

Zero Wire DMX

Operators Manual



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1. Introduction

Zero Wire DMX is designed to allow users to construct a wireless DMX network and enable the use of DMX devices where DMX over wire is not possible.

Zero Wire DMX is designed to allow people everywhere to use IEEE standard of 802.11 Wireless Ethernet as a transport mechanism for USITT DMX 512.

The construction of a simple wireless network allows users to send their DMX (within the constraints of the wireless network) instantly with no response difference from that of using cables.

As the standard for 802.11 differs for countries across the world users must familiarise themselves with the available local frequencies and work within local regulations.

Wireless Ethernet 802.11 systems can cause interference to and receive interference from amongst other things:

- Other Wireless Ethernet Systems
- Microwave Ovens
- Bluetooth enabled devices
- Some football stadium floodlight ballasts
- Cordless Analogue and Digital Telephone Systems

We therefore recommend only using wireless devices where it is impractical or impossible to run traditional cable systems.

Note

The hardware and software were designed for Cooper Controls by dAFTdATA Ltd.

dAFTdATA have considerable experience within the IT networks world as well as lighting industry working in the fields of design and installation.

2. How to set up a Zero Wire DMX system

The Zero Wire DMX system is shipped containing the following components:

- 2 Zero Wire DMX boxes
- 2 Mains Cables
- Manual & Configuration Software CD
- RS232 Programming Cable

Overview:

- Zero Wire DMX Box: A device that takes in USITT DMX 512 and converts the data into IP (Internet Protocol) packets embedded within Ethernet Frames for delivery across a wireless Ethernet system.

One box is configured to act as an encoder and one as a decoder. To enable the system to work from the box the following steps need to be followed:

- Connect the box labelled as the encoder to the lighting console.
- Connect the box labelled as the decoder to the lighting fixtures.
- Power up the boxes.

The system will now allow the transfer of DMX data from the encoder to the decoder. If the system seems to be underperforming it might be due to interference from another wireless network. To overcome this it may be necessary to switch to another wireless channel, or use a WAP (Wireless Access Point) box. Please refer to section 3 for information on using a WAP and switching channels.

Working with the Boxes

- The boxes are designed to be the entry and exit points for data transmitted over the network.
- A wireless network as a single entity can support up to 250 boxes.
- It is possible for each box to be set to either encode or decode data.
- One encoder can talk to 249 decoders on a single network.
- 4 encoders can talk to 60 decoders each all on the same wireless network.
- It is possible to extend the system beyond 4 universes by adding more WAPs to create further wireless networks.

Specification

- Mains voltage inlet connector: allows for mains power supply in the range of 90-260 v(AC).
- 5 Pin XLR Input– allows the box to act as an encoder.
- 5 Pin XLR Output – allows the box to act as a decoder.
- RS232 port – allows for the box to be configured by connecting it to any computer with an RS232 9 pin Serial port, or via USB with the appropriate converter.
- 3 stack Red LED indicator – allows for analysis of system operation. Provide indication of termination, data receive or transmit rate, and system status.
- Mode Green LED indicator – shows if box is set to encode or decode mode.
- Terminator Switch – allows for termination of the DMX run, when the box is in encode mode and is in line after some DMX devices that require termination.

For shipping, the boxes are preconfigured as one encoder and one decoder, in ad-hoc mode, allowing immediate use. If ordered with a WAP, the boxes will be configured to work in infrastructure mode, talking through the WAP.

If the boxes are to be used on a larger network or in conjunction with another system, or to extend the size of an existing system then they must be reconfigured accordingly.

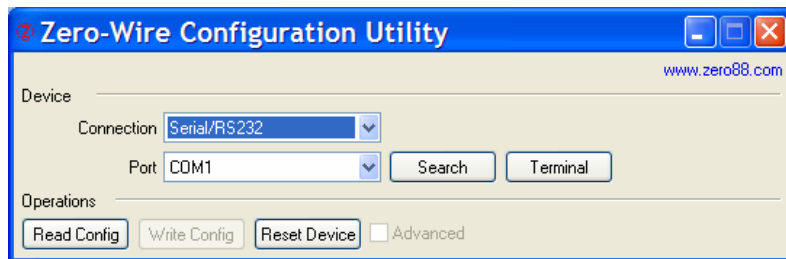
Connecting a Box to a PC

To begin reconfiguring the boxes they must be connected to a suitable PC, either via RS232 or with a USB to RS232 adaptor.

The Zero Wire Configuration Utility is provided on a CD with the units. This utility allows you to set up, configure, and reboot the devices, using a simple PC interface.

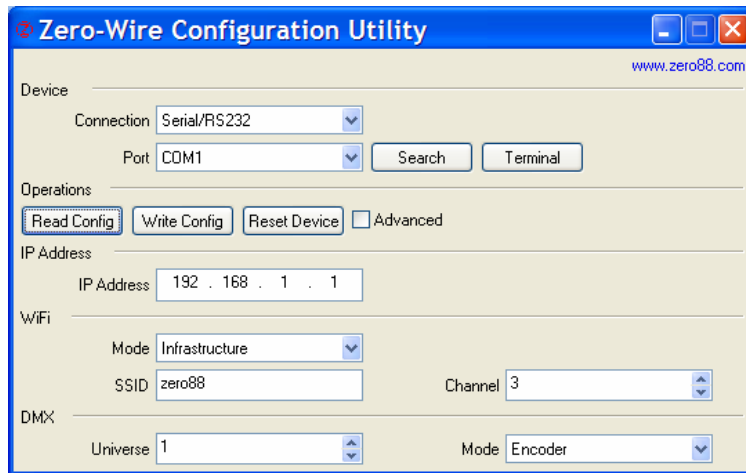
When connecting the Zero Wire DMX boxes to a PC, a special RS232 cable is required. This cable is supplied with the units. A 9 pin serial port on the PC is required or if a 9 pin port is not available then a USB port can be used with a suitable USB to RS232 converter. These are available from most PC equipment suppliers.

Once the computer and the box are connected and powered up, the Zero Wire Configuration Utility can be started.



Select the COM port which the Zero Wire box has been connected to, or press Search.

Now that a COM port has been selected, you can press Read Config to read the current Configuration from the attached box. If the connection is established correctly, the window will open up and display all of the current settings defined on the box.



The options are defined below:

IP Address

This is the units IP address. One of the benefits of the Zero Wire DMX system is that it uses full IP addresses which allowing the routing of the DMX data across all kinds of networks both switched and unswitched.

The IP address is each unit's unique identifier.

No two boxes or devices operating on the same network should ever be given the same IP address.

IP addresses allow each box to be set with a unique number which means we can tell the network that Box 1 is an encoder and Box 2 is a decoder. IP addresses within the range

192.168.X.1 through 192.168.X.250 are valid.

It is possible that X can be configured to something other than 1, but the default is 1 and we strongly recommend that you keep with this unless there are good reasons to change. Only Advanced users should ever change the value of X

192.168.1.255 is a reserved address and as such should never be used as an IP address of a box or device.

Subnet Mask

This is a TCP/IP specific detail and should only be changed from its default of 255.255.255.0 by experienced users.

Default Gateway

This is a TCP/IP specific routing detail and should only be changed from its default of 0.0.0.0 by experienced users.

Wifi Mode

Wifi Mode specifies the topology of the wireless network. The standard way is to use the system in AdHoc Mode, as this does not require the use of a WAP. In Ad Hoc mode the boxes communicate with each other directly. Every box must stay in communication with every other for the network to work. In a larger system we recommend using Infrastructure mode.

By using the Infrastructure mode switching physical frequencies via the allocated channels within IEEE Standard 802.11 can be performed simply by assigning a new channel to the WAP as opposed to having to change every frequency manually on every box. The WAP point also acts as a repeater station meaning that the boxes on the network don't all have to see each other. Please refer to section 3 for information on WAP channel allocation.

SSID

This is the Wireless networks SSID or name, it must be the same as the WAP and all other Boxes on the same network for every device to function accordingly. The default SSID is zero88 (note that this is all lower case).

Channel

This is the number of the IEEE Standard 802.11 radio channel that should be used when the boxes are being used in Ad Hoc mode. You should not normally need to change this since it is automatically set when in Infrastructure Mode.

WEP

Wireless Encryption Protocol, it is possible to run the system with WEP enabled should you wish to protect the DMX data as it travels across the wireless network. Using encryption will also add significantly to the processing overheads.

WEP KEY

This is the same key code that the WAP has stored within its configuration and as such it must be entered exactly as the WAP has it stored. Finally you must either run a system that is WEP enabled or not WEP enabled. Never attempt to run boxes that are not WEP enabled on a WEP enabled wireless network.

Shared Key Authority

This is a wireless encryption protocol parameter and as such should only be changed by experienced users.

HTTP

This is the Hyper Text Transfer Protocol based Web Server that is embedded within the box. There are only two options for this parameter, those of enabled and disabled. If the web server is enabled it allows for status reporting to be achieved through a typical web browser such as Internet Explorer etc. The Web Server can detail the parameters of the box and allows a quick and easy means to access such information. We strongly recommend that the

web server is kept enabled.

Universe

This is a number set by the user to distinguish one DMX universe from another when running multiple universes of DMX over the same wireless network. This parameter can be set from one to ten.

DMX Mode

This parameter specifies whether the box is to work as an encoder or decoder.

Encoders accept DMX data from a console via the male 5 pin XLR connector and encode the data onto the wireless network.

Decoders will decode data from the wireless network and output DMX from the female 5 pin XLR. The green LED under the female 5 pin will be lit if the box is set to decoder mode.

DMX Target

This is the target address of the decoder to which the encoder will send its data. The default target address is 192.168.1.255. The usage of an address ending with 255 dictates that the encoder will send the DMX data out to every decoder on the same network. If you only wanted the encoder to send the DMX data to one specific decoder then you would enter the IP address of that specific decoder. Unless there are special circumstances you should leave the last number at 255.

DMX Refresh Rate

If the box is acting as an encoder then it is possible to reduce the network traffic by reducing the refresh rate that the encoder accepts data from the console. The default setting is 40, which represents frames per second. It is possible to reduce this down to 10 when working with moving head fixtures without any noticeable degradation in the performance. However the usage of faster, more responsive DMX devices such as LED lights requires a refresh rate of 40 frames.

Advertisement

This is a Zero Wire specific message parameter and as such should not be changed.

Each of the above settings can be changed using the utility, and once the required settings have been achieved, the "Write Config" button can be pressed to send the new settings to the box.

At any time the box can be rebooted by using the "Reset Device" box.

3. Working with a WAP

Zero Wire DMX will work with any off the shelf Wireless Access Point (WAP). Each WAP comes with its own configuration setup software which should be run according to the accompanying manual.

However, after connecting to the WAP either wirelessly or via a cable, your PC should be able to reach the web interface. For the Linksys ® WAP11 the interface should look like this:



Here it can be seen that this WAP has its SSID set to A and its Channel is set to 1. If the SSID of the boxes are also set to A then the system will work and the encoder box will route its airborne DMX data via the WAP, if there is any discrepancy it will not work. Please note the SSID is Case Sensitive.

The Channel is the physical frequency which the WAP operates on. There are different numbers of channels available in different countries around the world and it is the users responsibility to check that they are using a legitimate frequency.

The key to the channel concept is that if you change the channel of the WAP then EVERY device on the same SSID will move channels.

So if you experience data corruption or interference whilst using the Zero Wire DMX system you can instantly move to a clear channel. This ability to change channels during the show and 'on the fly' is one of the great advantages of the Zero Wire DMX system above other similar systems and above traditional older wireless systems.

Configuring the WAP

The WAP should only ever need three parameters changing, these are the IP address, the SSID and the Channel.

NB The IP address of the WAP must be within the same range as the boxes, so if the boxes are 192.168.1.1 and 192.168.1.2 respectively then the WAP must be 192.168.1.X respectively. It is suggested that the numbers above 240 are used for WAP's so for example the typical WAP address range would be 192.168.1.240 through 192.168.1.249

Any time a change is made on the WAP configuration page, the change must be committed or applied to the WAP. If changing the WAP's IP address and viewing the WAP's configuration page through Internet Explorer then you will have to change the IP address in the IE address bar accordingly to reflect the new IP address.

To apply a change to the WAP you must scroll down to the bottom of the configuration utility and click on Apply.

The screenshot displays a configuration window for a wireless access point. The interface is divided into several sections:

- LAN IP Address:** (MAC Address: 00-06-25-57-90-34)
 - Obtain an IP Address Automatically
 - Specify an IP Address: 192 . 168 . 0 . 242
 - Subnet Mask: 255 . 255 . 255 . 0
 - Gateway: 0 . 0 . 0 . 0
- Wireless:** (MAC Address: 00-06-25-55-90-C0)
 - SSID: MyNewSSID
 - Channel: 11 (Domain: ETSI)
 - WEP: Mandatory Disable
- AP Mode:**
 - Access Point
 - Access Point Client Remote AP MAC Address
 - Wireless Bridge Remote Bridge MAC Address
 - Wireless Bridge - Point to MultiPoint

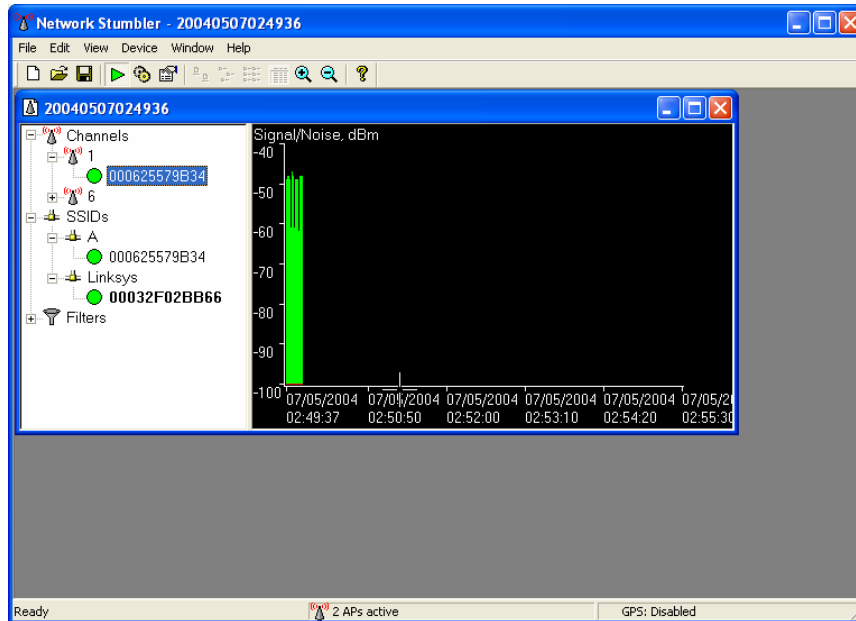
When set to "Access Point Client", "Wireless Bridge" or "Wireless Bridge - Point to MultiPoint" mode, the device will only communicate with another WAP 11 ver. 2.2 or WAP 11.
- Backup/Restore Setting:**
 -
 - Click "Backup" to store Access Point configuration on your local PC.
 - Click "Restore" to restore Access Point configuration from your local PC.
 -

A final note on changing the channels. Although channels 1 and 2 are numerically different the physical frequencies which they represent overlap. Depending on which other wireless networks are in use in the local area, you may need to reconfigure the units to respond to different channels.

4. A Note on other Wireless Networks.

There is a tool available as freeware known as Network Stumbler. This is a PC based package that allows you to discover other networks which might exist. The software is free and downloadable from www.netstumbler.com. (NB: At present, a Windows Vista compatible version of Net Stumbler does not exist).

The software can be run on a laptop and shows instantly what channels are in use, the signal to noise ratio of the devices in question etc. It is highly recommended that this program is run on a wireless capable laptop at show time to show the presence of any other wireless networks.



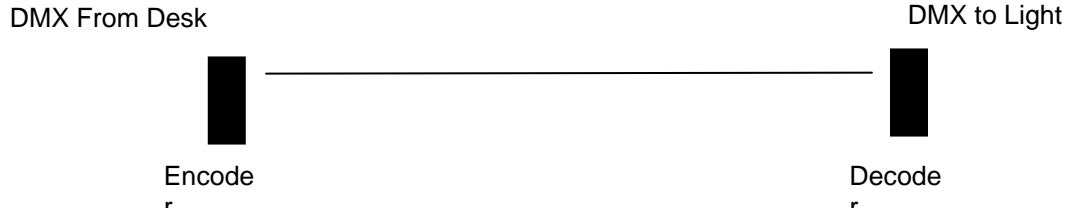
5. Running a Show

To enable maximum flexibility at show time it is recommended that a wireless networked enabled laptop is present and running both the WAP configuration software and the latest version of Net Stumbler. This allows for identification of rogue wireless networks and offers the ability to switch channels instantly.

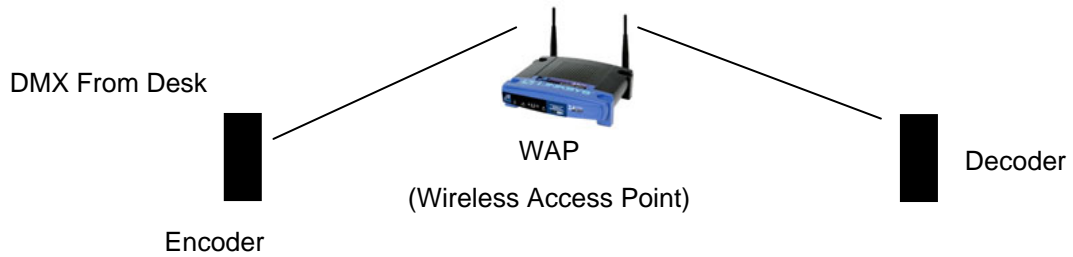
The likelihood of interference depends on where you are in the world. A wireless networks convention would not be the place to use a wireless network without the ability to switch channels instantly. Conversely an outdoor festival on an airfield would be ideal. The level of protection that you afford is dependant upon how much safety equipment and backup you deploy. If a cable can be run safely then this will *inherently* be more secure than any wireless system, however if there is the risk of damage to the cable or running it is impossible then the Zero Wire DMX system gives you a highly secure system.

6. System Configuration Options

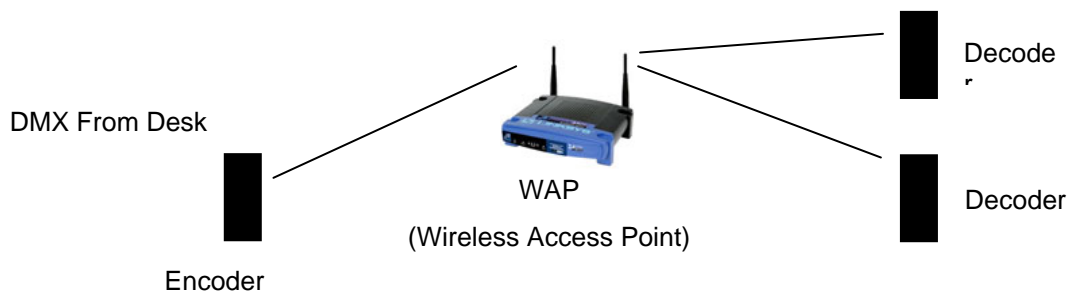
Simple point to point (AdHoc)



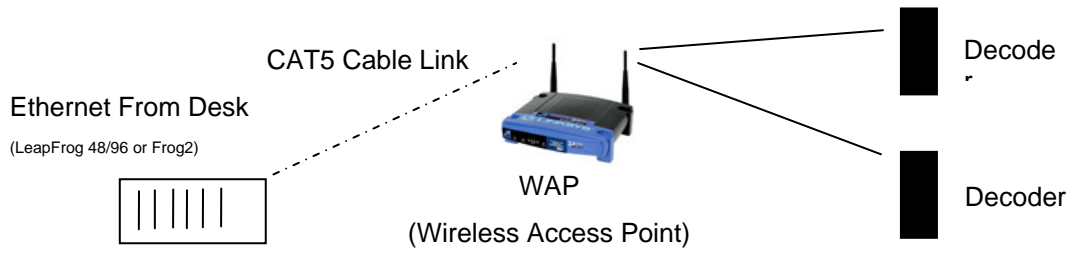
Simple point to point (Infrastructure)



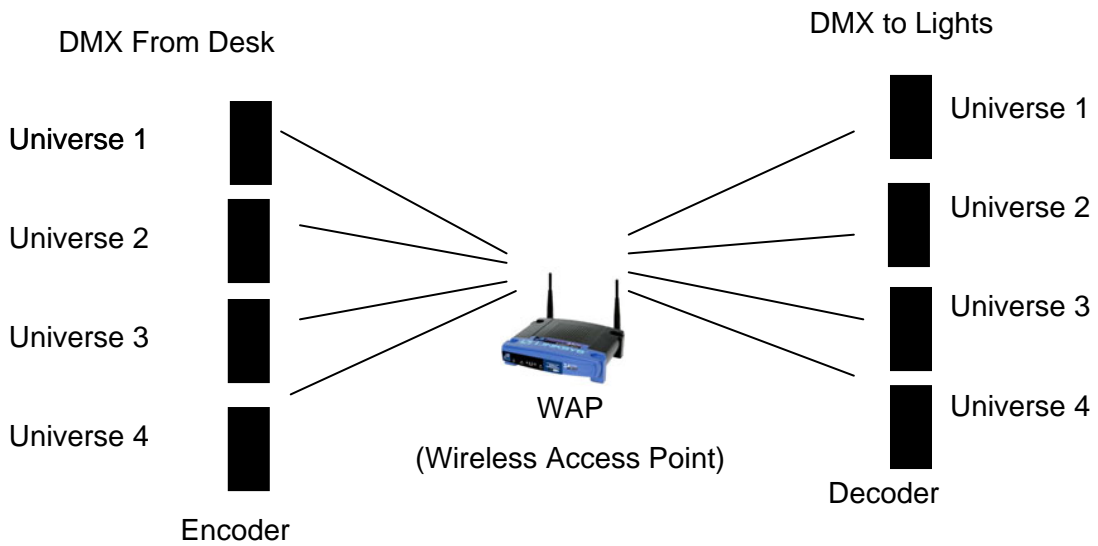
Simple point to multi point (Infrastructure)



Desk to multi point (Infrastructure)

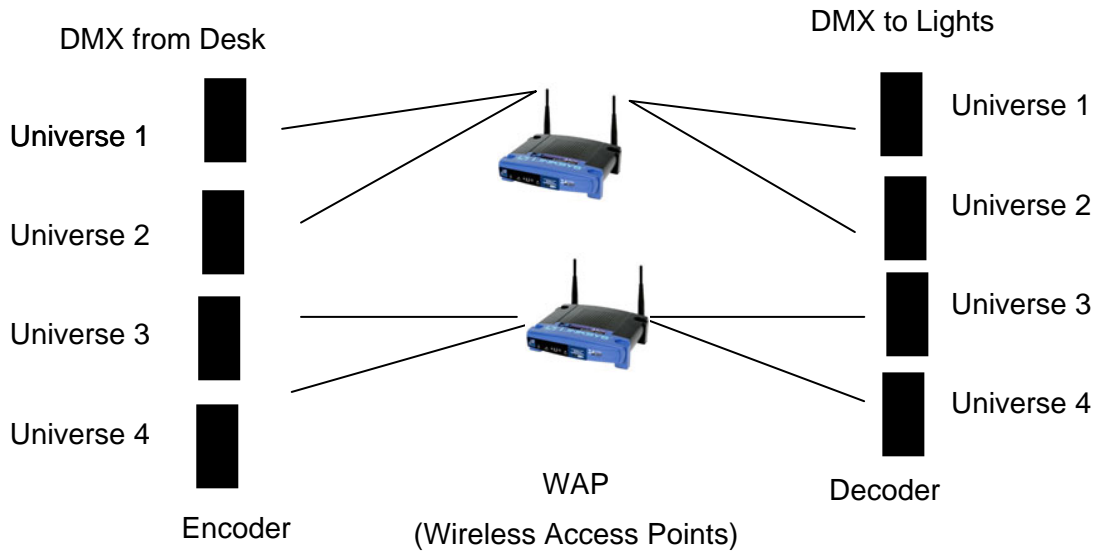


Multiple Universe through 1 WAP (Infrastructure)

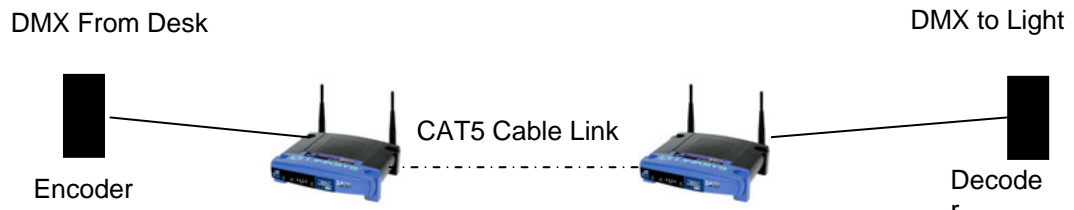


Up to 4 Universes can be run off of 1 WAP

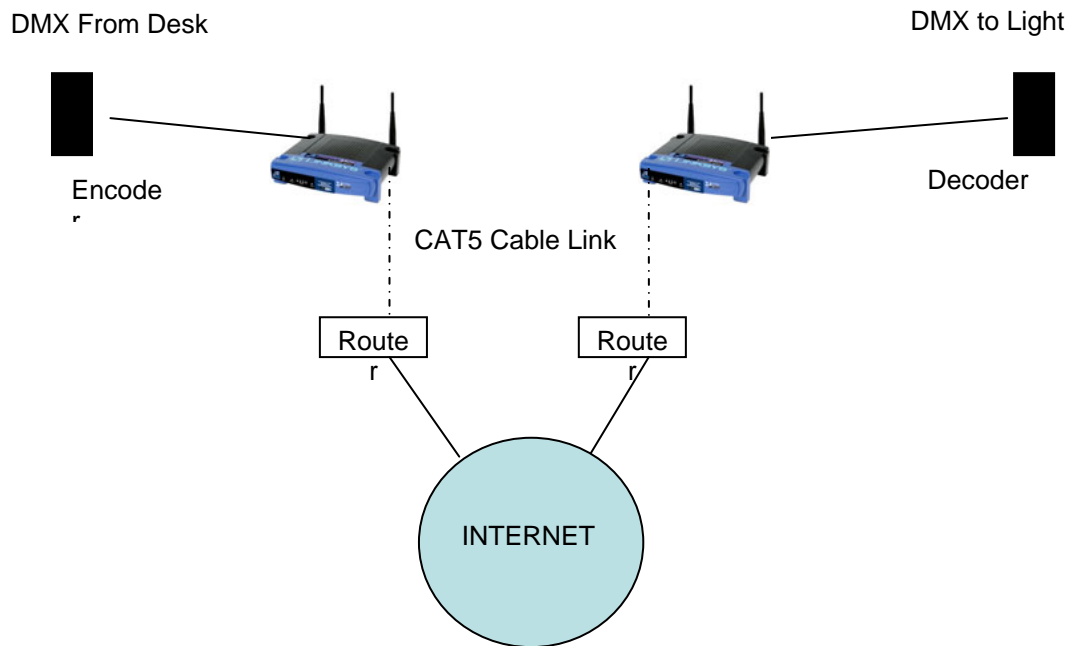
Multiple universes split across multiple waps (Infrastructure)



Extending WAP's using cable



Extending WAP's using the Internet



Zero 88 reserves the right to make changes to the equipment described in this manual without prior notice.


This equipment is designed for professional stage lighting control, and is unsuitable for any other purpose.

It should be used by, or under the supervision of, an appropriately qualified or trained person.

E&OE.

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