter into an electrical outlet, and then to a router or switch with Internet access. Install a second Powerline adapter near your Kaleidescape System, connecting it to the network connection of the Kaleidescape System and an electrical outlet. Because there are varying standards, Kaleidescape recommends using two Powerline adapters of the same make and model number.

4.0 Suggested Configurations

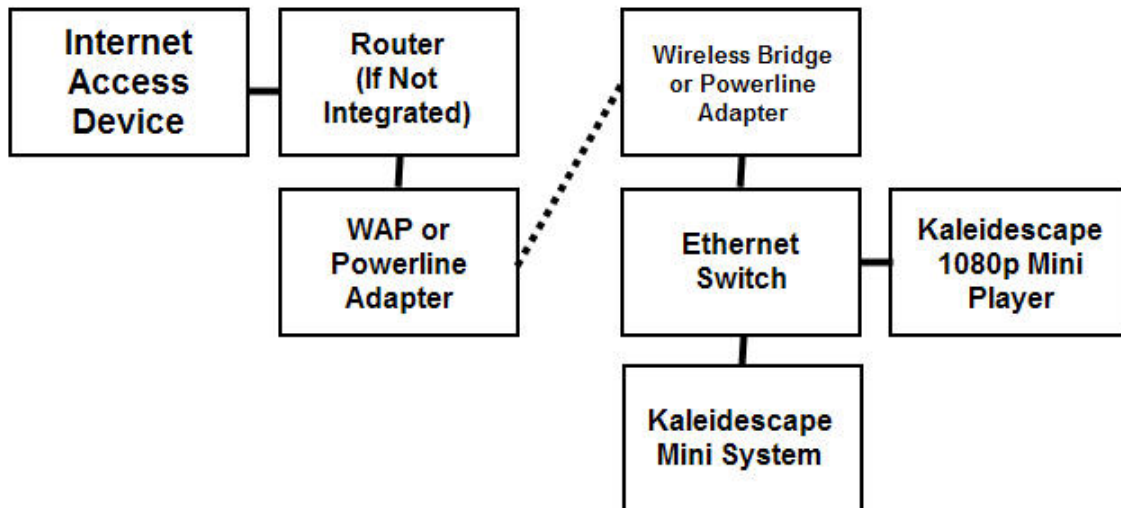
Depending on the requirements of the installation, several configurations are possible. The Mini System is the simplest Kaleidescape System to connect to the Internet using a wireless or powerline network because it is a single component and little networking hardware is required. However, you can connect any Kaleidescape System to the Internet with Wi-Fi or PLC.

Sample Configuration #1 – Kaleidescape Mini System with Wi-Fi or PLC



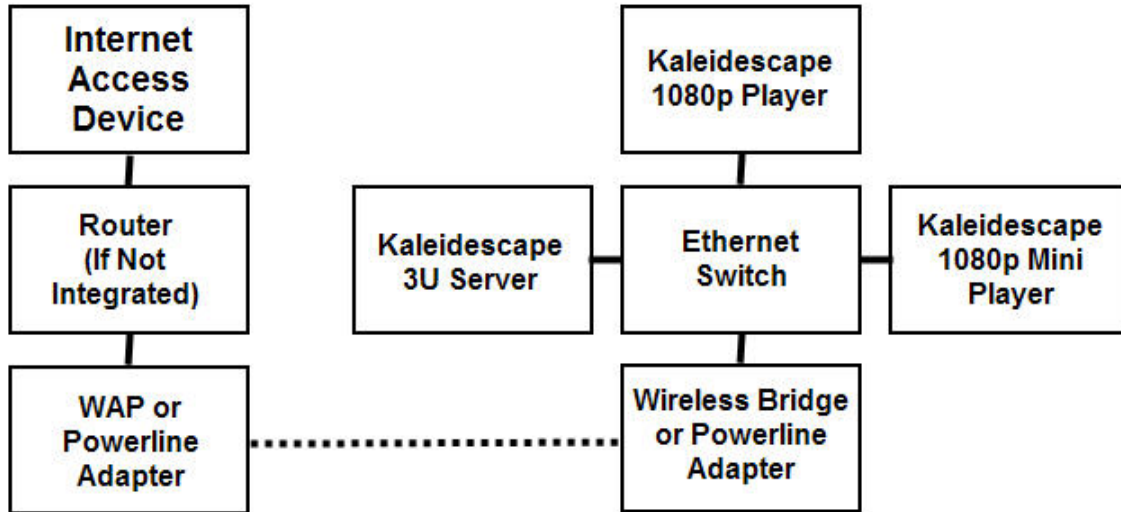
In this configuration, a wireless access point (WAP) or powerline adapter is connected to a router, which is connected to the Internet access device (such as a cable or DSL modem), and a wireless bridge or powerline adapter is connected to the Kaleidescape Mini System. Note that a wireless router performs the functions of both a router and a WAP.

Sample Configuration #2 – Kaleidescape Mini System and 1080p Mini Player



In this configuration, a Kaleidescape Mini System and 1080p Mini Player are connected to an Ethernet switch, which is connected to the Internet using either wireless or powerline networking equipment.

Sample Configuration #3 – Kaleidescape 3U Server with 1080p Player and 1080p Mini Player



In this configuration, a Kaleidescape 3U Server, 1080p Player and 1080p Mini Player are connected to an Ethernet switch, which is connected to the Internet using either wireless or powerline networking equipment.

These configurations are only examples. Many different configurations are possible, provided that the connection between Player(s) and Server(s) always uses Ethernet cabling.

5.0 Selecting Equipment

Some wireless networking hardware bears the “Wi-Fi Certified” logo. This certification includes testing designed to help ensure that devices from different manufacturers interoperate and implement the latest security features. Depending on the standards implemented, the logo will include designations for a, b, g and/or n.



Properly functioning 802.11a/b/g/n, UPA or HomePlug networks should provide sufficient bandwidth for the Internet access requirements of a Kaleidescape System. Kaleidescape does not endorse any particular wireless or powerline networking equipment. However, we have informally tested the following components with good results:

Networking Technology	Make and Model
802.11g	Linksys by Cisco WET54G
802.11n	Linksys by Cisco WGA600N gaming adapter with WRT610N router
802.11n	Ruckus MediaFlex 7111 adapter with 7811 WAP
PLC (HomePlug AV)	ZyXEL PLA-401 adapters
PLC (UPA)	Netgear HDXB101 adapters

6.0 Conclusion

There are several advantages to using a wireless or powerline network to connect a Kaleidescape System to the Internet. When possible, a wired Ethernet network is preferred but sometimes an alternate networking technology may be appropriate. If you have additional questions about establishing Internet access for your Kaleidescape System using a wireless or powerline network, contact Kaleidescape support by visiting <http://www.kaleidescape.com/support>.